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ORIGINAL ARTICLE

Knowledge on occupational health and safety among civil engineering sector operators

Conocimientos sobre seguridad y salud en el trabajo en operadores del sector de obra civil

Conhecimento sobre saúde e segurança ocupacional entre operadores do setor de engenharia civil

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ABSTRACT

Introduction: civil works workers are constantly exposed to risks such as falls from different levels, structural collapse, electrocutions, and exposure to hazardous substances, physical fatigue, constant noise, and improper handling of tools and heavy machinery. **Objective:** to determine the level of knowledge about occupational health and safety among civil works construction operating personnel in a company located in the Barranquilla District, Colombia. **Method:** an analytical cross-sectional study was conducted in the last quarter of 2024 with 40 workers selected through convenience sampling. The survey-type methodological instrument designed by Mejia*et al*. in 2016 and validated for this study was used. The instrument consisted of a self-administered survey consisting of 12 questions related to the characteristics of the respondent and their work, as well as 10 multiple-choice questions about their work knowledge. **Results:** weaknesses were evident in the understanding and internalization of the fundamental concepts that underpin occupational risk prevention. A relevant finding was the gap between formal compliance with certain institutional processes and a lack of awareness of the rights, duties, and regulations governing occupational health and safety. **Conclusions:** this situation suggests the existence of a superficial preventive culture, focused on compliance based on requirements rather than on a critical understanding of the elements, that guarantees a few or king conditions. Furthermore, factors such as educational level, the nature of the employment relationship, and the type of occupation directly influence the appropriation of knowledge on the subject.

Keywords: level of knowledge; occupational health; industrial safety; operating personnel; civil engineering; occupational safety and health

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RESUMEN

Introducción: los trabajadores de obra civil están constantemente expuestos a riesgos como caídas a distinto nivel, colapso de estructuras, electrocuciones, exposición a sustancias peligrosas, fatiga física, ruido constante y manipulación inadecuada de herramientas y maquinaria pesada. **Objetivo:** determinar el nivel de conocimientos sobre seguridad y salud en el trabajo en el personal operativo de construcciones de obras civiles en una empresa del Distrito de Barranquilla, Colombia. **Método:** se realizó un estudio transversal analítico en el último trimestre de 2024, en 40 trabajadores seleccionados a través de un muestreo por conveniencia, donde se utilizó el instrumento metodológico tipo encuesta diseñado por Mejia *et al.* en 2016 y que fue validado para el presente estudio. El instrumento consistió en una encuesta auto aplicable, que consta de 12 preguntas referidas a las características del encuestado y su trabajo, así como 10 preguntas de opción múltiple acerca de sus conocimientos laborales. **Resultados:** se evidenciaron debilidades en la comprensión e internalización de los conceptos fundamentales que sustentan la prevención. de riesgos laborales. Como dato relevante se relacionó con la distancia existente entre el cumplimiento formal de ciertos procesos institucionales y el desconocimiento de los derechos, deberes y normativas que rigen la seguridad y salud en el trabajo. **Conclusiones:** esta situación sugiere la existencia de una cultura preventiva superficial, centrada en el cumplimiento por requerimiento y no en la comprensión crítica de los elementos que garantizan condiciones laborales seguras. Asimismo, se identifican que factores como el nivel educativo, la naturaleza del vínculo laboral y el tipo de ocupación influyen de manera directa en la apropiación del conocimiento sobre el tema.

Palabras clave: nivel de conocimiento; salud laboral; seguridad industrial; personal operativo; obra civil; seguridad y salud en el trabajo

RESUMO

Introdução: trabalhadores da engenharia civil estão constantemente expostos a riscos como quedas de diferentes níveis, desabamento estrutural, eletrocussões, exposição a substâncias perigosas, fadiga física, ruído constante e manuseio inadequado de ferramentas e máquinas pesadas. **Objetivo:** determinar o nível de conhecimento sobre saúde e segurança ocupacional entre o pessoal de operação de obras civis de uma empresa no Distrito de Barranquilla, Colômbia. **Método:** foi realizado um estudo transversal analítico no último trimestre de 2024, em 40 trabalhadores selecionados por amostragem de conveniência, onde foi utilizado o instrumento metodológico do tipo survey, desenvolvido por Mejia *et al* em 2016 e validado para o presente estudo. O instrumento consistiuemum questionário auto aplicável, composto por 12 questões referentes às características do respondente e seu trabalho, além de 10 questões de múltiplaescolha sobre seu conhecimento sobre o trabalho. **Resultados:** foram evidenciadas fragilidades na compreensão e internalização dos conceitos fundamentais que embasam a prevenção. de riscos ocupacionais. Um fato relevante foi a lacuna entre o cumprimento formal de determinados processos institucionais e a falta de conhecimento dos direitos, deveres e normas que regem a saúde e a segurança ocupacional. **Conclusões:** esta situação sugere a existência de uma cultura preventiva superficial, focada no cumprimento por exigência e não na compreensão crítica dos elementos que garantem condições seguras de trabalho. Da mesma forma, fatores como o nível educacional, a natureza do vínculo empregatício e o tipo de ocupação são identificados como influenciadores diretos na aquisição de conhecimento sobre o tema.

Palavras-chave: nível de conhecimento; saúde ocupacional; segurança industrial; pessoal operacional; obras civis; segurança e saúde no trabalho

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INTRODUCTION

The construction industry represents one of the most relevant economic sectors worldwide, both for its contribution to the development of infrastructure and for its capacity to generate employment. However, it is also one of the sectors with the highest occupational accident rates.[1] According to the International Labor Organization (ILO), approximately 60,000 workers die each year in construction-related accidents, which represents about 17% of all occupational fatalities worldwide, despite the fact that this sector employs only 7% of the global workforce.[2]

Civil works workers are constantly exposed to risks such as falls to different levels, collapse of structures, electrocutions, exposure to hazardous substances, physical fatigue, constant noise and improper handling of tools and heavy machinery. These hazards are exacerbated in contexts of informality, where adequate training and compliance with occupational safety and health (OSH) regulations are not guaranteed.[3] In Latin America, this situation is critical. Studies show that more than 60% of informal construction workers are unaware of basic OSH regulations, which increases their vulnerability to accidents.[4]

Internationally, scientific literature has addressed the need to strengthen the preventive culture in the construction sector, highlighting the importance of continuous training, access to personal protective equipment and technical supervision. The implementation of OSH management systems significantly improves working conditions in small and medium-sized companies in the sector.[5,6,7]

In the Colombian context, the picture is no different. The Ministry of Labor and the Labor Risks Fund reported that 22% of the occupational accidents registered in the country correspond to the construction sector, being one of the most affected after the manufacturing sector.[8,9]. Research shows that the educational level of the workers directly affects their adoption of safe behaviors underlining the need for training programs adjusted to the worker's socio-labor profile.[10]

Particularly in Barranquilla, a port city in northern Colombia with an accelerated urban and infrastructure growth there is a high concentration of civil works workers, many of them linked to the informal sector, with little or no training in OSH. This reality raises the urgency of developing local diagnostics to understand the level of knowledge that these workers have regarding occupational hazards, in order to guide interventions to strengthen their preventive competencies and improve their occupational well-being.[1]

The purpose of this study is to evaluate the level of knowledge in occupational safety and health in operators of the civil works and construction sector in Barranquilla, in order to identify training gaps, establish relationships with sociodemographic variables and propose actions for improvement. The results are expected to contribute to the strengthening of the culture of prevention in a critical sector for regional development, and to serve as input for public policies and intervention programs based on empirical evidence.

METHOD

An observational, descriptive, cross-sectional, descriptive study was carried out with 40 operative workers of companies in the civil construction sector in the District of Barranquilla (Northern Colombia) in the last period of 2024. To determine the number of participants, a convenience sampling was carried out with those workers who were willing to participate in the study and who signed the informed consent form.

The methodological instrument developed by Mejía et al.[11] was used, which is characterized by being structured on the basis of key dimensions, including the legal regulations on Occupational Safety and Health. The identification of occupational hazards in the environment, the use of personal protective equipment, measures to prevent occupational accidents and diseases, as well as emergency procedures and biosafety protocols. This self-applicable survey, which consists of 12 questions referring to the characteristics of the respondent and his/her work, as well as 10 multiple-choice questions about his/her work knowledge. It was validated in the Colombian context for use in the research. The Excel program was used to process the data from the surveys.

The present study is based on the ethical principles established in the Declaration of Helsinki, which include respect for the freedom of individuals to decide their participation in research, justice to guarantee equitable treatment and beneficence, ensuring that no harm will be caused to participants. In addition, Resolution 008430 of 1993 was considered, which classifies this research as low risk, since only documentary techniques and methods applied retrospectively to the participants were used.

RESULTS

Table 1 show that the sample consisted of 40 operators in the civil works sector in the city of Barranquilla, of which 92.5% were men and 7.5% women, reflecting a marked masculinization of the sector. The age of the participants ranged between 19 and 63 years, with an average that suggests a population in the middle of the productive stage.

In relation to educational level, 55% had no academic training, while only 12.5% had professional studies and 17.5% had technical training, which showed a generalized low academic qualification. The main occupations were “other trades in the sector” (37.5%), master builder (20%) and bricklayer (17.5%), while only 12.5% were safety technicians or engineers.

Regarding access to OSH processes, all workers (100%) reported having received occupational health training and having been informed about occupational hazards, although only 60% were notified about their affiliation to the Complementary Risk Work Insurance (SCTR) at the time of entering the job. Likewise, 100% reported having undergone an occupational medical examination upon entry, and an alarming 90% reported having suffered an occupational accident during the last year.

Table 1: Socio-educational characteristics

Variable	No.	%
Sex		
Male	37	92,5
Female	3	7,5
Age (Years)	40	19,6
Level of education		
Professional	5	12,5
Technician	7	17,5
Bachelor's degree	6	15,0
None	22	55,0
Occupation		
Master Builder	8	20,0
Mason	7	17,5
Engineer	5	12,5
Safety Technician	5	12,5
Other	15	37,5
Passed occupational medical examinations upon entry		
No	-	-
Yes	40	100,0
Upon admission he was informed of his SCTR		
Yes	24	60,0
No	16	40,0
Received occupational health training		
Yes	40	100,0
No	-	-
Had an accident in the last year		
Yes	36	90,0
No	4	10,0
Received information on health risks at work		
Yes	40	100,0
No	-	-

The results on specific OSH knowledge shown in Table 2 revealed significant gaps. Only 30% correctly answered what the OSH Law is, and only 30% correctly identified the SCTR. Likewise, there was a lack of knowledge regarding the responsibility for reporting non-fatal accidents, where only 35% responded correctly.

In contrast, 87.5% correctly identified the OSH regulatory entity in Colombia, and 97.5% answered correctly about the mandatory annual occupational examination and retirement, which could indicate a partial knowledge focused on medical procedures rather than on regulatory or administrative aspects.

Knowledge of occupational diseases was intermediate: 50% responded correctly on the suspicion of occupational disease, while 47.5% responded correctly on who should report an occupational disease. Finally, only 37.5% were clear about coverage in the event of a disabling accident.

Table 2: Knowledge of occupational safety and health

Variable	No.	%
The OSH Act		
Correct	12	30,0
Incorrect	28	70,0
Entity that regulates OSH in Colombia		
Correct	35	87,5
Incorrect	5	12,5
Who must report occupational disease		
Correct	19	47,5
Incorrect	21	52,5
Who should report a non-fatal accident		
Correct	14	35,0
Incorrect	26	65,0
Supplementary insurance for work at risk		
Correct	12	30,0
Incorrect	28	70,0
Work accident		
Correct	23	57,5
Incorrect	17	42,5
Annual labor review		
Correct	39	97,5
Incorrect	1	2,5
Suspected occupational disease		
Correct	20	50,0
Incorrect	20	50,0
Coverage for disabling work accident		
Correct	15	37,5
Incorrect	25	62,5
Occupational retirement examination		
Correct	39	97,5
Incorrect	1	2,5

DISCUSSION

The findings of this study show a high exposure to risk, associated both with the working conditions of the construction sector and with important deficiencies in OSH regulatory and practical knowledge.

The fact that 9 out of 10 workers have suffered an occupational accident in the last year reflects a critical situation that, although it coincides with the national trend reported by the Colombian Ministry of Labor (2022), significantly exceeds acceptable accident rates in the sector.[3]

This result is in line with studies such as that of Cárdenas Saavedra et al.[12] who found that a large percentage of construction workers lacked basic OSH regulatory knowledge, directly affecting the adoption of safe behaviors. Similarly, Aguilar et al.[13] concluded that risk perception and knowledge of the legal framework are factors that directly affect occupational accidents, especially in informal contexts.

The fact that the majority of workers have received OSH training, but maintain a low rate of correct answers to key questions, such as the legal definition of OSH (30%), accident reporting (35%) and disability coverage (37.5%), suggests that the training may be insufficient, superficial or poorly contextualized. This is consistent with the findings of several studies,[14,15] which indicate that the quality and depth of training is a determining factor in its effectiveness.

Also relevant is the contrast between the high knowledge of occupational examinations (97.5%) and the low knowledge of the SCTR and legal coverage. This could be interpreted as an asymmetry in information, where the most visible aspects or those imposed by the employer (such as medical examinations) are known. But legal rights and duties are not properly disclosed or understood by workers, as noted by Bustos Pabón et al.[16] and Gutiérrez Cisneros et al.[17] in their study on risk perception among workers in the construction sector.

The low educational level identified (55% without academic training) may also be affecting the understanding of the training contents, a relationship already reported by Zapata Ramirez et al.[18] in their research, where it was established that the level of schooling is closely related to the internalization of safe practices.

Taken together, these findings show the urgent need to design more effective, accessible and culturally appropriate training programs, as well as to implement communication strategies to ensure that workers know, understand and apply OSH regulations. In addition, it is essential to strengthen institutional oversight and promote labor formalization in this sector, in order to reduce accident rates and guarantee the right to safe and dignified work.

CONCLUSIONS

The analysis carried out revealed that, although there is an active participation in occupational safety and health training processes within the civil works sector, there are still important weaknesses in the understanding and internalization of the fundamental concepts that underpin occupational risk prevention.

One of the most relevant findings is related to the existing gap between the formal compliance with certain institutional processes and the lack of knowledge of the rights, duties and regulations governing occupational safety and health. This situation suggests the existence of a superficial preventive culture, focused on compliance by requirement and not on the critical understanding of the elements that guarantee safe working conditions. Likewise, it was identified that factors such as educational level, the nature of the labor relationship and the type of occupation have a direct influence on the appropriation of knowledge on the subject.

RECOMMENDATIONS

Rethink the pedagogical strategies used, as well as the communication channels with workers and design training processes considering the socio-cultural characteristics of the working population, with accessible and contextualized methodologies focused on the transformation of daily practices. Promote a culture of prevention, the strengthening of information systems and the generation of safe work environments as shared responsibilities to achieve sustainable impacts.

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The authors declare that there are no conflicts of interest.

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YicelaMaria Palma Rodriguez: data curation, research, methodology, validation, original drafting, drafting-revising and editing.
Mayra Alejandra Ayos Coronell: formal analysis, research, supervision, drafting, drafting and editing
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