

Current state and improvement prospects of warehouse workers health and safety practices in Bulgarian manufacturing and trading organizations

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Abstract: Occupational health and safety (OHS) of warehouse workers is a crucial issue for warehouse managers. The importance of OHS practices has increased over recent years due both to high levels of fatal accidents in the logistics industry, and chronic shortage of labor in the sector, which requires systematic efforts to reduce absenteeism and increase warehouse employee motivation. This article aims to address the current state of some fundamental OHS practices of warehouse workers in Bulgarian manufacturing and trading organizations, and to outline some recommendations for their future improvements. The data were collected using the questionnaire survey method among 91 manufacturing and trading organizations in Bulgaria, which operate warehouses, and were processed using Chi-square analysis. The results show that the share of trading organizations, which implement OHS practices is lower, in comparison with surveyed manufacturing organizations. In addition, small organizations lag behind medium and large regarding the use of fundamental measures to protect warehouse workers. The main research findings indicate that there is a need to expand the frequency of OHS practices applied in trading organizations through a wider implementation of joint firefighting drills with fire and emergency safety authorities, adaptation of warehouse infrastructure, clear designation of emergency exits and placement of signs/work instructions for safe work at workplaces. Furthermore, it is critical to increase the use of appropriate work clothing and personal protective equipment (PPE), as well as to provide regular safety briefings in trading warehouses and small organizations.

1 Introduction

OHS practices are an issue of increasing importance for warehouse managers. According to data provided by Eurostat in 2019 the transport and storage sector ranks second, and accounts for 15% of all fatal accidents at work in the EU-27 countries [1]. The operations carried out in the warehouse engage a significant human resource in labor-intensive activities that are performed in a working environment with a high degree of risk and hazards. In addition, physical work in the warehouse leads to fatigue and causes stress arising from the increasing demand to cut down on customer service time. All that has an adverse effect on the attractiveness of the logistics industry. As a result, in recent years the logistics sector has been known to suffer from a chronic labor shortage [2], including warehouse operations. In these conditions, ensuring adequate practices for health and safety working conditions of warehouse workers becomes a crucial issue for warehouse managers. On the one hand, they look for options to reduce accidents resulting in inefficient use of the available workforce. On the other hand, improving the working conditions in the warehouse is an important prerequisite in efforts to boost the motivation of warehouse workers.

Despite the growing number of publications dealing with various aspects of OHS practices in general, little is known at this point about their application in terms of warehouse workers in manufacturing and trading organizations both in Bulgaria and abroad. The importance of this issue for manufacturing and trading organizations

stems from three main factors. First, in 2019 about a third (31%) of non-fatal accidents at work resulting in at least 4 days of absence and about a quarter (22.9%) of fatal incidents occurred in the manufacturing and trading sector in the EU-27 [1]. Second, the incidents often happen in warehouses during the movements of material flows by forklifts [3], which are used there due to their universal application in heavy loads handling [4]. Third, previous research in the manufacturing industry has been focused on studying the relationship between OHSAS 18001 certification and operating performance [5], revealing the results of the implementation of a complex safety program in an automotive parts plant [6], outlining the issues of safety requirements provided by service providers in the automotive industry [7], analyzing the factors for building a safe work culture in the Malaysian manufacturing industry [8], the safety of the work environment in Korean manufacturing [9], as well as the relationships between work accidents and the causes of their occurrence in Romanian organizations [10], including manufacturing and trading, but has failed to reveal the most commonly applied practices for health and safety working conditions of warehouse workers.

Occupational accidents in Bulgaria are a serious challenge. In 2019, the country ranked second in the EU-27 with 3.37 fatal occupational accidents per 100 000 employees [1], which is 2 times higher than the average level for the EU member states. Nevertheless, OHS practices in the logistics sector have not been included in the scope of some of the most significant studies in this

field [11,12]. Therefore, it is the right moment now to study the OHS practices in manufacturing and trading organizations, and Bulgaria is the right place to conduct such kind of research. Previous studies found insufficient knowledge in this field [13], as well as the need to apply an interdisciplinary research approach when conducting studies [14]. In addition, workers in small and medium-sized organizations are among the most at risk of injuries at work [15]. This shows that the size of the organization can also influence OHS practices. Currently, this relationship is inadequately examined and hence it is also worth researching.

Therefore, the aim of this article is to reveal the current state of some basic OHS practices of warehouse workers in Bulgarian manufacturing and trading organizations based on which to outline the necessity for their future improvement. To achieve this goal, the following research questions need to be clarified:

1. *What are the fundamental and most frequently used OHS practices of warehouse workers?*

2. *Are there statistically significant relationships between OHS practices of warehouse workers and organization type/ organization size?*

3. *What is the strength of the relationships between the variables mentioned?*

4. *What are the individual differences in the statistically significant relationships between the variables?*

5. *What recommendations for improving the health and safety practices of warehouse workers can be formulated and addressed to stakeholders?*

This study extends existing knowledge on the application of OHS practices in two ways. First, it outlines the importance of the practices most commonly applied for the protection of warehouse workers in the high-risk sectors of manufacturing and trading in Bulgaria, for which the currently available knowledge is still insufficient. Second, the research provides some practical guidelines to assist warehouse managers in their efforts to improve the working environment and working conditions and to support policy makers in building a more favourable regulatory environment and funding opportunities for organizations to enhance health and safety culture in warehouses.

The results of this article will offer valuable initial scientific and practical inferences not only in the Bulgarian context, but also for other developing countries lacking knowledge of OHS practices involving warehouse workers.

The rest of this article is organized as follows. The theoretical framework of the study is presented in section 2. Section 3 deals with data and methods used. The results of the study are addressed in Section 4. Section 5 focuses on the discussions about OHS practices as well as some recommendations to warehouse managers and policy makers. Concluding remarks and some guidelines for future research are provided in Section 6.

2 Theoretical framework

OHS of warehouse workers is a controversial management area that requires the achievement of a number of compromise solutions. On the one hand, the improvement of working conditions promotes a better labor force utilization by reducing sick leaves and increasing work capacity. It also helps decrease the compensation costs for occupational accidents, and the losses caused by damage to warehouse equipment, involved in accidents with warehouse workers. On the other hand, however, ensuring OHS requires financing a number of measures to improve the working environment, which reduces the profit margin. All this requires warehouse managers to be precise when opting for the set of OHS practices applied.

A number of good practices for OHS ensuring of warehouse workers are found in specialized books, standards and some scientific studies. This study identifies some basic and frequently applied practices that will support efforts of logistics managers to build both a better working environment, and better working conditions in warehouses. These practices are systematized in three groups.

The first group comprises the conduct of general and specialized OHS training. Conducting general training [16-19] stems from employers' commitments to provide their workers with a basic understanding of all aspects related to OHS. In addition, training in narrowly defined fields also contributes significantly to reducing accidents with warehouse workers. Some basic OHS practices applied in these fields involve: first aid training [18-21]; demonstrations of available equipment safety use [18,21]; joint firefighting drills with fire and emergency safety authorities [16,18,21], as well as periodical evacuations of warehouse workers and visitors [20,21].

The second group covers various OHS practices that will mitigate warehouse workers' risks arising from working environment. Measures such as adaptation of warehouse infrastructure [16-18,20] by improving the lighting of work areas, better protection of pedestrian walkways, etc.; use of equipment for protective signals [20,22]; clear designation of emergency exits [16,18,19]; designation of places with first aid kits [17,18,20] and placement of signs/work instructions for safe work at workplaces [18,21] are of top priority when ensuring safer working conditions.

The third group of OHS practices takes into account the efforts of employers to improve working conditions. Fundamental measures of key importance in this field are related both to provision of appropriate work clothing and PPE [16-19,21], and periodically conducting safety briefings [21].

3 Data and methods

3.1 Data

The article presents the final results of a survey conducted among manufacturing and trading organizations in Bulgaria that use warehouses.

The data were collected using the questionnaire survey method during the period April – May 2020. The survey was conducted online through the LimeSurvey platform. The questionnaire used consisted of a general and a specialized section, the latter containing OHS practices issues. The general questionnaire section was completed by 134 organizations, and the specialized section with OHS practices by 91 organizations or about 68% of those participating in the survey. The share of manufacturing organizations was 40.70% and that of trading organizations was 59.30%. In terms of size, 44% of the organizations were small (up to 49 employees), 31.85% were medium-sized (from 50 to 249 employees) and 24.15% were large (more than 250 employees). Only representatives of organizations familiar with OHS practices in use took part in the survey. They were selected among the other participants through a control question for access to the specialized section.

The questionnaire used for the survey was approbated during the period February – March 2020.

Data processing in the present study was performed using SPSS, ver. 20 and MS Excel software.

3.2 Methods

To clarify the research questions posed in the present study a five-stage research approach that engaged various research methods was applied.

Within the first stage, based on a literature review with the help of content analysis, some of the most significant practices for ensuring health and safety of warehouse workers were identified. They were included in the test version of the questionnaire. It was approbated with ten participants including seven warehouse managers with up to 5 years of relevant experience, as well as two warehouse managers and a consultant with more than 5 years of experience in the field. The results of the approbation verified the identified OHS practices of warehouse workers as some of the most frequently used, and they were incorporated in the final version of the questionnaire. Therefore, in the construct "implemented practices to ensure OHS of warehouse workers" the following measurement items were included: general training on health and safety at work; first aid training; demonstrations of available equipment safety use; joint firefighting drills with fire and emergency safety authorities; conducting periodical evacuations of warehouse workers and visitors; adaptation of warehouse infrastructure; use of equipment for protective signals; clear designation of emergency exits; designation of places with first aid kits; placement of signs/work instructions for safe work at workplaces; provision of appropriate work clothing and PPE, as well as periodically conducting safety briefings.

During the second stage, a reliability evaluation of the measurement items in the used construct was carried out using the Cronbach's alpha coefficient – Table 1.

Table 1 Construct, measurement items and Cronbach's alpha coefficient, used to study of warehouse workers' OHS practices in Bulgarian trading and manufacturing organizations

Construct	Measurement items	Cronbach's alpha coefficient value
Implemented practices to ensure OHS of warehouse workers	1. General training on health and safety at work	0.828
	2. First aid training	
	3. Demonstrations of available equipment safety use	
	4. Joint firefighting drills with fire and emergency safety authorities	
	5. Conducting periodical evacuations of warehouse workers and visitors	
	6. Adaptation of warehouse infrastructure	
	7. Use of equipment for protective signals	
	8. Clear designation of emergency exits	
	9. Designation of places with first aid kits	
	10. Placement of signs/work instructions for safe work at workplaces	
	11. Provision of appropriate work clothing and PPE	
	12. Periodically conducting safety briefings	

Source: author's calculation

The result obtained shows good reliability ($\alpha = 0.828$). This means that the selected measurement items can be used for subsequent statistical analyses.

To establish the statistical significance of warehouse workers' OHS practices in terms of both organization type and organization size, statistical hypotheses testing using Chi-squared analysis was performed. It was chosen

because qualitative variables such as type of organization, size of the organization, as well as implemented OHS practices were used.

The requirement of no cells with minimum theoretical frequencies below 5 in regard to the relationship between conducting of general training on health and safety at work and organization size wasn't met. In the subsequent

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analysis this relation wasn't analyzed, because inferences drawn would be of compromised credibility. The analysis of the rest relationships shows that all the reliability requirements of the Chi-square analysis in terms of theoretical frequencies and sample size were met. Consequently, the results can be interpreted.

Within the third stage, for the statistically significant relationships established between the variables, the strength of the relationship was evaluated. For this purpose, the Cramer's coefficient was used.

During the fourth stage, the individual differences in the shares of OHS practices applied both for organization types and for organizations by size were assessed with the help of descriptive statistics toolkit. Only the differences

referring to the established statistically significant interrelationships were discussed.

Within the final stage, on the basis of the results obtained for the state of OHS practices in Bulgarian manufacturing and trading organizations, some recommendations for their improvement addressed to warehouse managers and policy makers were provided.

4 Results

In this section, the results of the applied statistical tools are presented and analyzed. Table 2 shows relationship between OHS practices applied and research variables for which all the reliability requirements of the Chi-square analysis are met.

Table 2 Results of Pearson Chi-Square tests for the relationship between OHS practices applied and organization type/organization size

OHS practices	Statistically significant relationship between practices applied and organization	
	type	size
1. General training on health and safety at work	0.1476	-
2. First aid training	0.2584	0.0982
3. Demonstrations of available equipment safety use	0.3980	0.2964
4. Joint firefighting drills with fire and emergency safety authorities	0.0164*	0.1432
5. Conducting periodical evacuations of warehouse workers and visitors	0.0908	0.3995
6. Adaptation of warehouse infrastructure	0.0145*	0.4715
7. Use of equipment for protective signals	0.1133	0.4512
8. Clear designation of emergency exits	0.0069*	0.0780
9. Designation of places with first aid kits	0.0523	0.4334
10. Placement of signs/work instructions for safe work at workplaces	0.0167*	0.3281
11. Provision of appropriate work clothing and PPE	0.0009*	0.0012*
12. Periodically conducting safety briefings	0.0499*	0.0190*

Asymptotic Significance (1-sided); * Statistical significance, $p < 0,05$

Source: author's calculation

The analysis of significance levels shows that there are several statistically significant relationships between the OHS studied practices in the warehouses of the Bulgarian manufacturing and trading organizations and the variables

organization type and organization' size. The statistically significant relationships established are evaluated by the Cramer's coefficient, and the results are systematized in Table 3.

Table 3 Results of Cramer's coefficients for the established statistically significant relationships between OHS practices applied and organization type/ organization size

OHS practices	Statistically significant relationship between the practices applied and organization			
	type		size	
	Cramer's coefficient value	Relationship strength	Cramer's coefficient value	Relationship strength
Joint firefighting drills with fire and emergency safety authorities	0.224	weak	-	-
Adaptation of warehouse infrastructure	0.229	weak	-	-
Clear designation of emergency exits	0.258	weak	-	-
Placement of signs/work instructions for safe work at workplaces	0.223	weak	-	-
Provision of appropriate work clothing and PPE	0.326	average	0.365	average
Periodically conducting safety briefings	0.173	weak	0.268	weak

Source: author's calculation

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The analysis of the Cramer's coefficients shows that for the statistically significant relationships established between research variables, weak strength of relationships prevails. An exception with regard to the practice related to provision of appropriate work clothing and PPE is observed. For this OHS practice applied, medium relationship strength is established both with respect to organization type and organization size.

The existence of relationships, despite predominantly weak strength, indicates that individual differences in the meanings of OHS practices for the research variables can be interpreted. These differences, in terms of OHS practices applied and organization type are presented in Figure 1.

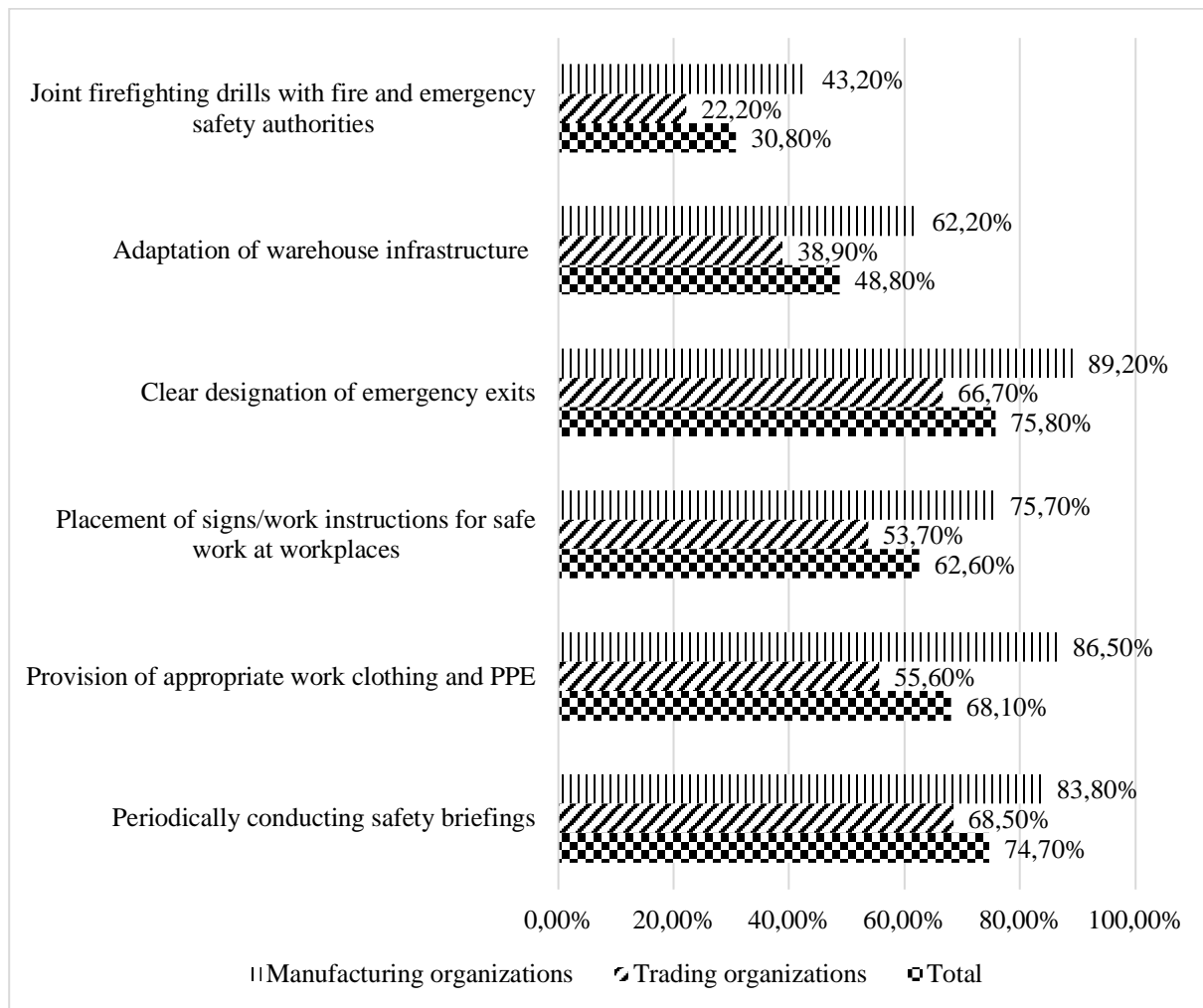


Figure 1 OHS practices applied in Bulgarian manufacturing and trading organizations - overall and by organization type
Source: author's calculation

The analysis of the data shows that OHS practices of warehouse workers are applied to a greater extent in manufacturing organizations compared to trading ones. In manufacturing warehouses, there are more health and safety risks for warehouse workers due to the proximity of production machinery and the greater frequency of handling operations with heavier and bulkier loads. In addition, manufacturing organizations more often have occupational health and safety experts who contribute to integrated improvement of health and safety measures in all organizational entities.

Clear designation of emergency exits is the most commonly used OHS practice and it is implemented by 75.80% of organizations surveyed. In regard of organization type, this OHS practice is applied by 89.20% of manufacturing organizations and by 66.70% of trading ones.

Periodically conducting safety briefings is implemented in total by 74.70% of organizations surveyed. This practice to ensure the health and safety of warehouse workers is used by 83.80% of manufacturing and 68.50% of trading organizations.

Provision of appropriate work clothing and PPE is implemented by 68.10% of the organizations surveyed. The importance of this OHS practice is greater in manufacturing warehouses than in trading ones. It is used by 86.50% of manufacturing and 55.60% of trading organizations.

Placement of signs/work instructions for safe work at the workplace is implemented by 75.70% of manufacturing organizations and 53.70% of trading ones or in total by 62.60 % of the surveyed organizations.

About half of surveyed organizations are adapting warehouse infrastructure as a measure to improve the

health and safety of warehouse workers. This OHS practice is applied by 62.20% of manufacturing and 38.90% of trading organizations.

The most underestimated OHS practice seems to be the joint firefighting drills with fire and emergency safety authorities, which is applied in total by 30.80% of organizations surveyed. It is applied by 43.20% of manufacturing and 22.20% of trading organizations.

Individual differences in terms of OHS practices applied and organization size are presented in Figure 2.

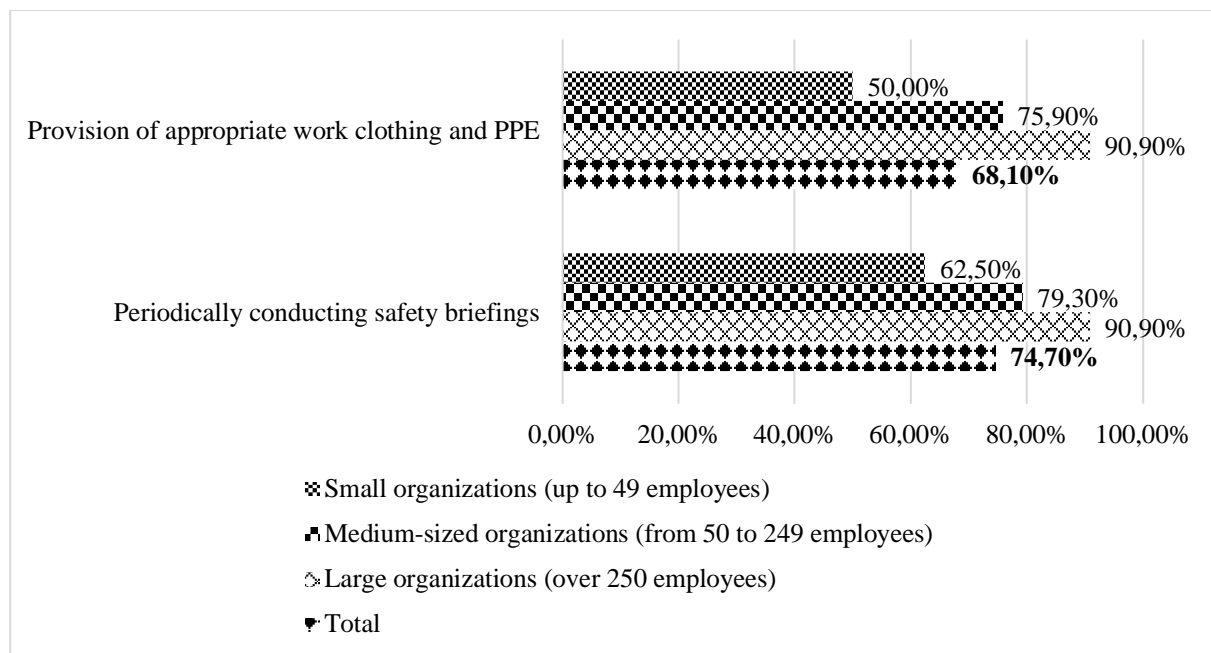


Figure 2 OHS practices applied in Bulgarian manufacturing and trading organizations - overall and by organization size
Source: author's calculation

Data analysis shows that the practices of providing appropriate work clothing and PPE, as well as periodically conducting safety briefings are used by 68.10%, and 74.70% of organizations surveyed, respectively. These measures to ensure OHS are mainly used in large and medium-sized organizations, and small ones lag behind them. Small organizations often cannot afford to hire an OHS specialist and have more limited financial resources to provide OHS measures at work.

Appropriate work clothing and PPE, as well as periodical safety briefings are implemented by 90.90% of large organizations and by 75.90%, and 79.30% of medium-sized organizations, respectively. Small organizations are generally in a catch-up position, and a smaller proportion of them apply these practices, compared to the share of medium and large ones. Providing work clothing and PPE is implemented by 50.00% of small organizations, and conducting periodic safety briefings by 62.50% of them.

5 Discussion

Contemporary trends in trading warehouses that build up better opportunities for faster order fulfillment in e-commerce involve both an increase in stock density and higher degree of automation [23]. They lead to high intensity of material flow. As a result, health and safety risks of warehouse workers are increased, while OHS practices in the warehouses of the Bulgarian trading organizations are noticeably weaker than in manufacturing ones. Therefore, it is imperative that trading warehouse managers expand protection measures of warehouse workers.

The finding that the surveyed organizations downplay the importance of joint firefighting drills with fire and emergency safety authorities for OHS ensuring in the warehouses is also a source of concern. This comes against the backdrop of worrying data from the US National Fire Protection Association. They show that for the period 2016-2020 in the US only, an average of 1,450 warehouse fires occur annually, killing an average of 2 civilians and

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injuring 16 others [24]. This indicates that a wider application of joint firefighting drills is necessary in the studied organizations. In particular, this need is even more pressing for trading organizations, which apply this OHS practice noticeably less compared to manufacturing ones. Some of the most significant fires in recent years claimed a number of victims among both workers and firefighters in warehouse incidents in Tianjin, 2015 [25], Changchun, 2021 [26], Moscow 2016 [27,28], 2022 [29], Orlando, 2022 [30], and hundreds of thousands square-foot property in fire incidents in Indiana 2022, Illinois 2022, and North Carolina 2021 [23].

The warehouse work environment is highly hazardous. In manufacturing and trading warehouses, high intensity movement of lifting transport equipment and pedestrians as well as intense pressure to reduce customer service times are observed. Hence, the higher risk to health and safety of warehouse workers. Available data shows that forklift accidents account for around 10% of workplace injuries [31] and they are often caused by a collision between a forklift and a warehouse worker [32]. Therefore, the need to adapt the warehouse infrastructure arises. Various measures such as improving the lighting, installing guardrails, delineating separate areas for the movement of forklifts and pedestrians, as well as installation of signal warehouse traffic warning light system contribute to reduction of warehouse occupational injuries.

The decrease of occupational injuries for warehouse workers is a key prerequisite for reducing work injury costs, workers' compensation costs, absenteeism and improvement of the employer brand trust. Although the employment injury insurance scheme options are constantly expanding, they are still overwhelming for many employers. As a result, ensuring health and safety at work continues to be one of the most significant challenges for business managers, and warehouse managers in particular. According to a study conducted by The International Labor Organization and The United Nations Global Compact, around 60% of the global workforce lacks protection against work-related injury and illness [15]. In addition, data from the National Safety Council show that in the US private sector, employers lost the opportunity to use significant number of workers of all ages due to injury or illness in 2020 – 22.1; 27.3 and 28 workers per 10,000 employed, respectively for a period from 6 to 10; 11 to 20 and 31 + working days [33]. This gives rise to the need for constant prevention of occupational accidents in the risky warehouse environment and the wider application of practices for warehouse workers' protection. In Bulgarian trading organizations warehouses this necessity is clearly expressed. The study results show that warehouse workers in these storehouses receive less protection in terms of some OHS practices such as clear designation of emergency exits, placement of signs/work instructions for safe work at workplaces, provision of appropriate work clothing and PPE, and periodically conducting safety briefings, in comparison

with surveyed manufacturing organizations. A need to expand protection practices in small-sized organizations that lag behind medium and large ones in implementation of mandatory OHS measures such as provision of appropriate work clothing and PPE, as well as periodically conducting safety briefings is also observed.

Based on the results of the analysis, several recommendations to warehouse managers and policy makers can be drawn up.

First, better warehouse workers protection can be achieved through a wider implementation of OHS practices by a greater number of trading organizations. Moreover, hiring a part-time OHS specialist or training such an expert at the organization's expense would also contribute to OHS improvements in trading warehouses.

Second, reducing the health and safety risks for workers as a result of fires requires warehouse managers in Bulgarian manufacturing and trading organizations to conduct joint firefighting drills with fire and emergency safety authorities at least once a year.

Third, advancement of investments to ensure a safer working environment can be accomplished with legislative initiatives by policy makers. Measures such as tax reductions on the amount of investments to adapt the warehouse infrastructure and/or provision of low-interest investment loans by the Bulgarian Development Bank would contribute to better protection of warehouse workers in Bulgarian manufacturing and trading organizations.

Fourth, establishing an association that promotes OHS of warehouse workers would contribute to increasing the expertise and synergy in the field of safety in a warehouse environment of member organizations. It would facilitate the interaction between warehouse managers and policy makers by formulating common positions to support regulatory framework updating and changing. In addition, the association expert committees could support warehouse managers by drawing up recommendations, instructions and guides for conducting periodic safety briefings, tailored to the peculiarities in a warehouse environment.

Fifth, policy makers could create conditions for acquisition of suitable work clothing, PPE and protection signs to expand OHS practices applied in the warehouses of small, medium and large-sized manufacturing and trading organizations in Bulgaria by including an appropriate application mechanism in the operational programs financed by the European Structural Funds for Bulgaria.

Sixth, ISO 45000 management system certification can also help to build a culture of prevention and better control of health and safety issues in warehouses. It can be done with the support of policy makers and the provision of an appropriate application mechanism under the operational programs of the European Structural Funds for Bulgaria.

6 Conclusion

The results of this research provided some valuable initial scientific inferences and practical recommendations regarding the OHS practices of warehouse workers in Bulgarian manufacturing and trading organizations. The study outcomes laid out an answer to the research questions posed. They can be summarized as follows:

First, some fundamental and frequently used OHS practices of warehouse workers are identified. These are: general training on health and safety at work; first aid training; demonstrations of available equipment safety use; joint firefighting drills with fire and emergency safety authorities; periodically conducting evacuations of warehouse workers and visitors; adaptation of warehouse infrastructure; use of equipment for protective signals; clear designation of emergency exits; designation of places with first aid kits; placement of signs/work instructions for safe work at workplaces; provision of appropriate work clothing and PPE, as well as conducting periodic safety briefings.

Second, existence of statistically significant relationships between some of OHS practices applied and research variables are established. Such relationships between six of OHS practices and organization type are observed. These practices are clear designation of emergency exits; periodically conducting safety briefings; provision of appropriate work clothing and PPE; placement of signs/work instructions for safe work at the workplace; adaptation of warehouse infrastructure, as well as joint firefighting drills with fire and emergency safety authorities. Statistically significant relationships regarding OHS practices related to provision of appropriate work clothing and PPE, periodically conducting safety briefings and organization size are also established.

Third, the provision of appropriate work clothing and PPE is a practice that is characterized by a medium relationship strength, both in terms of organization type and organization size. All other statistically significant relationships between OHS practices applied and research variables are weak.

Fourth, the individual differences in the statistically significant relationships show that OHS studied practices are applied more frequently in the warehouses of manufacturing organizations than in those of trading organizations. Moreover, fundamental practices of high importance for OHS ensuring of warehouse workers, such as joint firefighting drills with fire and emergency safety authorities, and adaptation of warehouse infrastructure are used more limitedly - totally by 30.80 % and 48.80 % of organizations surveyed, respectively. In addition, small organizations lag behind medium- and large-sized organizations in terms of implementing practices for providing appropriate work clothing and PPE, and periodically conducting safety briefings.

Fifth, some recommendations to improve the OHS practices of warehouse workers aimed at stakeholders are inferred. The main guidelines to warehouse managers are

related to hiring a part-time OHS specialist or training such an expert at the organization's expense, conducting joint firefighting drills with fire and emergency safety authorities at least once a year, as well as participation in establishing an association that promotes OHS of warehouse workers. The recommendations to policy makers are related to building an appropriate regulatory environment and creating conditions for wider application of OHS practices. Appropriate measures in this field involve tax reductions on the amount of investments to adapt the warehouse infrastructure, provision of low-interest investment loans by the Bulgarian Development Bank and provision of an appropriate application mechanism under the operational programs of the European Structural Funds for Bulgaria with the purpose of acquisition of suitable work clothing, PPE, protection signs, as well as ISO 45000 management systems certification.

The present research also has some limitations. They stem from the relatively small sample size, the engagement of a limited number of fundamental OHS practices, the use of only qualitative variables, as well as the narrow focus solely on manufacturing and trading organizations in supply chains. Overcoming these limitations in future research will require expanding the sample scope, investigating a more comprehensive set of OHS practices applied, selecting quantitative variables in order to create conditions for the application of more advanced statistical tools and inclusion of additional supply chain participants - suppliers of raw materials or/and logistics service providers.

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References

- [1] Eurostat, <https://ec.europa.eu/eurostat>: *Accidents at work statistics*, [Online], Available: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Accidents_at_work_statistics [14 Aug 2022], 2019.
- [2] McKINNON, A., FLOETHMANN, CH., HOBERG, K., BUSCH, CH.: *Logistics Competencies, Skills, and Training: A Global Overview*, [Online], Available: <https://openknowledge.worldbank.org/handle/10986/27723> [14 Aug 2022], 2017.
- [3] LEHTONEN, E., PERTTULA, P., MAASALO, I., REUNA, K., KANNISTO, H., PURO, V., HIRVONEN, M.: *Learning game for improving forklift drivers' safety awareness*, *Cognition, Technology & Work*, Vol. 23, No. 4, pp. 743-753, 2021. <https://doi.org/10.1007/s10111-020-00648-7>

- [4] SARIC, S., BAB-HADIASHAR, A., HOSEINNEZHAD, R., HOCKING, I.: Analysis of forklift accident trends within Victorian industry (Australia), *Safety Science*, Vol. 60, pp. 176-184, 2013. <https://doi.org/10.1016/j.ssci.2013.07.017>
- [5] LO, C.K.Y., PAGELL, M., FAN, D., WIENGARTEN, F., YEUNG, A.C.L.: OHSAS 18001 certification and operating performance: The role of complexity and coupling, *Journal of Operations Management*, Vol. 32, No. 5, pp. 268-280, 2014. <https://doi.org/10.1016/j.jom.2014.04.004>
- [6] HERMANN, J.A., IBARRA, G.V., HOPKINS, B.L.: A safety program that integrated behavior-based safety and traditional safety methods and its effects on injury rates of manufacturing workers, *Journal of Organizational Behavior Management*, Vol. 30, No. 1, pp. 6-25, 2010. <https://doi.org/10.1080/01608060903472445>
- [7] NENONEN, S.: An operational model of safety management for service providers in manufacturing industry, *The Service Industries Journal*, Vol. 33, No. 1, pp. 99-114, 2013. <https://doi.org/10.1080/02642069.2011.600442>
- [8] KUMAR, R., CHELLIAH, T.D., CHELLIAH, M.K., AMIN, F.B.M.: An analysis on safety work culture in malaysian manufacturing industry, *BIOINFO Business Management*, Vol. 2, No. 1, pp. 11-15, 2012.
- [9] KWON, O.-J., KIM, Y.-S.: An analysis of safeness of work environment in Korean manufacturing: The "safety climate" perspective, *Safety Science*, Vol. 53, pp. 233-239, 2013. <https://doi.org/10.1016/j.ssci.2012.10.009>
- [10] IVASCU, L., SARFRAZ, M., MOHSIN, M., NASEEM, S., OZTURK, I.: The causes of occupational accidents and injuries in Romanian firms: an application of the Johansen cointegration and Granger causality test, *International Journal of Environmental Research and Public Health*, Vol. 18, No. 14, pp. 1-17, 2021. <https://doi.org/10.3390/ijerph18147634>
- [11] RAKOVSKA, M., IVANOV, N., VODENICHAROVA, M.: *Development of logistics in Bulgarian processing and trading enterprises*, Sofia, Publishing complex – UNSS, 2014. (Original in Bulgarian)
- [12] RAKOVSKA, M.: Logistics in Manufacturing and Trading Companies in Bulgaria – State and Development in the Period 2000-2013, *Economic Alternatives*, Vol. 4, pp. 49-63, 2014.
- [13] HOFSTRA, N., PETKOVA, B., DULLAERT, W., RENIERS, G., DE LEEUW, S.: Assessing and facilitating warehouse safety, *Safety Science*, Vol. 105, pp. 134-148, 2018. <https://doi.org/10.1016/j.ssci.2018.02.010>
- [14] DRAGOMIROV, N.: *Warehousing in logistics – main review of Bulgarian research contribution*, Conference proceedings Fifth International Scientific Conference ERAZ - Knowledge Based Sustainable Development, Budapest, pp. 107-111, 2019.
- [15] International Labour Organization and United Nations Global Compact, <http://www.ilo.org>: *Nine Business Practices for Improving Safety and Health through Supply Chains and Building a Culture of Prevention and Protection*, [Online], Available: http://www.ilo.org/global/topics/geip/publications/WCMS_821481/lang--en/index.htm [14 Aug 2022], 2021.
- [16] EMMETT, S.: *Excellence in warehouse management: How to minimise costs and maximise value*, Chichester, John Wiley & Sons Ltd., 2005.
- [17] RUSHTON, A., CROUCHER, P., BAKER, P.: *The Handbook of Logistics and Distribution Management*, 6th ed., London, Kogan Page, 2017.
- [18] SWARTZ, G.: *Warehouse Safety: A Practical Guide to Preventing Warehouse Incidents and Injuries*, Lanham MD, Rowman & Littlefield, 1998.
- [19] SOWA, M.: Threats to health and safety at work when completing a warehouse process, *European Journal of Service Management*, Vol. 27, No. 3/1, pp. 285-291, 2018. <https://doi.org/10.18276/ejsm.2018.27/1-36>
- [20] RICHARDS, G.: *Warehouse Management: A Complete Guide to Improving Efficiency and Minimizing Costs in the Modern Warehouse*, 2nd ed., London, Kogan Page, 2014.
- [21] Occupational Safety and Health Administration and U.S. Department of Labor, <https://www.osha.gov>: *Training Requirements in OSHA Standards*, [Online], Available: <https://www.osha.gov/sites/default/files/publications/osha2254.pdf> [20 Aug 2022], 2020.
- [22] KELLER, S., KELLER, B.C.: *The definitive guide to warehousing: Managing the storage and handling of materials and products in the supply chain*, Upper Saddle River, NJ, Pearson Education, 2014.
- [23] MISHALL, J.: Storage trends and new technology ignite fire risks for commercial warehouses, [Online], Available: <https://www.zurichna.com/knowledge/articles/2022/07/storage-trends-and-new-technology-ignite-fire-risks-for-commercial-warehouses> [06 Jan 2023], 2022.
- [24] CAMPBELL, R.: Warehouse Structure Fires, [Online], Available: <https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Building-and-life-safety/oswarehouse.ashx> [08 Jan 2023], 2022.
- [25] The Guardian, <https://www.theguardian.com>: *Tianjin explosion: China sets final death toll at 173, ending search for survivors*, [Online], Available: <https://www.theguardian.com/world/2015/sep/12/tianjin-explosion-china-sets-final-death-toll-at-173-ending-search-for-survivors> [08 Jan 2023], 2015.
- [26] AP NEWS, <https://apnews.com>: *Fire in Chinese warehouse kills 15, injures 25*, [Online], Available: <https://apnews.com/article/fires->

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- b88f030a72040b310be778180c3ca1a0
[08 Jan 2023], 2021.
- [27] BBC News, <https://www.bbc.com>: *Moscow fire: Warehouse blaze kills eight firefighters*, [Online], Available: <https://www.bbc.com/news/world-europe-37449897> [08 Jan 2023], 2016.
- [28] Deutsche Welle, <https://www.dw.com>: *Fire in Moscow warehouse kills workers*, [Online], Available: <https://www.dw.com/en/fire-in-russian-warehouse-kills-several-migrant-workers/a-19508184> [08 Jan 2023], 2016.
- [29] APA GROUP LLC, <https://apa.az>: *Death toll from warehouse fire in central Moscow reached 7-VIDEO-UPDATED*, [Online], Available: <https://apa.az/en/cis-countries/death-toll-from-warehouse-fire-in-central-moscow-reached-7-video-updated-389937> [09 Jan 2023], 2022.
- [30] FOX 35 Orlando, <https://www.fox35orlando.com>: *Orlando Warehouse Fire: Fourth person dies days after blaze that ignited fireworks*, [Online], Available: <https://www.fox35orlando.com/news/orlando-warehouse-fire-fourth-person-dies-days-after-blaze-that-ignited-fireworks> [09 Jan 2023], 2022.
- [31] CAMPBELL, W., DASGUPTA, P., CUEVAS, D., MAUERMAN, L.: *Importance of Training Methods in Safety: A Model Training Program*, Proceedings of the 31st Annual International Occupational Ergonomics and Safety Conference, New Orleans, Louisiana, USA, pp.41-47, 2019.
- [32] EMILY, PH.: *Temporary Labor: Issues of Health and Safety Experienced by Warehouse Workers in the Inland Empire*, [Online], Available: <https://www.pdf-filler.com/230399014-EmilyPhippspdf-Temporary-Labor-Issues-of-Health-and-Safety-Experienced-> [09 Jan 2023], 2012.
- [33] National safety council, <https://www.nsc.org>: *Work Injuries and Illnesses by Age*, [Online], Available: <https://injuryfacts.nsc.org/work/industry-incidence-rates/work-injuries-and-illnesses-by-age/> [29 Jan 2023], 2023.

Review process

Single-blind peer review process.