e-ISSN: 3062-0198

1 cilt volume
1 sayı issue
2024 mart March

HİTİT JOURNAL OF OCCUPATIONAL HEALTH AND SAFETY

HİTİT UNIVERSITY PRESS

HITIT JOURNAL OF OCCUPATIONAL HEALTH & SAFETY

e-ISSN: 3062-0198
Volume: 1 • Number: 1
March 2024

LANGUAGE OF PUBLICATION

English

CONTACT ADDRESS

Hittite University Occupational Health and Safety Coordination Office, CORUM, TURKEY
Tel: +90 364 219 19 58 Fax: +90 364 219 19 31
hjohs@hitit.edu.tr | https://hjohs.hitit.edu.tr/Home/Index

PUBLISHER

Hitit University Press

REFEREE BOARD

Hitit Medical Journal uses a double-blind review. Referee names are kept strictly confidential.

Editörden

Değerli Okuyucularımız,
Hitit İş Sağlığı ve Güvenliği Dergisi'nin ilk sayısıyla sizlerle tanışmaktan büyük onur duyuyoruz. Dergimizin kendi alanında ilerlemesi, okuyucularımızın desteğine ve takdirine bağlıdır. Dergimizin kalitesini korumak ve sürekliliğini sağlamak için editör kurulumuza alanında uzman kişileri ekledik. Dergimizin her sayısında İş Sağlığı ve Güvenliği alanında çeşitli çalışma alanlarında makaleler yayınlamayı hedefliyoruz. İş Sağlığı ve Güvenliği alanında özgün makale yayınlayacak dergi sayısının sınırlı olması nedeniyle dergimizin bu alanda bir boşluğu dolduracağına inancımız tamdır. Dergimizin bu sayısında literatüre katkı sağlayacağını düşündüğümüz 6 özgün araştırma makalesini sizlerle paylaşıyoruz.
Tüm okuyucularımıza keyifli ve verimli okumalar dileriz.
Saygılarımızla,

Prof. Dr. Dursun Ali KOSE
HJOHS Editöryal Kurul adına

From the Editor

Dear Readers,
We are very honored to meet you with the first issue of Hitit Occupational Health and Safety Journal. The progress of our journal in its field depends on the support and appreciation of our readers. In order to maintain the quality of our journal and ensure its continuity, we have added experts in the field to our editorial board.
We aim to publish articles in various fields of study in the field of Occupational Health and Safety in each issue of our journal. Due to the limited number of journals that will publish original articles in the field of Occupational Health and Safety, we have full faith that our journal will fill a gap in this field. In this issue of our journal, we are sharing with you 6 original research articles that we think will contribute to the literature.
We wish all our readers enjoyable and productive reading.
Sincerely,

Prof. Dr. Dursun Ali KÖSE
On behalf of the HJOHS Editorial Board

INDEX

HİTİT
UNIVERSITY
PRESS

HITIT JOURNAL OF OCCUPATIONAL HEALT & SAFETY

e-ISSN: 3062-0198
Volume: 1 • Number: 1 • ID: 024001
March 2024

PHTHALATE ANALYSIS AND INVESTIGATIONS IN POLYMER TYPE TOYS IN TERMS OF OCCUPATIONAL

Mehtap EVCİ[1]
Sevil ÖZKINALI[2]

[1] *Department of Geochemistry, General Directorate of Mineral Exploration and Research, 06520, Ankara, Turkey.*
[2] *Department of Chemistry, Hitit University, 19030, Çorum, Turkey,*

Article Information

Article Type: Research Article
Doi: -
Received: 23.09.2023
Accepted: 21.10.2023
Published: 01.03.2024

Cite As

Evci M., Özkınalı S., Phthalate analysis and investigations in polymer type toys in terms ofoccupational. Hitit Journal of Occupational Health and Safety. 2024 Vol.1 Number 1 ID: 024001.

Author Contributions: Mehtap Evci collected data and obtained information about volatile compounds and polymers.Sevil Özkınalı conceived the idea, provided the toys, supervised the experimental progress, analyzed the structure of the study and GC-MS results. Both authors drafted and wrote the manuscript.

Review: Single anonymized - Two Internal (Editorial board members) and Double anonymized - Two External Double-blind Peer Review It was confirmed that it did not contain plagiarism by similarity scanning (Turnitin).

Ethical Statement: It is declared that scientific and ethical principles have been followed while conducting and writing this study and that all the sources used have been properly cited.

Complaints: hjohs@hitit.edu.tr

Conflicts of Interest: The author(s) has no conflict of interest to declare.

Grant Support: The authors acknowledge that they received no external funding to support this research.

PHTHALATE ANALYSIS AND INVESTIGATIONS IN POLYMER TYPE TOYS IN TERMS OF OCCUPATIONAL HEALTH AND SAFETY

Mehtap EVCİ[1] | Sevil ÖZKINALI[2]

[1] Department of Geochemistry, General Directorate of Mineral Exploration and Research, 06520, Ankara, Turkey.
[2] Department of Chemistry, Hitit University, 19030, Çorum, Turkey,
** Correponding Author: Sevil ÖZKINALI, E-mail: sevilozkinali@hitit.edu.tr; Phone: +90 364 227 70 00; Fax: +90 364 227 70 05*

ABSTRACT

Polymer technology provides the biggest contribution to the Turkish economy. Unfortunately, various health problems arise along with this rapid growth in the plastics industry. Within the scope of the study, the quantitative fhthalates analysis of different toy types has been examined in terms of occupational health and safety. In this study, determination of plasticizer phthalates, which are endocrine disrupting chemicals (EDC) and used to soften poly vinyl chloride (PVC) material, by GC-MS/MS is analysed. Within the scope of the study, quantitative analyzes of eight different endocrine disrupting phthalate derivative compounds were carried out on ten widely used different types of toys offered for sale in the Turkish market. Banned Di-isobutylphthalate (DIBP) and Di(2-ethylhexyl)phthalate (DEHP) were detected in the study on three different toys.

Keywords: Phthalate, toys, occupational health and safety, polymer

INTRODUCTION

Technological developments that contribute to people's comfortable lives can also become an important danger factor for human life and the environment. Every new substance, every new machine, used tools and equipment in the production process can be considered as a threat to human health, workplace safety and the environment. Business success, safe and rapid development largely depends on a healthy working environment.

One of the most important constituent of the Turkish economy is polymer technology. Industry analysis indicates that the plastics industry's economic contribution to the nation is gradually growing, with annual growth exceeding the growth of the gross national product (GNP) over the past ten years, a total production of close to 10 million tons, a turnover of close to 33 billion dollars, and direct exports of close to 5 billion dollars [1]. With the manufacturing capacity it has reached, the sector has therefore ascended to the second spot in Europe and the sixth spot globally [1]. The rapid growth of the Plastics Industry is both proud and alarming in terms of the emergence of various health problems. Concerns can be minimized by ensuring the correct selection of the material used and by taking the necessary occupational safety measures. The use of the right personal protective equipment and the early diagnosis of the occupational disease that may occur allow the employee to continue working in a safer environment without much harm. Recognizing the chemical substance being studied and taking safety measures accordingly also prevent the emergence of new occupational diseases. Because of the occupational health and safety measures we do not take, the negative effects of plastic additives and monomers used in production on health can be listed as cancer [2], hormonal disorders [3], dermatological disorders, respiratory problems, neurological problems and birth defects [4]. Many countries take measures to restrict or prohibit the useage of some of these materials.

In this research, phthalate analyzes were carried out on some widely used toys within the scope of occupational health and safety in the polymeric toy industry. Before releasing a toy on the market, manufacturers are required by the Toy Safety Directive to complete a risk analysis and ascertain the likelihood that children may be exposed to certain dangers. [5]. In agreement with this prescription, toys launched to the European market must have a legally binding statement of engagement representing that the product conform with European law.

Products need to successfully complete a conformity assessment process and get the necessary certificates before the producer can issue a declaration of ccompatibility. In addition, hazardous compounds must be properly removed so that recycled polymers can be reused, especially in "sensitive use" areas (toys, food containers, food packaging, kitchen equipment, water pipes and water tanks).

Compounds that affect the synthesis, secretion, transport, metabolism, elimination and receptor binding of natural hormones are called endocrine disrupting chemicals (EDC) [6]. Unfortunately, there are many EDCs in our environment that we are exposed to via inhalation, oral or dermal routes [6]. The plasticizer phthalates used to soften PVC material, dialkyl or alkyl/aryl esters of 1,2-benzenedicarboxylic acid (phthalic acid) (**Table 1**), are just one of the EDCs. The majority of the population is exposed to high levels of these substances. Phthalates show developmental, reproductive, hepatic, renal and thyroid toxicity, especially since males are more susceptible to the toxic effects of phthalates [7]. In addition, it is suggested that one of the most important causes of testicular cancers seen at an early age (between 30-40 years) is phthalate exposure [8].

Table 1. Types of phthalates and their usage areas [7]

Phthalate	Abbreviation	Usage
Diethyl phthalate	DEP	In cosmetics (shampoo, perfume, soap, lotion), as industrial solvent, in medicines (tablet coating, capsule production)
Dibutyl phthalate	DBP	In cosmetics, as industrial solvent (solvent), pharmaceuticals (tablet coating, capsule production), adhesives
Diisobutyl phthalate	DIBP	In cosmetics, as an industrial solvent, in adhesives
Butyl benzyl phthalate	BBP	In vinyl floor coverings, as a solvent in the industry, in the production of seals
Dicyclohexyl phthalate	DCHP	As a stabilizer in rubber and polymer production
Di (2-ethylhexyl) phthalate	DEHP	As a plasticizer in soft plastics (IV bags, toys, household products, food packaging bags in the food industry), paper industry, electrical capacitors, paints/pigments, resins, rubber industry, textiles, cosmetics
Dioctyl phthalate	DOP	In soft plastics
Diisononyl phthalate	DINP	Use instead of DEHP in soft plastics

Consequently, and according to the European Union Regulations REACH (Registration, Evaluation, Authorization and Restriction of Chemicals) six of the major phthalates namely as bis(2-ethylhexyl) phthalate (DEHP), dibutyl phthalate (DBP), di-isononyl phthalate (DINP) , benzyl butyl phthalate (BBP), di-isodecyl phthalate (DIDP), and di-n-octyl phthalate (DNOP) are banned [9]. The most significant phthalate is di(2-ethylhexyl)phthalate (DEHP), which is manufactured in excess of two million tons annually worldwide[10]. The tolerated daily intake (TDI) for DEHP has been defined at 37 mg/kg body weight/day by the EU Scientific Committee for Toxicity, Ecotoxicity, and the Environment (CSTEE) [9]. Phthalic acid esters, usually referred to as phthalates, are frequently utilized as plasticizers in PVC (polyvinyl chloride) products, such as building supplies, toys, and numerous other items we use every day.

Some phthalates are also utilized in non-PVC applications like paints, adhesives, personal care products, textile additives, and pesticide formulations. As a result, phthalates are now common compounds and environmental hazards, according to industry studies of the role of plastics [10]. Natseh et al. investigated the simultaneous detection of eight phthalate derivatives in plasticized toys and childcare products using gas chromatography-mass spectrometry (GC-MS) and were found phthalic acid esters (PAE) at concentrations exceeding the allowable 0.1% (w/w) of all PVC samples [11].

The toy manufacturing sector, which is examined within the scope of the study, is important in that it not only concerns the employees, but also closely concerns the health of our children, to whom we entrust our future. Within the scope of the study, 10 different quality toys offered for sale in the Turkish market were collected and phthalate analysis was performed with GC-MS/MS, and the results were evaluated in terms of compliance with European Union standards.

MATERIAL AND METHODS

Test of phthalates; It was carried out in Hitit University Scientific Technical Application and Research Center (HÜBTUAM) according to CPSC-CH-C1001-09.4 Standard Operating Procedure for Determination of Phthalates 2018 standards via thermo scientific brand, TSQ QUANTUM XLS model Gas Chromatography-Mass Spectroscopy (GC-MS/MS) (**Table 2**).

According to this method, 10 mL of tetrahydrofuran (THF) was added to the samples weighing 0.1 g, and it was extracted in an ultrasonic bath for 1 hour. Then, in order to precipitate the polymeric materials, 20 mL of hexane was added and mixed vigorously. After the polymeric materials precipitated, they were taken from the upper phase and filtered with a 0.45 µm syringe filter. Benzylbenzoate was used as internal standard.

Table 2. GC-MS/MS operating conditions

Sample Name	Toys	
Sample Materials	Liquid	
Flow Rate	1 mL/min – He(Helium)	
Column Properties	TG-5MS Column	
Injection Block Temperature	270 °C	
Analysis Time	13,0 min	
Temperature Program		
Rate of Increase (°C/min)	**Temperature (°C)**	**Standby Time (min)**
	150	1,00
3	280	0,00
15	310	5,67

10 different toys with various brands and models sold in the Turkish market were collected and coded as follows (**Table 3**), and phthalate analysis was carried out.

Table 3. Sample Codes

Code	Toy Name	Code	Toy Name
1	Doll	**6**	Purple Cup
2	Orange Carrot	**7**	Yellow Lego Piece
3	Purple Seal	**8**	Red Ball
4	Pink-White Teether	**9**	Multi Color Ball
5	Orange-Blue Teether	**10**	Plastic Hair Pin

Figure 1: Picture of the Analyzed toys

RESULTS AND DISCUSSION

Phthalates are referred to as plasticizers when they are utilized in the manufacture of plastic to increase the robustness, lifespan, and flexibility of products [12]. Phthalates are classified as endocrine disruptors acting on the hormonal system because of their impact on living organisms [13]. Despite the harm of phthalate in our body, approximately eight million metric tons are produced every year [14]. It is possible to find phthalates in many products such as and clothes, toys, cosmetics, food packaging, paints. They are pervasive in the environment, enter organisms through the digestive tract, the lungs, and the skin, and affect how many internal organs work [12]. There are studies showing that phthalates negatively affect the reproductive organs, endocrine, nervous and immune systems and increase the risk of diabetes and obesity [15, 16].

In this study, eight different phthalate species were searched by GC-MS\MS in ten different quality toys collected from the Turkish market. It is possible to the phthalate types investigated and the calibration data in **Table 4**.

Table 4. Calibration data

	Equation	R^2
DIBP (Di-isobutyl phthalate)	Y = -0.0793042+0.205917*X	0.9994
DBP (Di-butyl phthalate)	Y = -0.0527271+0.187907*X	0.9996
DPENP (Di-n-pentyl phthalate)	Y = -0.0850672+0.30413*X	0.9998
DHEXP (Di-n-hexyll phthalate)	Y = -0.0924868+0.327574*X	0.9998
BBP (Benzyl Butyl phthalate)	Y = -0.128263+0.314628*X	0.9992
DEHP (Di-(2-ethyl-hexyl) phthalate)	Y = -0.082855+0.228724*X	0.9987
DCHP (Di-cyclohexyl phthalate)	Y = -0.0777661+0.191843*X	0.9985
DINP (Di-isononyl phthalate)	Y = -0.0287416+0.363205*X	0.9951

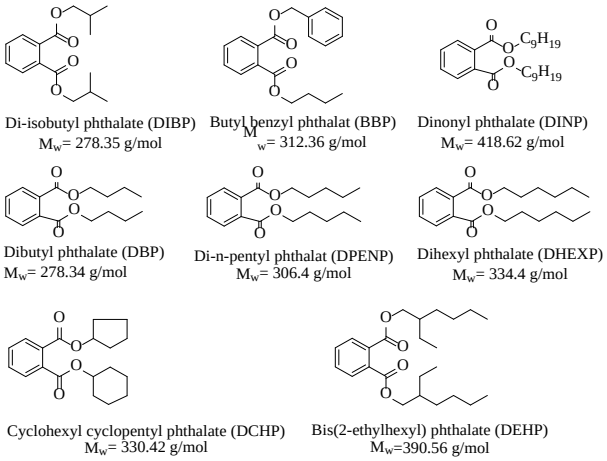


Fig 2 Molecular structures and molar masses of the analyzed phthalates

Eight different phthalate species (**Figure 2**) were searched in 10 different quality toys collected from the Turkish market. As a result of the analysis, 700 ppm di-isobutyl phthalate (DIBP), 300 ppm DIBP, and 500 ppm di-(2-ethylhexyl) phthalate (DEHP) under legal limits were found in samples 1, 9 and 10 respectively, in doll, multi-color ball and plastic hairpin **(Figures 3,4,5)**. Test results are also given in **Table 5**. As a result of the analysis, phthalate derivatives were not found in other samples.

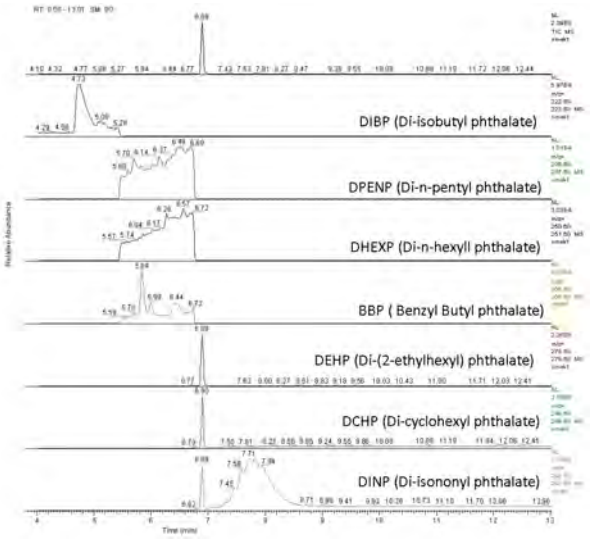


Fig 3. GC-MS chromatogram of the Toy 1 **(**Doll)

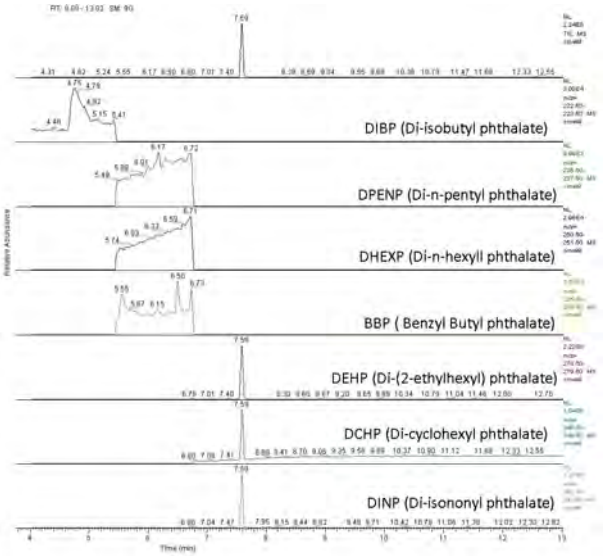


Figure 4. GC-MS chromatogram of the Toy 9 (Multi Color Ball)

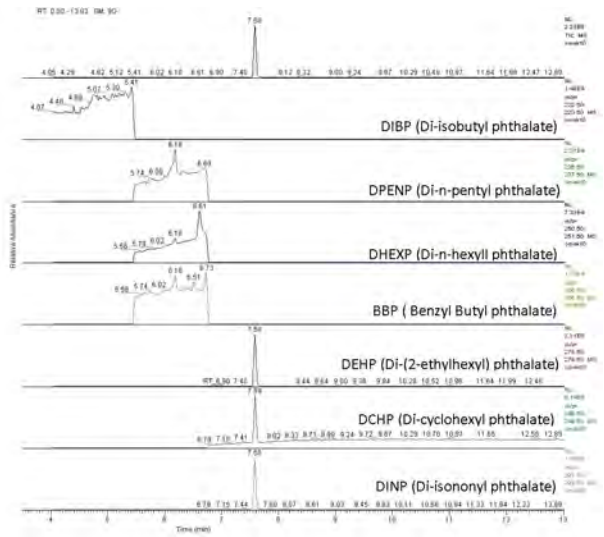


Figure 5. GC-MS chromatogram of the Toy 10 (Plastic Hairpin)

Table 5. Phthalate Test Results

Phthalate	Cas No	Toy 1 Doll	Toy 2 Orange Carrot	Toy 3 Purple Seal	Toy 4 Pink-White Teether	Toy 5 Orange- Blue Teether
DIBP	84-69-5	%0,07	ND	ND	ND	ND
DBP	84-74-2	ND	ND	ND	ND	ND
DPENP	131-18-0	ND	ND	ND	ND	ND
DHEXP	84-75-3	ND	ND	ND	ND	ND
BBP	85-67-7	ND	ND	ND	ND	ND
DEHP	117-81-7	ND	ND	ND	ND	ND
DCHP	84-61-7	ND	ND	ND	ND	ND
DINP	28553-12-0	ND	ND	ND	ND	ND
Total Phthalate		%0,07	ND	ND	ND	ND
Limit		0,1% (1000ppm)	0,1% (1000ppm)	0,1% (1000ppm)	0,1% (1000ppm)	0,1% (1000ppm)

Phthalate	Cas No	Toy 6 Purple Cup	Toy 7 Yellow Lego Piece	Toy 8 Red Ball	Toy 9 Multi Color Ball	Toy 10 Plastic Hairpin
DIBP	84-69-5	ND	ND	ND	%0,03	ND
DBP	84-74-2	ND	ND	ND	ND	ND
DPENP	131-18-0	ND	ND	ND	ND	ND
DHEXP	84-75-3	ND	ND	ND	ND	ND
BBP	85-67-7	ND	ND	ND	ND	ND
DEHP	117-81-7	ND	ND	ND	ND	%0,05
DCHP	84-61-7	ND	ND	ND	ND	ND
DINP	28553-12-0	ND	ND	ND	ND	ND
Total Phthalate		ND	ND	ND	%0,03	%0,05
Limit		0,1% (1000ppm)	0,1% (1000ppm)	0,1% (1000ppm)	0,1% (1000ppm)	0,1% (1000ppm)

ND: Not Dedected

Organizations of the three biggest world economies (European Union (EU), United States of America (USA), China) focusing on Food Contact Materials (FCM), toys, cosmetics, and child care products observed the prohibited concentrations of the 8 most preferred phthalates (DIBP, DBP, DPENP, DHEXP, BBP, DEHP, DCHP, DINP) for their own countries. BBP, DEHP, DBP and DIBP are are not permitted to make up more than 0.1% of toys and childcare items in the EU. All eight phthalates are strictly limited and, for the most part, prohibited as cosmetic ingredients in FCM. Although there isn't an official ban on it, phthalates are mainly restricted in FCM in the USA. Although the use of DEHP, BBP and DBP in cosmetics is prohibited in China, the amount of BBP, DBP, DNOP, DEHP, DINP, DIDDP used in plastic toys cannot exceed 0.1% by weight [17, 18]. In our country, in the Regulation on Restrictions on the Production, Placement and Use of Certain Hazardous Substances, Preparations and Goods (RG-20/3/2011-27880) of the Ministry of Environment and Urbanization, for DEHP, DBP and BBP "In toys and children's care articles, It cannot be placed on the market or used as a substance or mixture component at concentrations higher than 0.1% by weight" [19].

Low molecular weight liquids known as phthalate-type plasticizers are not chemically linked to polymers. To interact with the various polymer chains, they are spread out along the polymer chains. Thus, they separate the chains and cause a significant reduction in the relatively stronger interpolymer interactions. This results in an overall significant increase in macromolecule mobility, making the material more flexible [20].

CONCLUSION

Phthalates, which are not chemically bound to polymers, pose a great danger to children who put everything in their mouth to explore. Therefore, this research is very important for our future and society beyond occupational health and safety. In the GC-MS results, DIBP in Toy 1 (%0.07) and Toy 9 (%0.03), and DEHP in Toy 10 (%0.05), among the banned phthalate compounds, were detected below the legal values (%0.1). In the next step,

further restrictions can be made in the use of phthalates by calculating the amount of phthalate that migrates to the artificial saliva solution by performing phthalate analysis in the unused toy.

Acknowledgements

The authors wish to thank Central Laboratory of Hitit University for to perform GC-MS/MS analyses.

References

Turkey Plastics Industry Monitoring Report 6 (2021)
Yuan ZN. Human health concerns regarding microplastics in the aquatic environment-From marine to food systems. Science of The Total Environment (2022) 153730.
Rodrigues MO. Impacts of plastic products used in daily life on the environment and human health: What is known? Environmental toxicology and pharmacology 72 (2019) 103239.
Anderson SE. Potential health effects associated with dermal exposure to occupational chemicals. Environmental health insights 8 (2014) EHI-S15258.
Directive 2009/48/EC of the European Parliament and of the Council of 18 June 2009
Park J, Park C, Gye MC, Lee Y. Assessment of endocrine-disrupting activities of alternative chemicals for bis(2-ethylhexyl)phthalate. Environmental Research. 172 (2019) 10-17.
Zhang YJ.. Hazards of phthalates (PAEs) exposure: A review of aquatic animal toxicology studies. Science of The Total Environment. (2021) 145418.
Guo YW. Phthalate metabolites in urine from China, and implications for human exposures. Environment international. 37(5) (2011) 893-898.
Koch HM, Drexler H, Angerer J. An estimation of the daily intake of di(2-ethylhexyl)phthalate (DEHP) and other phthalates in the general population. Int. J. Hyg. Environ. Health 206, (2003) 77 –83.
Enke U, Schleussner E, Pälmke C, Seyfarth L, Koch HM. Phthalate exposure in pregnant women and newborns – The urinary metabolite excretion pattern differs distinctly. International Journal of Hygiene and Environmental Health. 216 (6) (2013) 735–742.
Al-Natsheh MA. Simultaneous GC–MS determination of eight phthalates in total and migrated portions of plasticized polymeric toys and childcare articles. Journal of Chromatography B. 985 (2015) 103-109.
Wang Y, Zhu H, Kannan K. A review of biomonitoring of phthalate exposures. Toxics. 7 (2019) 21.
Kahn L, Philippat C, Nakayama S, Slama R Trasande L. Endocrine-disrupting chemicals: Implications for human health. Lancet Diabetes Endocrinol. 8 (2020) 703–718.
Net S, Sempere R, Delmont A, Paluselli A, Ouddane, B. Occurrence, fate, behavior and ecotoxicological state of phthalates in. Environ. Sci. Technol. 49 (2015) 4019–4035.
Radke E, Braun J, Nachman R, Cooper G. Phthalate exposure and neurodevelopment: A systematic review and. Environ. Int. s. 137 (2020) 105408.
Huang S, Qi Z, Ma S, Li G, Long C, Yu Y. A critical review on human internal exposure of phthalate metabolites and the. Environ. Pollut. s. 279 (2021) 116941.
Monti MF. A review of European and international phthalates regulation: focus on daily use products: Marco Monti. European Journal of Public Health. 32 (2022) 131-226.
Almroth BC. Circular economy could expose children to hazardous phthalates and chlorinated paraffins via old toys and childcare articles. Journal of Hazardous Materials Advances. (2022) 100107.
Yıldıztekin KEG. Are plastics a threat for health? A general overview of. FABAD J. Pharm. Sci. 42 (2) (2017) 111-123.
Chiellini FF. Perspectives on alternatives to phthalate plasticized poly (vinyl chloride) in medical devices applications. Progress in polymer Science. 38(7) (2013) 1067-1088.

HITIT JOURNAL OF OCCUPATIONAL HEALT & SAFETY

e-ISSN: 3062-0198
Volume: 1 • Number: 1 • ID: 024002
March 2024

INVESTIGATION OF CHANGE IN AWARENESS OF KINDERGARTEN STUDENTS ON OCCUPATIONAL HEALTH AND SAFETY AFTER A SPECIAL TRANINING PERIOD

Berna GÜR[1]
Tuğrul YILDIRIM[2]

[1,2]*Hitit University, Vocational School of Technical Sciences, Department of Property Protection and Security Çorum/Turkey*

Article Information

Article Type: Research Article
Doi: -
Received: 17.09.2023
Accepted: 15.10.2023
Published: 01.03.2024

Cite As

Gür B., Yıldırım T. Investigation of Change in Awareness of Kindergarten Students on Ocuupational Health and Safety After a Special Tranining Period. Hittite Journal of Occupational Helth & Safety. 2024; Vol. 1 Number 1 ID: 024002.

Author Contributions: Berna GÜR; planning of the study, literature review, implementation of the study, writing the article, evaluation of the results. Tuğrul YILDIRIM; correspondence with the institution, implementation of the study, concept, design.

Review: Single anonymized - Two Internal (Editorial board members) and Double anonymized - Two External Double-blind Peer Review It was confirmed that it did not contain plagiarism by similarity scanning (Turnitin).

Ethical Statement: It is declared that scientific and ethical principles have been followed while conducting and writing this study and that all the sources used have been properly cited.

Complaints: hjohs@hitit.edu.tr

Conflicts of Interest: The author(s) has no conflict of interest to declare.

Grant Support: This work; İt was produced from the BAP project numbered TBMY19001.21.002, supported by Hitit University

INVESTIGATION OF CHANGE IN AWARENESS OF KINDERGARTEN STUDENTS ON OCCUPATIONAL HEALTH AND SAFETY AFTER A SPECIAL TRANINING PERIOD

Berna GÜR[1] | Tuğrul YILDIRIM[2]

[1,2]Hitit University, Vocational School of Technical Sciences, Department of Property Protection and Security Çorum/Turkey

** Corresponding Author: First Author, E-mail: bernagur@hitit.edu.tr; Phone: +905413596102*

ABSTRACT

The management goals of all countries in the world include the absence of health and safety problems. According to the World Health Organization (WHO), health is defined as "the state of being in complete physical, mental and social well-being and the absence of disease and infirmity. The dissemination of OHS should be essential to ensure health and safety in our entire society, starting with our children, who make up our future.

In this study, it is aimed to create an OHS culture among students in some specified kindergartens in Çorum by giving OHS training compatible with the age. The significant part of study is to ensure the permanence of culture by converting it to a behavior. Growing up with OHS culture and making OHS a philosophy of life for kindergarten students, who are the employees of the future, will help our country to minimize the number of occupational accidents and diseases in the coming years. As a result of the study, it is aimed that the students gain OHS basis that they can use both in school and daily life and to adopt the OHS culture.

Keywords: Occupational Health and Safety, Kindergarten, Education, OHS Awareness

INTRODUCTION

Education is a planned action system that provide changes in human behavior in line with the determined principles. Education is the process of creating a deliberate desired change in the behavior of individuals because of their own experiences. (http 1)

The progression of cognitive, physical, social and emotional areas as inseparable links is called development (Akalın, 2021). Societies are in constant change. This change is visible depending on the fact that both social and cultural changes are visible. One of the most important of various factors directing these social changes is education (Ahi and Kıldan, 2013).

Pre-school education is the process from the birth of the child to the day when basic education starts. During this time; physical, psychomotor, social-emotional, mental and language development of children, which has a great role in their maturation and their further lifetime, is complemented and their personality is configured through the training provided (Deretarla Gül, 2018).

The period in which the child develops rapidly in all areas is the early childhood period. When the child is born, he/she is in a social relationship only with his/her parents, but the educator and the peer group are included in this relationship from the beginning of the early childhood (Akalın, 2021).

Along with the new production methods and technologies, which are indispensable for the industry today, difficulties that manifest themselves as occupational accidents and diseases regarding OHS have also begun to emerge. As these difficulties cause personal, social and organizational losses, the significance of OHS is increasing day by day (Koçali, 2022).

Main purpose of OHS in modern business environments is to eliminate occupational accidents and diseases by providing a safe working environment. Situations that may pose a danger both in the working environment and in terms of the health and safety of employees can only be prevented by taking precautions. Therefore, giving OHS trainings in order to create a safety culture for people before they start their career occupy an important position considering to prevent possible accidents (**Çırakoğlu** Kelleci and Taş, 2022).

Youngers in the just beginning of their careers are more at risk. They are unfamiliar with the workplace and the job they are going to do. Therefore, they are inexperienced about the health and safety risks that will negatively affect them.

Physical and mental development is not matured for youngers, therefore they may lose attention very quickly. They are prone to take existing risks because of inexperience. Due to reasons lack of occupational health and safety awareness as well as others mentioned, it is imperative to create both behavioral change and OHS awareness in students (Tuna and Ulutaşdemir, 2022).

In the studies carried out, it was emphasized that education should be important in order to develop the prevention culture, which is one of the occupational health and safety strategies of the EU. Moreover, OHS training should be given when the employee enters the business life, and should be included in the school curriculum. Providing occupational health and safety for the employees of the future will be possible with the inclusion of OHS in the curriculum (Tuna and Ulutaşdemir, 2022).

Occupational health and safety awareness should be created for the 0-6 age group, i.e., the early

childhood, during which the development of children is very rapid. The awareness created at this period is very important in terms of creating an adopted OHS culture and awareness for future. In societies where OHS awareness, consciousness and culture are settled, there will be reductions in direct and indirect losses depending on the occupational accidents and diseases.

The purpose of assessment and evaluation in early childhood is to follow the development of the child throughout education and to identify children with special needs. Considering the development of children in this age group, it is better to exploit the different measurement and evaluation approaches from other education levels (Işıkoğlu Erdoğan and Canbeldek, 2017).

MATERIAL AND METHODES

In our research, interview technique was used within the scope of the qualitative method-based method. Meeting covers conversations between two or more people to learn about the behaviors, situations, feelings or perspectives in line with the scope of study. There are different types of interviews depending on the number of people participating in the interview (individual or group) and whether it is planned or not (structured or unstructured) (Işıkoğlu Erdoğan and Canbeldek, 2017).

Interviews made by preparing open-ended and flexible questions are semi-structured interviews. In semi-structured interviews, predetermined questions are asked regularly and in a special order. However, the people who conducted the study may ask questions beyond the concept in order to direct the research (**Özde** et al, 2023).

While the universe of the study consists of all kindergartens in Çorum, the sample of the study consists of 418 students who are educated in two kindergartens in Çorum, which only provide education as a kindergarten.

Figure 2. Various activities in kindergarten

Figure 3. Various activities in kindergarten

In the study, nine open-ended questions were prepared for the use of the interview method. These questions were asked to the students twice, first to determine the occupational health and safety awareness and readiness levels of the children, and the second is to determine the changes in their awareness levels after the OHS training. The goal is to observe the change in the awareness of the students depending on the answers with the training given. Predetermined questions are asked by making meeting playful in their own environment suitable for the developmental level of the children.

The study consists of three parts. In the first part, students were asked pre-prepared open-ended questions by showing health and safety signs and personal protective equipment (PPE) compatible with them. Moreover, directive questions were asked about what these health and safety signs mean, where they see these signs, who uses the displayed PPE and what it does. The answers given to the questions asked were written by coding (Table 1). In the second part, the meanings of the 10 existing health and safety signs, where they are used, the names of PPEs and what benefits they provide when used are explained. These signs and their meanings are as follows.

Table 1. Health Safety Signs and Personal Protective Equipment

Health Safety Signs	PPE	Meanings
		Use appropriate gas mask in hazardous environments such as corrosive, irritating and toxic gases
		Use a helmet to protect the head against the possibility of a blow to the head (collision, object falling, etc.) and falls.

		Use work gloves to protect the hand against impacts, especially when working with harmful chemicals.
		Use goggles when working with chemicals or in dusty environments.
		Wear a work vest (jacket) against being noticed or chemical splashes, especially at night and in dark environments.
		Use earplugs in noisy environments
		Wear business headphones in very noisy environments
		Use a dust mask when working in dusty environments.
		Use to indicate slippery floors or areas where there is a constant risk of slipping, especially after cleaning.
		Use to indicate the location of the fire extinguisher
		Use it for directions for emergencies.

In the third part; the questions posed in the first part were asked again after the training. Question can be given as what the meanings of the health and safety signs are, what they do, where and by whom they are used, and what their benefits are. After questions about all health and safety signs and getting answers, children were asked to find the health and safety signs in the coloring books prepared by the General Directorate of Occupational Health and Safety, and were asked to match and paint the relevant picture. By this way permanent learning was expected to achieve.

RESULT

Responses to 10 health and safety signs and PPEs directed to students before the first part of the training;

• Responses to safety vests are received mainly from the students as “my uncles wear it, miners wear it, builders wear it, my father also wears it”. It is noted that they did not have any idea about what it was used for.

• The answers to the safety glove were mostly “snow glove or dishwashing glove”. As for what it was used for, they replied: “To protect our hands from the cold, not to get cold and not to harm our hands”.

• While most of the students could not respond to the gas mask at all, four students answered that “it is put on the mouth to protect from smoke”.

• When the fire extinguisher sign is showed, the answers are received from all of the students for the same that “ fire extinguisher and it is used to extinguish the fire”. The reason for the correct answers received from each student is because of that the students had recently received practice for emergency situations and during this training, the fire extinguisher was introduced.

• When the protective helmet is shown, the answers are “hat and helmet”. To the question of why it is used, they answered “to protect our heads, not to harm our heads”.

• They gave the answer “sunglasses and prescription glasses” to the safety glasses shown. When asked why we use it, they answered “to see, to protect our eyes from the sun”.

• Almost all of the students gave the answer to the slippery floor sign shown, “This is the sign of the slippery floor, we see it in the shopping mall and in the cafeteria, it was placed so that we do not slip”.

• Almost all of the students replied to the dust mask, “ we cover our mouth and nose to protect ourselves from Covid and diseases by this mask.”

• We have difficulty getting a response from the students to the earplugs shown. They state that they did not see it and did not know what it was used for.

• Some of the students answer the

• emergency exit door health safety sign as “running man and some as exit door”. As for why it should be used, they answer, “Mustn’t run”, and three students answer as “ to exit in emergencies”.

The answers given to the 10 health safety signs and PPEs directed to the students after the third part of the training are;

• The answers to the safety vest are “We should wear it while working in order to be noticed and seen in the dark”. The painting activity was carried

out by finding the relevant health safety sign from the coloring book by all students.

• They answer that "we should wear it on our hands to be protected from chemicals and to be protected from infectious diseases" for the question about safety glove. 98% of the students performed the painting activity by finding the relevant PPE in the coloring book.

• The statements "necessary for protection from dangerous gases, clean air and breathing" to the gas mask are the answers from the students. The activity was carried out by finding the relevant health safety sign and the relevant PPE in the coloring book by 80% of the students.

• When the fire extinguisher sign is shown, the answer is "used to extinguish the fire". As before the training, 99% of the students gave correct answers after the training. The painting activity was done by finding the picture about the fire tube in the coloring book.

• From the health safety signs to the helmet picture, 82% of the students answer, "We wear it so that we don't get hurt by anything, the construction workers wear it," and found the relevant picture and carried out the painting activity.

• 92% of the students answer the safety glasses sign as "it is used to protect the eyes from chemicals while they are working", and the painting activity was carried out by finding the relevant picture in the coloring book.

• To the slippery floor sign, 98% of the students give the answer that "it is used in cleaning time, it warns us not to slip, it is necessary on wet floors". The painting activity is carried out by finding the relevant health safe sign in the coloring book.

• When a dust mask, which is one of the PPEs, is shown, 25% of the students still replied, "While they renew their answer to protect from Covid", 70% of them reply as "should use it to prevent dust from getting into our mouths, not to cough, and to get fresh air".

• To the emergency exit direction sign, which is one of the health safety signs, 89% of the students answered "it shows the escape route, its lamp flashes in case of emergency".

Figure 2. Coloring books published to raise awareness of "Occupational Health and Safety" of the Ministry of Labor and Social Security.

CONCLUSION AND FUTURE PROSPECTS

In the first part of the study, it was determined that the level of readiness of the students was very high when they were faced with questions about the concepts they had learned during the training they had previously received for emergencies, while the level of readiness due to their OHS awareness was found to be negligible. From the answers given to the questions about health safety signs and PPEs directed to the students before the education, it was concluded that there is no OHS-based education in the pre-school education. As a result of the OHS training given, it has been determined that almost every child has the highest level of OHS awareness. This determination has shown us how important education is for the adoption of OHS by every individual in our country. According to this;

• In order to create OHS awareness and create safety culture in our society, we need to start with our children, who form the future of society.

• OHS education should be started at the pre-school education level earlier than the compulsory education levels (primary and secondary education).

• OHS basic training must be included in the curriculum to be repeated at certain periods at every education level.

• In order to ensure the permanence of OHS education and awareness in preschool children, it is necessary to include and adopt OHS as a part of life.

• In pre-school education, the families together with the children should be included in OHS training and a basis should be provided for permanent behavior change.

• In the pre-school education, where the concrete concept is effective, the measurement and evaluation of the OHS trainings given should be done in accordance with the age and the missing information should be given by repeating.

ACKNOWLEDGMENTS

This work; İt was produced from the BAP project numbered TBMY19001.21.002, supported by Hitit University.

REFERENCES

Akalın, N. (2021). (Doktora Tezi). *Yaratıcı Drama Eğitim Programının Çocukların Sosyal Davranış ve Sosyal Problem Çözme Becerilerine Etkisi.* Hacettepe Üniversitesi, Eğitim Bilimleri Enstitüsü.

Berat, A. H. İ. and Kıldan, A. O. (2013)**.** *Türkiye'de okul öncesi eğitimi alanında yapılan lisansüstü tezlerin incelenmesi (2002-2011).* Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi, 1(27), 23-46.

Çırakoğlu Kelleci S. and Taş, B. (2022). *İş Sağlığı ve Güvenliği Eğitiminin Peyzaj ve Süs Bitkileri Yetiştiriciliği Programı Öğrencilerinin Bilgi ve Farkındalıklarına Olan Etkisi.* Uluslararası İnsan ve Sanat Araştırmaları Dergisi, 7(4), 317-329.

Deretarla Gül, E. (2008). *Meşrutiyet'ten günümüze okul öncesi eğitim.* Çukurova Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 17(1), 269-278.

https://tr.wikipedia.org/wiki/Eğitim. (Erişim tarihi: 20.03.2023)

Işıkoğlu Erdoğan, N. and Canbeldek, M. (2017). *Erken Çocukluk Eğitiminde Ölçme ve Değerlendirme.* Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 17 (3), 1306-1327.

Koçali, K. (2022). *6331 Sayılı İş Sağlığı ve Güvenliği Kanunu Sonrası Lisansüstü Tezlerin Değerlendirilmesi.* Hastane Öncesi Dergisi, 7 (1), 63-80. Doı: 10.54409/Hod.1078292

Özde, H. Ö., Cerrahoğlu, N. and Kurak, K. (2023). *Beden Eğitimi Öğretmenlerinin Beden Eğitimi ve Spor Dersinde Öğrencilere Kazandırmış Olduğu Değerlere Yönelik Görüşlerinin İncelenmesi*. Yalova Üniversitesi Spor Bilimleri Dergisi, 2(1), 87-99.

Tuna, H. and Ulutaşdemir, N. (2022). *İş Sağlığı ve Güvenliği Dersinin Staj Yapan Öğrencilerin Güvenlik İklimi Algılarına Etkisi (Doğu Karadeniz Bölgesi Örneği).* Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi, 11(2), 730-737.

SUPPLEMENTARY FİLES

Supplementary File 1: Institution Work permit

T.C.
ÇORUM VALİLİĞİ
İl Milli Eğitim Müdürlüğü

Sayı : E-13583543-605.99-68786256 19.01.2023
Konu : Etkinlik İzin Talebi

HİTİT ÜNİVERSİTESİ REKTÖRLÜĞÜNE
(Bilimsel Araştırma Projeleri Birimi Koordinatörlüğü)

İlgi : a) 13.01.2023 tarih ve E-68302693-604.01.01-2300003615 sayılı yazınız.
b) Valilik Makamının 19.01.2023 tarih ve E-13583543-605.99-68743232 sayılı Onayı.

İlgi (a) yazınız ile talep edilen üniversiteniz Teknik Bilimler Meslek Yüksekokulu Öğretim Üyesi Dr. Öğr. Üyesi Berna GÜR'ün, yaptığı TBMY19001.21.002 nolu "İş Sağlığı ve Güvenliği Eğitimi İle Anaokulu Öğrencilerinin İş Sağlığı Ve Güvenliği Bilincindeki Değişimin İncelenmesi" başlıklı proje kapsamında Müdürlüğümüze bağlı Ulukavak Anaokulu ile Nenehatun Anaokulunda ek'te yer alan takvimde belirtilen tarihlerde etkinlik yapmalarının uygun görülmesi ile ilgili Valilik Makamının ilgi (b) onayı ekte gönderilmiştir.

Bilgilerinizi arz ederim.

Şerif DOĞAN
Müdür a.
Şube Müdürü

Ek: Valilik Onayı (1 adet)

HITIT JOURNAL OF OCCUPATIONAL HEALT & SAFETY

e-ISSN: 3062-0198
Volume: 1 • Number: 1 • ID: 024003
March 2024

EXPOSURE OF AGRICULTURAL WORKERS TO PESTICIDES AND SAFETY MEASURES

Esra KILIÇ[1]
Tuğrul YILDIRIM[2]
Dursun Ali KÖSE[1]

[1]*Hitit University, Graduate School of Education, Department of Occupational Health and Safety Çorum/Turkey*

[2] *Hitit University, Vocational School of Technical Sciences, Department of Property Protection and Security Çorum/Turkey*

Article Information

Article Type: Research Article
Doi: -
Received: 01.10.2023
Accepted: 28.10.2023
Published: 01.03.2024

Cite As

Kılıç E., Yıldırım T. & Köse D. A. Exposure of Agricultural Workers to Pesticides and Safety Measures. Hitit Journal of Occupational Health & Safety. 2024; Vol.1 Number 1 ID: 024003.

Author Contributions: Esra KILIÇ conceived the idea, collected and organized all the data. Tuğrul YILDIRIM prepared and interpreted the results. Dursun Ali KÖSE drew the graphics and compiled the results into a manuscript.

Review: Single anonymized - Two Internal (Editorial board members) and Double anonymized - Two External Double-blind Peer Review It was confirmed that it did not contain plagiarism by similarity scanning (Turnitin).

Ethical Statement: It is declared that scientific and ethical principles have been followed while conducting and writing this study and that all the sources used have been properly cited.

Complaints: hjohs@hitit.edu.tr

Conflicts of Interest: The author(s) has no conflict of interest to declare.

Grant Support: The author(s) acknowledge that they received no external funding to support this research.

EXPOSURE OF AGRICULTURAL WORKERS TO PESTICIDES AND SAFETY MEASURES

Esra KILIÇ[1] | Tuğrul YILDIRIM[2] | Dursun Ali KÖSE[1]

[1]Hitit University, Graduate School of Education, Department of Occupational Health and Safety Çorum/Turkey
[2] Hitit University, Vocational School of Technical Sciences, Department of Property Protection and Security Çorum/Turkey
** Corresponding Author: Dursun Ali KÖSE, E-mail: dalikose@hitit.edu.tr ; Phone: +905425821348*

ABSTRACT

Pesticides are used to increase agricultural production and maintain productivity, and excessive and unconscious use harms both employee and public health. It is used frequently and intensively by agricultural workers, especially in our country. This situation exposes them to chemicals through respiration, digestion, skin and eyes and causes health problems. Chemical substances are most exposed during spraying processes. Pesticides create chemical hazards and risks in terms of occupational health and safety.

Preparation, transportation, and storage of pesticides cause new problems. Agricultural workers who use and prepare pesticides are also exposed to physical, chemical, ergonomic, biological, and psychosocial risks.

In this study, the ways in which agricultural workers are exposed to pesticides, their importance and effect are explained, examples from the literature review are given, and the dangerous and risky situations in terms of occupational health and safety are emphasized. In addition, it has been determined what kind of acute and chronic health risks children and adults may be exposed to because of consumption of pesticide residue foods. In this respect, it has been revealed that it is very important for both employees and public health to regularly control the foods sprayed in agriculture before they are offered for consumption, and to reduce the frequency of application and the number of pesticides. To ensure the use of pesticides and other harmful chemicals in a way that does not pose a danger or risk to agricultural workers, and to mediate the importance of ambient ventilation in indoor environments, most importantly in greenhouses.

Keywords: Pesticides, exposure routes, agricultural workers, poisoning, occupational health and safety

INTRODUCTION

According to ILO data, more than one third of the world's workforce is employed in agriculture, and with this feature, the agricultural sector draws attention as the second largest employment source after the service sector. While approximately 9 percent of the labor force is employed in agriculture in developed countries, this rate can reach up to 60 percent of the total labor force in developing countries. Considering the total number of workers, according to the estimates of the ILO, 1.3 billion people around the world are engaged in agriculture. Although it covers such a large part of working life, unfortunately, the agriculture sector has been determined as the sector with the highest risk ratio in terms of occupational health and safety, after the mining and construction sectors. Again, according to ILO estimations, half of the fatal occupational accidents in the world are caused by the agricultural sector. This means that 170,000 agricultural workers lose their lives every year around the world (Uysal, 2012).

The use of pesticides used by agricultural workers has an important place. In particular, the unconscious and uncontrolled use of these drugs leads to major health problems. As a result of scientific studies, pesticides have been banned due to the fact that they cause tumors or cancer, and also cause diseases such as mental retardation and infertility. Despite this prohibition, unconscious and uncontrolled use continues in some regions of our country (Gül, 2017). According to statistical data, pesticide consumption in Turkey increased by 270% between 1979 and 2007. Especially in 2002, it was 12.199 tons, in 2006 it was 18.258 tons with an increase of 50%, and in 2007 it was 22,681 tons with an increase of 24.22% (Delen, 2008).

Occupational diseases and other diseases are frequently experienced due to the low level of education of the workers working in the agricultural sector in our country and the insufficient safety culture. Agricultural workers are exposed to chemicals with the pesticides they use. These workers are required to take preventive measures to identify the risks they are exposed to while using pesticides and to eliminate or reduce these risks to an acceptable level.

According to the World Health Organization data, each year 3 million agricultural workers suffer from pesticide poisoning, while approximately 180,000 of them die. According to another study, there is a risk of pesticide poisoning working at different rates in developing countries (Gül, 2017).

Chemical substances used in agriculture to destroy insects, microorganisms and other damages that harm plants are called "pesticides".

The unconscious use of pesticides by agricultural workers causes health problems and various diseases. Therefore, it was necessary to develop necessary studies on the use of these substances. The nuisance of houseflies and mosquitoes has been eliminated by the use of pesticides (Sarp, 2011).

Agricultural workers are exposed to chemicals during their spraying operations, as well as applications that increase efficiency such as fertilization and irrigation. Because of this situation, the harmful effects of pesticides should be struggled against (Gezer, 2006).

Pesticides have an acute or chronic effect on the health of agricultural workers. It is inevitable that these substances will cause acute effects by inhalation, ingestion or skin contact, and chronic effects if the residues of these substances are ingested and included in the digestive system.

Classification of Pesticides

Pesticides are the chemicals of greatest concern to the health and safety of agricultural workers.

Pesticides are classified according to their effects, toxicity, use techniques and chemical structures.

Classification according to the types of pests they are active in;

- Herbicides: Herbicides
- Insecticides: Insecticides
- Acaricides: Acaricides
- Fungicides: Fungicides
- Picycides: Fish killers
- Avicides: Bird killers
- Rodenticides: Mice killers
- Nematicides: They kill worms in the soil.
- Molluscicides: Molluscicides
- Bacteria: Bactericides

Classification of pesticides according to their chemical content;

- Organophosphorus compounds
- Chlorinated hydrocarbons
- Disinfectants
- Carbamates
- Striazines
- Synthetic prethyroids
- Others

Classification of pesticides according to their mode of action

- Semi-demands
- Non-systemic
- Respiratory poison
- In the plant
- Systemic
- In the pest
- stomach poison
- Touch (contact) poison (Şahin, 2009).

Usage Areas of Pesticides

Pesticides in the agricultural sector, insect control, fertilization processes, planting products, construction works, livestock works (farm animals), field and garden works, industry sector, industrial sector (solvents, disinfectants), pool works (ornamental pool, artificial lake), tradesmen. It is frequently used against harmful creatures in (selling vegetables and fruits), mining, housework, fish farming, cleaning industry, food industry, manufacturing production sectors, garden, landscaping works, playgrounds.

Pesticide use varies according to the fields. Especially in the agricultural sector, their use is quite common and they are located in most of our living space with the foods produced. As the amount of use increases, the exposure rate increases proportionally. They are at great risk as they are mostly used by agricultural workers. It is also very common in terms of environment. Care should be taken to use it in a controlled and limited manner (Şahin, 2009, Aktürk, 2019).

Application

All work should be done with caution, as pesticide applications carry a significant risk of exposure, both by inhalation and skin contact. Whether very hazardous pesticides can be substituted for less hazardous pesticides must be continually evaluated.

During the spraying process, the wind direction may change suddenly, causing the pesticide to be sprayed towards the agricultural workers. Outdoor spraying should be done in minimum wind conditions or in the most ideal meteorological conditions where it can be applied to minimize the exposure of agricultural workers. Spraying in greenhouses or similar non-open environments should be done in such a way that the wind movement does not affect the exposure of the workers at a minimum level or even at all. Temperature and ambient humidity should also be taken into account when determining the time and duration of the spraying during the day. If conditions allow, closed cabinets or other types of enclosures should be used where appropriate

to minimize worker exposure. Spray equipment to be mounted on vehicles should be placed in such a way that it does not adversely affect the stability of the vehicle. In addition, while working, necessary precautions should be taken to prevent the operator from being harmed during spraying. Agricultural workers spraying in the greenhouse may inhale the pesticide due to the air movements caused by the ventilation systems. However, this situation can be corrected by providing training (ÇSGB, 2022).

Re-entering the Sprayed Area

After the application process is over, pesticide residues may remain in the environment. Contact with the skin and inhalation of these residues by workers can cause exposure. Re-entering the sprayed environment can lead to serious poisoning and situations that require first aid activities. According to the procedures, for all pesticide applications, the appropriate period during which entry to the sprayed area will be prohibited should be determined. Warning signs regarding the period of prohibition to enter the area after spraying should be in a position where all employees can notice and access, or they should be announced to the employees in some way.

In cases where it is necessary to re-enter the sprayed environment, special trainings should be given to agricultural workers (MoLSS, 2022).

Ways of Exposure of Agricultural Workers to Pesticides

Inhalation exposure

Respiratory exposure of agricultural workers to pesticides occurs by breathing in the vapors and dusts emitted into the ambient air during the use of pesticides in the form of liquid, gas, or powder. The most dangerous form of exposure is inhalation of pesticides into the body. Unconscious and uncontrolled work, especially when working in a closed environment, increases the exposure by breathing. The harmful effects of these drugs cannot go out in a closed environment and directly endanger the health of agricultural workers. Significant risks are seen on agricultural workers as a result of respiration. As a result of inhalation of these drugs, various diseases such as respiratory problems, fatigue, cough, vomiting, blood pressure problem, abdominal pain, forgetfulness, insomnia, nausea, dizziness can be seen on agricultural workers and even cause death (Gül, 2017).

Spraying in the open air can reduce the effect on agricultural workers by mixing with the air. For example, agricultural workers using these pesticides in greenhouse cultivation are directly exposed to the damage of these pesticides by respiration due to the closed area, but agricultural workers working in open areas are exposed to the effects of harmful pesticides to some extent and are less exposed. In fact, agricultural workers should enter the greenhouse after a certain period of time, waiting for the effect of the pesticide to wear off after spraying (Sakartepe, 2016).

Exposure through ingestion

The ingestion of pesticides used in agriculture by agricultural workers may cause some health problems. Pesticides used by farmers can even be found on our table indirectly. Agricultural workers can be exposed to these pesticides through eating, drinking and smoking activities without washing hands after direct contact with these pesticides. Thus, various diseases such as nausea, vomiting, diarrhea, weakness, and even advanced levels of cancer can result. Generally, agricultural workers ingest these substances by eating and drinking by mistake. For example, if agricultural workers eat a drug without a label, it may cause serious poisoning (Akpınar and Özyıldırım, 2016).

Skin exposure

The most common entry of pesticides into the body is through the skin. Absorption of drugs used as liquids through the skin is usually rapid. The effects of cancer, reproduction, development and immune system upon ingestion have been emphasized (Gezer, 2006). Absorption through the skin in the body shows various differences. The amount of pesticide may vary depending on the duration of stay on the skin, previous effects such as wounds and cuts on the skin. Pesticides are usually associated with dermatitis or allergy diseases. According to studies, hair, nail disorders and skin cancer are less common (Tunçdemir, 2016).

Exposure occurs by direct contact with the skin during the use of drugs. For example, organic phosphorus can cause skin irritation because it is easily absorbed and comes into direct contact with the skin. Dichlorvos (DDVP) is a poison used by agricultural workers to control their animals against parasites. Since this poison is quite dangerous and risky, agricultural workers should not come into direct contact with their skin (Şahin, 2009). Paraquat are herbicides that cause blistering and ulceration of the skin and discoloration of the nails when they come into contact with the skin.

Since pesticides can cause infertility for male agricultural workers, pesticide exposure should be avoided (Anonymous, 2013).

Eye exposure

Another exposure route is through the eye. Agricultural workers should act cautiously because chemicals are easy to enter through the eyes. In addition to the eye being a sensitive organ, it would be beneficial for agricultural workers to take personal precautions to ensure that it is least damaged. For example, safety glasses should be used when using disinfectant or abrasive cleaning

agents. Animal manures are also irritating to the eye tract, so agricultural workers should be careful. Complaints such as burning, tearing, redness and even temporary blindness may occur in the eyes of the agricultural worker who contacts the chemical pesticide in his eye. Eyes should not be rubbed during spraying. After spraying, clothes should be changed, hands and faces should be washed with water and cleaned (Anlı, 2018).

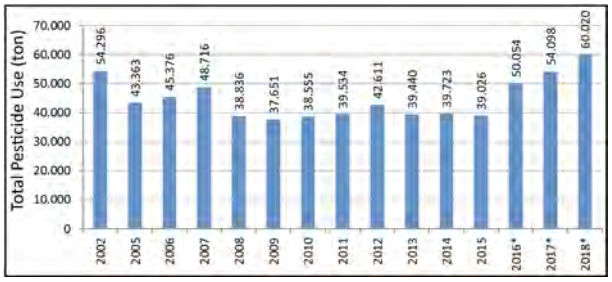
Usage Cases of Pesticides in Our Country

Pesticides are generally used in quite different intensities, depending on the climatic conditions, the level of development and prevalence of the countries. Türkiye has very rich plant species. Therefore, there are many pesticide types used depending on the cultivation of a wide variety of plants (Göl, 2021).

Table 1. Pesticide use cases in Turkey between 2015-2016 and 2017, divided into groups

YEARS	Insecticides (Ton)	Fungicides (Ton)	Herbicides (Ton)	Acaricides (Ton)	Rodenticide+ Molluscide (Ton)	Others (Ton)	Total (Ton)
2015	8.117	15.984	7.825	1.576	197	5.327	**39.026**
2016	10.425	20.485	10.025	2.025	259	6.835	**50.054**
2107	11.436	22.006	11.759	2.452	236	6.209	**54.098**

According to the data of the Ministry of Agriculture and Forestry, General Directorate of Food and Control, the amount values depending on the type of pesticide used in 2015-2017 are given in Table 1. While the amount of pesticides in our country was 39,026 tons in 2015, it increased to 54,098 tons by 2017, an increase of 38.62%.



*Due to the changes in the calculation method after 2016, the amount of usage seems high.

Figure 1. Total pesticide use in our country by years

The amount of pesticide use indicated in Figure 1 varies from year to year. In this respect, the use of pesticides should be treated by considering the amount and effect factors (Anonymous, 2019).

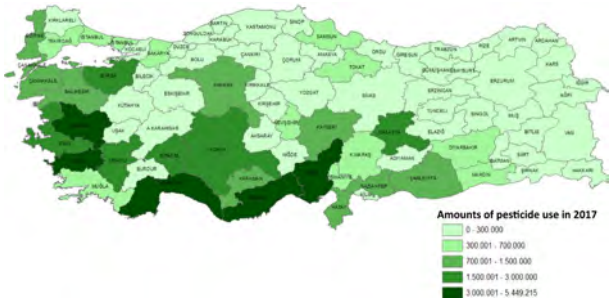


Figure 2. Amount of pesticide use in Turkey in 2017 (Anonymous, 2019).

MATERIAL AND METHOD

Pesticide Accidents

Case study 1- The family who ate pomegranate in Kayseri was hospitalized.

On October 30, 2019, Saliha, who ate pomegranate after dinner in Kayseri, became ill. The pesticide came to the cracked place of the pomegranate and as a result of the researches, 4-year-old Saliha Çakır, who ate the pomegranate, died as a result of pesticide poisoning (Anonymous, 2021).

Case study 2- The case of three people related to carbofuran poisoning is mentioned. Two people were formulation plant workers who prepared 10% granules. The other person was an entomologist who began to feel uncomfortable while weighing the 50% water-dispersible powder formulation. She developed symptoms suggestive of carbamate poisoning, such as profuse sweating, weakness, blurred vision, and nausea. Then both were taken to the doctor 3 hours later. One doctor administered atronin and the other did not. The patient who received atropine (0.02 g im) completely recovered within 30 minutes. The untreated patient recovered within 2-3 hours. The entomologist also experienced mild discomfort that regressed without atropine administration within 4 to 6 hours (Tobın, 1970).

Case study 3- A spray incident that occurred during the spraying process.

The classic signs of ChE poisoning were seen in the aircraft co-pilot as a result of a pinhole leak in the high-pressure pump line that emitted a fine aerosol of mexacarbate formulation to the fuselage. Untreated, these toxic symptoms progressed to paralysis of the extremities. With the interventions in the hospital, the symptoms decreased rapidly. After 3 days the co-pilot returned to normal (Richardson & Batteese 1973).

Case study 4- A study was conducted on 19 agricultural workers in the USSR. In the study, whole blood ChE activity was measured before and after 4 to 6 hour exposures to carbaryl in air for 3-4 days. Significant ChE inhibition was found in men exposed to mean airborne carbaryl concentrations of up to 4 mg/m^3. No objective signs of disease

were observed. No change was measured at 0.7 mg/m^3 (Yakim, 1967).

Case study 5- The study conducted by 'Kuzu 2020' consisted of patients who applied to the Emergency Service of Akdeniz University Medical Faculty Hospital; It was stated that there was a 42-year-old woman and a 10-month-old baby due to mercury poisoning, 3 of the 4 people who were poisoned by eating ornamental plants in the house were girls between the ages of 1-6, there was a woman who got sick after eating bitter melon, and there were 4 people who swallowed a clock battery (Lamb, 2020).

RESULTS

It is possible for pesticides to have a direct or indirect negative effect on agricultural workers. The effect of pesticides on the body of agricultural workers is possible through the ingestion of the ingested substance into the body through respiration, digestion, skin and eyes.

Eating or drinking pesticide-contaminated food can cause toxic effects. Pesticides are transmitted to agricultural workers through food, and then they can show their effects in the form of poisoning, genetics and diseases that can cause cancer. In addition, it has been stated that agricultural workers' contact with pesticides causes carcinogens, effects on growth, reproduction and immune system. In this case, mortality is generally low, but may vary depending on the amount and dose of pesticide taken. In general, pesticides also show their effect in the form of acute and chronic diseases.

Pesticides can contaminate food as well as water. When agricultural workers take this drinking water directly or indirectly into their bodies, they face various health problems. This may cause significant concern. Agricultural workers need to know very well that these substances are toxic and have cancer-causing, hereditary damage and lethal effects when taken into the body. In general studies, it has been observed that the risk of cancer is higher in agricultural workers who use pesticides directly (Gezer, 2006).

While pesticides affect the health of agricultural workers, they can also reduce the body's sensitivity without realizing it. The unconscious and uncontrolled use of these substances is important in terms of adaptation as well as endurance in the body of agricultural workers.

Studies conducted on agricultural workers and family members have shown that there is a high risk of exposure in situations such as applying pesticides directly with bare hands or using them without work clothes (Tunçdemir, 2016).

Davies et al. (1980, 1984) classified pesticides by categorizing them according to their exposure, periods and conditions (Figure 3)

Figure 3. Pesticide exposure types (Tunçdemir, 2016).

Major Acute and Chronic Effects of Pesticides

Acute Effect: Pesticides enter the body of agricultural workers directly through respiration, digestion, eyes and skin. Toxic effects occur by eating or drinking food contaminated with pesticides. When using pesticides, the sudden effect of the dose taken in contact with it in a short time is called poisoning. This effect is called the "acute effect". In addition, this situation may vary depending on the dose and amount of chemical substances (Gezer, 2006).

Chronic Effect: It is the feature of showing the effect of the chemical substance taken slowly or in a long time. Time and accumulation in the body are the most important features of this effect. If it recurs repeatedly, it is chronic. In this respect, it may have a carcinogenic effect for agricultural workers (Şahin, 2009).

Harmful and Toxic Drugs Used by Agricultural Workers

Depending on the agricultural diversity in our country, various types of pesticides can be used in different regions. Information was collected about the pesticides used predominantly by the Central Anatolia Region, according to their types and effects. In order to obtain information on the use of pesticides, information was obtained from experts engaged in the trade of agricultural products.

Table 2. Some pesticides used by agricultural workers

Pesticide Type	Preferability	Domain
Maneb	It's a banned drug	–
Zineb	Not actively used in Turkey	–
Azinphos	Not used for 10 years	–
3-a grubu insektisit- Lambda Cyhalohtrin	It is among the most preferred	Sunn pest, wheat worm, earthworm, fruit worm, fruit flies
4-a grubu Acetamiprid	A most preferred insecticide is insecticide.	Aphids, whitefly, psilla pests
1-b grubu Malathion	A most preferred insecticide is insecticide.	Cochnil (bark lice), amber pests, leafworm

Grup 6 İnsektisit+ Akarisit- Abamectin	Insecticide is insecticide	Red spiders, mites, fruit flies
Grup 23 Larvasit- diflubenzuron	Acts as larval inhibitor in all insects	It is used as an insect growth regulator
Grup 1-a primikarb	Aficide is an insecticide	Thrips and aphids
Grup 7-c Propoksifen	Larvacid is an insecticide	Crustacean lice, fruit flies

Practices Affecting Agricultural Workers During Spraying

Agricultural workers may encounter certain situations when using pesticides;

➢ Not being careful while working with moving equipment,

➢ Failure to act consciously about the time during spraying,

➢ Leaving materials such as containers, buckets, boxes that are contaminated with pesticides around,

➢ To be cautious against negative situations that may arise against lack of attention,

➢ Applying pesticides in accordance with gender and age,

➢ Taking care to carry out the spraying work at the right time and in the appropriate environment (atmospheric condition),

➢ Using appropriate control methods against harmful and toxic effects of drugs,

➢ Considering the health of the agricultural workers and the community in every spraying,

➢ Correct selection of pesticides and review of the selection,

➢ Include important information in Risk Assessments and Material Safety Forms and to continue working within the scope of this information,

➢ Paying attention to air temperature and climatic conditions in the use of pesticides,

➢ The application of pesticides by agricultural workers in accordance with their purpose,

➢ Being sensitive to environmental pollution during and after spraying,

➢ Giving importance to the advice given by experts or authorities,
items such as can be listed (Sarp, 2011).

Purpose of Occupational Health and Safety in Working with Agricultural Workers

To protect the life and health of agricultural workers, to maintain their physical and mental health, to keep them away from dangers and risks and to work peacefully and happily. It aims to provide general and specific comprehensive information about pesticides. On the other hand, it is inevitable for agricultural workers to work in an unhealthy and insecure environment, reflecting the cost both to themselves and to the country. Therefore, it would be beneficial to provide a suitable and safe working environment for agricultural workers.

The employer is also responsible for the implementation of occupational health and safety. The employer is obliged to take occupational health and safety measures in the environment where agricultural workers work. Informing agricultural workers about their legal rights and responsibilities is important in terms of eliminating professional risks and uncertainties. Agricultural workers may quit their jobs in the face of a serious and unavoidable dangerous situation. They must comply with the set instructions and procedures while working. They are responsible for using pesticides and personal protective equipment in accordance with the purpose of the training they have received. It is beneficial for sustainability to reduce the exposure of agricultural workers to pesticides used in the working environment to an acceptable level and to confirm the reduced level (Anlı, 2018).

Necessary precautions should be taken to prevent exposure of pregnant agricultural workers, children and animals during pesticide applications. Pregnant farmers, children and animals should be kept away from the application area (Anonymous, 2013).

Precautions to be Taken Against Pesticide Exposure of Agricultural Workers

They must have sufficient knowledge about the pesticides used in agriculture and other fields. They should get the necessary help from experts. During spraying, first of all, it should be understood what the harmful factor is. Later, this factor may need to be accurately determined, defined and determined according to experience.

Agricultural workers should carry out the spraying operations in accordance with the usage situation. Medications should be prepared and administered safely. Priority should be given to pesticides that have the least harmful effects on employee health, are low risk or do not harm the environment. It is necessary to fight against the use of pesticides that are not allowed or restricted in developed countries (Erdoğan, 2010).

The use of unlicensed pesticides is dangerous and therefore should not be used. Care should be taken not to use pesticides other than for their intended purpose. Dangerous and risky situations should be considered. Pesticides can be used in many ways. Warnings should be reviewed before each method is used. Pesticides should not be used in living areas, especially in homes. It should be kept away from the environment especially where children and pregnant women are present.

The instructions for use of the pesticides and the MSDS must be read. If poisoning occurs, what to do should be explained (Sakartepe, 2016).

Problems with pesticides can persist even during use. For this reason, necessary help should be

sought from experts. In particular, it can be directed to factors such as the identification of hazards, the use of pesticides, transportation, filling and emptying, cleaning (Erdoğan, 2010). Special precautions must be taken for the disposal of finished wastes and empty boxes. The LC50 and LD50 values of the pesticides used should be known and clearly stated (Şahin, 2009). Drugs with low toxicity should be used as much as possible. Excessive use of doses and repeated applications without reason should be avoided. It should be ensured that personal protective equipment is used against the health and safety hazards of pesticides (Karlıoğlu, 2007). Health education should be given to agricultural workers in order to prevent the negative effects of pesticides.

The right equipment should be preferred while working. All equipment should be well protected and maintained (Erdoğan, 2018).

CONCLUSION and RECOMMENDATIONS

✓Pesticides used by agricultural workers should be brought under control and awareness should be raised. It should be kept in mind that these drugs are toxic substances and affect not only agricultural workers but also the environment, primarily and indirectly, on public health. In order to eliminate the stated problems, employees should be trained, working environment and conditions should be improved.

✓It has been stated that the use of personal protective equipment by agricultural workers is not sufficient. Therefore, awareness should be created about the importance, maintenance, repair, cleaning and effect of the use of personal protective equipment.

✓Necessary precautions should be taken on time and on the spot. If the precautions are not taken adequately, the situation of threatening the health of the agricultural workers increases.

✓Agricultural workers must read the instructions on the pesticides before using pesticides. They also need to understand the instruction they read. This is where the level of education comes into play.

✓They should be warned not to eat or drink while working with pesticides and be informed about the possible consequences.

✓Agricultural workers must change their clothes after spraying or post-application work is finished. Cleaning (washing and other processes) of these clothes in a similar way to daily clothes should definitely be prevented. The cantamination of pesticide residues is important. Contaminated work clothes should not be worn again. If these residues remain on work clothes for a long time, necessary precautions should be taken to prevent family exposure.

✓Pesticides should not be transported or stored together with food and beverages. Since this situation is quite dangerous, it should be prevented and necessary strict measures should be taken.

✓Empty boxes of used pesticides, which are in danger of seriously harming the health of employees, should be removed from the environment in an appropriate manner.

✓Drinking water should not be in a place where pesticides can affect it. Employees should be sensitive in this regard.

✓Agricultural workers should not take the pesticides they use to their homes. It should not be forgotten that children and other people at home may also be at risk.

✓When working with sprayers, work clothes or protective clothing must be worn.

✓Prescription pesticides should be taken and applied according to the user manual during the use phase.

✓Necessary support should be provided to protect the health of the employees. Necessary studies should be carried out in order to prevent situations such as work accidents, near misses, occupational diseases and incapacity to work. Agricultural workers should be encouraged to use pesticides in optimal amounts. It should be ensured that they actively participate in the activities to be carried out for the purpose of information.

✓Attention should be paid to the issue of proper ventilation in works performed in closed areas (such as greenhouses, barns, warehouses), and they should be provided with training and support on ventilation applications.

✓Agricultural workers should be made aware of the fact that animals are removed from the sprayed environment before the application of pesticides in the environment where farm animals are present.

✓Spraying products should not be left open, they should be kept locked up at all times. Emergency studies should be carried out, and if the environment is suitable, drills should be carried out.

✓Health examinations of all employees should be carried out periodically and diseases that may occur should be prevented before they occur. Studies should be carried out to ensure that agricultural workers receive adequate health education on health surveillance.

✓Each employee should obtain a vocational training certificate specific to the field he/she works in. Work to be done in terms of occupational health and safety should be considered permanent.

✓Agricultural workers and other producers should not use chemical pesticides in such a way as to damage the natural environment and harm employee health in order to obtain more products. It can be said that when these drugs are used more

than necessary, endurance problems may occur. Thus, in the future, disease and poisoning may increase gradually.

✓It will be more efficient and healthy for the authorities recommending pesticides to make suggestions not only according to the statements and observations of the agricultural workers, but also by going to the working environment and seeing them.

✓Methods should be found to reduce the use of chemical drugs. Thus, the negative effects of employee health will be reduced and the duration of resistance to pesticides will be improved.

✓In particular, the use of wrong drugs that threaten employee health and cause deterioration of the natural balance should be prevented.

✓Using pesticides more and continuously does not mean that the yield will increase continuously. Therefore, more control should be done during the study and excessive and unnecessary spraying should be reduced or eliminated.

✓Appropriate precautions should be taken, taking into account the content of pesticides used and previous accidents. Common problems, occupational diseases and near-miss events should be emphasized while spraying.

✓Prevention and protection measures should be taken in accordance with the standards for the healthy and safe working of agricultural workers. Studies should be carried out taking into account educational levels and language differences. When a serious and dangerous situation is encountered, it should be ensured that the work is stopped and the employees are removed from the area.

✓Before starting pesticide application, health examinations of agricultural workers should be carried out regularly without neglecting them.

REFERENCES

Akpınar, T. & Özyıldırım, K. (2016). Trakya bölgesinde tarımsal faaliyette bulunan tarım çalışanlarının iş sağlığı ve güvenliği açısından değerlendirilmesi. *Çalışma ve Toplum 3*, 2016/3 (50).

Aktürk, Ş. (2019). *Yangın bazı herbisitlerin mıkroporöz karbonlu materyaller üzerindeki adsorsıyon-desorpsıyon davranışlarının ve bir taşıyıcı olarak kullanabilirliklerinin incelenmesi.* (Tez No. 612894) [Yüksek Lisans Tezi, Atatürk Üniversitesi]. YÖK Ulusal Tez Merkezi.

Altıkat, A., Turan, T., Torun, F. & Bingül, Z. (2009). Türkiye'de pestisit kullanımı ve çevreye olan etkileri. *Atatürk Üniversitesi Ziraat Fakültesi Dergisi, 40(*2), 87-92.

Anlı, Z. (2018). *Şanlıurfa'da tarım çalışanlarının tarımsal ilaçlamada iş sağlığı ve güvenliği kuralları hakkında farkındalık düzeylerin araştırılması.* (Tez No. 533929) [Yüksek Lisans Tezi, Harran Üniversitesi]. YÖK Ulusal Tez Merkezi.

Anonim, (2013). *Tarımda güvenlik ve sağlık uluslararası çalışma örgütü düzenlemeleri.* (1. basım) Çalışma ve Sosyal Güvenlik Bakanlığı. Erişim adresi: https://www.csgb.gov.tr/media/1331/tar%C4%B1mda-gueven-lik-ve-sa%C4%9Fl%C4%B1k.pdf

Anonim, (2019 July 7). PESTİSİT KULLANIMI SON 10 YILDA YÜZDE 57 ARTTI VE ANTALYA BAŞI ÇEKİYOR, https://politeknik.org.tr/pestisit-kullanimi-son-10-yilda-yuzde-57-artti-ve-antalya-basi-cekiyor-bulent-sik-bianet/

Anonim, (2021 September 13) . Kayseri'de nar yiyen aile hastanelik oldu! Saliha'nın ölüm nedeni tarım ilacı, https://www.internethaber.com/kayseride-nar-yiyen-aile-hastanelik-oldu-salihanin-olum-nedeni-tarim-ilaci-2207691h.htm

ÇSGB (2022). *"Tarım sektöründe iş sağlığı ve güvenliği*. Erişim adresi: https://guvenlitarim.csgb.gov.tr/isg-konulari/tarim-ilaclari-pestisitler/

Delen. N. (2008). *Fungisitler.* (1. Basım). Nobel Yayınevi.

Erdoğan, B. (2010). *Samsun'da yaygın olarak kullanılan pestisitlerin sağlığa ve çevreye etkileri.* Alın teri Zirai Bilimler Dergisi, 19(2), 28-35. https://dergipark.org.tr/tr/download/article-file/26237

Erdoğan, N. (2018). *Zirai ilaçların tarım çalışanları üzerine olumsuz etkileri ve bu etkileri azaltma tedbirleri.* (Tez No. 516104) [Yüksek Lisans Tezi, Ankara Yıldırım Beyazıt Üniversitesi].

Gezer, F. (2006). *Tarım ilaçlarının zararlı etkilerinin iyon değiştiricilerle giderilmesi.* (Tez No. 181767) [Yüksek Lisans Tezi, Sakarya Üniversitesi].

Göl, E. (2021). *Türkiye'de ilköğretim çağı öncesi çocuklarda organik fosforlu ve pietroid grubu pestisitlere maruziyetin belirlenmesi.* (Tez No. 681692) [Doktora Tezi, Gazi Üniversitesi].

Gül, H. (2017). *Türkiye'de kullanılan zirai ilaçların sağlığa etkileri*. (Tezsiz Yüksek Lisans Dönem Projesi, Nevşehir Hacı Bektaş Veli Üniversitesi].

Karlıoğlu, A. (2007). *Türkiye'de uygulanan tarımsal ilaç politikalarının tarım çalışanları gelirleri üzerine etkisi: Kırklareli ili Lüleburgaz ilçesi örneği.* (Tez No. 179518) [Yüksek Lisans Tezi, Namık Kemal Üniversitesi].

KOÇ, A., Tanrıvermiş H., Budak F., Gündoğmuş E., İnan İ.H., Kubaş A. & Özkan, B. (2001). *Türk tarımında kimyasal ilaç kullanımı: etkinsizlik, sorunlar ve alternatif düzenlemelerin etkileri*. (Yayın No: 63). TEAE Yayınları. Erişim adresi: https://arastirma.tarimorman.gov.tr/tepge/Belgeler/Yay%C4%B1n%20Ar%C5%9Fivi/1997-2005%20Yay%C4%B1n%20Ar%C5%9Fivi/Yay%C4%B1nNo63.pdf

Koç, İ. (2021). *Ulusal Zehir Danışma Merkezi (UZEM) raporları 2014-2020 yılları.* T.C. Sağlık Bakanlığı Halk Sağlığı Genel Müdürlüğü. Erişim adresi: https://hsgm.saglik.gov.tr/depo/kurumsal/yayinlarimiz/Raporlar/Uzem/uzem_raporlari_2014-2020.pdf

Kuzu, S. (2020). *2017-2018 yılları arasında Akdeniz Üniversitesi Tıp Fakültesi Hastanesine zehirlenme nedeniyle müracaat eden olguların özellikleri.* (Tez No. 618288) [Uzmanlık Tezi, Akdeniz Üniversitesi].

Richardson, Em. & Batteese, RI, Jr, (1973). *Bir Zectran zehirlenmesi olayı*. J. Maine Med. Doç .64: 158-159.

Sakartepe, İ. (2016). *Seracılık sektörü çalışanlarının iş sağlığı ve güvenliği konusundaki farkındalık ve tutumlarının incelenmesi.* (Tez No. 433020) [Yüksek Lisans Tezi, Akdeniz Üniversitesi].

Sarp, D. (2011). *Kapitalist üretim ilişkileri sürecinde tarım ilacı kullanımı Eğirdir örneği.* (Tez No. 289499) [Yüksek Lisans Tezi, Süleyman Demirel Üniversitesi].

Şahin, G. (2009). *Isparta ilinde tarım ilaçlarının uygun kullanımı ve korunma yöntemleri konusunda bireylerin bilgi, tutum ve davranışları ile tarım ilaçlarının anne sütündeki kalıntı düzeyleri.* (Tez No. 236633) [Yüksek Lisans Tezi, Süleyman Demirel Üniversitesi].

Tobın, JS. (1970). Carbofuran yeni bir karbamati İnsektisit. *J. İşgal Et. Med., 12,* 16-19. https://dergipark.org.tr/tr/download/article-file/425476

Tunçdemir, A. (2016). *Adıyaman il merkezinde çiftçilerin güvenli pestisit kullanımı ile ilgili bilgi, tutum, uygulamaları ve eğitimin etkisi.* (Tez No. 429128) [Doktora Tezi, İnönü Üniversitesi].

Uysal, K. (2012). *Dünyada tarım sektöründe iş sağlığı ve güvenliği: Genel bir bakış ve ILO düzenlemeleri.* Şanlıurfa: I. Tarım Sağlığı ve Güvenliği Sempozyumu Çevresel ve Mesleki Riskler, 6-7 Nisan, 142.

Yakim, Vs. (1967). Çalışma bölgelerinin havasında izin verilen maksimum seviye konsantrasyonunu kanıtlayan veriler. *Gig. i Sanit,* 32,29-33.

HITIT JOURNAL OF OCCUPATIONAL HEALT & SAFETY

e-ISSN: 3062-0198
Volume: 1 • Number: 1 • ID: 024004
March 2024

EVALUATION OF PERIODIC CONTROL RESULTS OF ELEVATORS, CASE OF ÇORUM PROVINCE

M. Burak DEMİR[1]
Faruk GÖKMEŞE[2]
Ebru GÖKMEŞE[2]

[1]*Department of Chemistry, Graduate Education Institute, Corum, Turkey*
[2] *Department of Chemistry, Hitit University, 19030, Çorum, Turkey.*

Article Information

Article Type: Research Article
Doi: -
Received: 08.09.2023
Accepted: 12.10.2023
Published: 01.03.2024

Cite As

Demir M. B., Gokmese F., Gomese E. Evaluation of Periodic Control Results of Elevators, Case of Corum Province. Hitit Journal of Occupational Health and Safety. 2024 Vol.1 Number 1 ID: 024004.

Author Contributions: M. Burak Demir conceived the idea, collected and organized all the data. Faruk Gökmeşe prepared and interpreted the results. Ebru Gökmeşe drew the graphics and compiled the results into a manuscript.

Review: Single anonymized - Two Internal (Editorial board members) and Double anonymized - Two External Double-blind Peer Review It was confirmed that it did not contain plagiarism by similarity scanning (Turnitin).

Ethical Statement: It is declared that scientific and ethical principles have been followed while conducting and writing this study and that all the sources used have been properly cited.

Complaints: hjohs@hitit.edu.tr

Conflicts of Interest: The author(s) has no conflict of interest to declare.

Grant Support: The authors acknowledge that they received no external funding to support this research.

EVALUATION OF PERIODIC CONTROL RESULTS OF ELEVATORS, CASE OF ÇORUM PROVINCE

M. Burak DEMİR[1] | Faruk GÖKMEŞE[2] | Ebru GÖKMEŞE[2]

[1]Department of Chemistry, Graduate Education Institute, Hitit Üniverity, Corum, Turkey.

[2] Department of Chemistry, Hitit University, 19030, Çorum, Turkey,

** Corresponding Author: Faruk GÖKMEŞE, E-mail: farukgokmese@hitit.edu.tr; Phone: +90 0364 227 70 00; Fax: +90 0364 227 70 05.*

ABSTRACT

In this study, the annual periodic control results of the elevators in Çorum in 2017, 2018 and 2019 are evaluated. The sources of the deficiencies encountered in the operation of the elevators and the relevant regulations are explained.

The purpose of the elevator inspections and the processes followed are explained, and the equipment used is introduced. In addition, the problems that control engineers encounter during inspections are also mentioned. With the TS EN 81-20 standard, additional security measures for elevators are discussed.

The inspection results of the electric elevators in Çorum in 2017, 2018 and 2019 were examined and the deficiencies are listed in graphics. Elevators have been inspected for defects based on inspection reports. It is emphasized why these deficiencies exist in elevators and why periodic controls are necessary. The dangers in the elevators are mentioned and examples of the accidents are presented.

Keywords: Elevator inspection, Elevator defects, Risk assessment, Periodic control

INTRODUCTION

It is known that there are cupboards descending and ascending between the floors in the palaces of the Roman Empire. At the beginning of the 17th century, the French Velayer developed this primitive tool and called it the "flying chair", which was turned and moved by hand and worked with a counterweight.

In 1853, Elisha Otis built a two-stop elevator and explained the safety system he produced against the breakage of the rope [1]. In 1864, the Frenchman Edoux used the word Ascenseur to describe his invention, which uses the energy of city water under pressure. In 1880, Siemens took the elevator technology one step further by using electricity. At the exhibition in Paris in 1889, the French Eiffel placed an elevator inside the tower, which he named. The use of elevators has been expanded from industry to commerce and public use. The first electric elevator in our country was built in Pera Palace Hotel in 1892 [2].

Elevators that do not require human power and work with compressed air were developed in the 17th century. With the widespread use of electricity, hydraulic elevators have been replaced by electric elevators. Nowadays, it is a great necessity to have elevators in buildings, the traffic calculations of which are made according to the building situation and the number of which is determined. The breakdown of the elevator in a ten-story building reveals the importance of the issue, as old and sick people go up and down in a four-story building.

While elevators with a speed of 1 m/s are used in a normal building, a speed of 21.1 m/s has been reached with the elevator in Guangzhou CTF Financial Center. This elevator, developed by the Tokyo-based company Hitachi, was selected as the fastest elevator in the world by Guinness World Records on September 10, 2019. This elevator can take a distance of 440 m from the ground floor to the 95th floor in 42 seconds by reaching a speed of 76 km per hour [3].

While the periodic controls of the elevators are carried out, the evaluations made by determining the relevant findings cover the maintenance and breakdown activities of the elevators and the work of the engineers who carry out these activities. Failure to carry out inspections at a sufficient level, performing maintenance services by unauthorized and inadequate persons and companies, lack of project design, and use of non-standard materials increase the risk of accidents in elevators [4].

To give an example of the dangers that the engineers who perform the periodic control of the elevator encounter in the field;

-Mechanical hazards; Angled parts, acceleration and deceleration, falling objects, cutting parts, high pressure, machine mobility, slippery surface, sharp edges, moving elements, rotating parts

-Electrical hazards; electrostatic or electromagnetic events, short-circuit conditions, live parts

-Thermal hazards; materials or objects with low or high temperature

- Hazards caused by vibration, noise, and materials/ substances

-Ergonomic hazards; access, flickering light, bright light, shadow, local lighting, mental overload, repetitive activity, posture, visibility

-Environmental hazards; smoke, fog, lightning, humidity, pollution, snow, heat, water, wind, lack of oxygen [5].

Eris B. et al. in their article titled "Occupational Safety in Elevator Controls", described the hazards experienced and foreseen by the engineers performing periodic elevator inspections and the possible consequences of the hazards. They talked about the rules that the employees should follow in terms of health and safety [5].

Tekin, in his thesis titled "Results of Periodic Controls of Elevators in Isparta and New Generation Safety Measures in Elevators", stated what the deficiencies are according to the results of periodic control of elevators in Isparta province and what to do for corrective actions, and investigated how the measures that can be taken on a provincial basis will spread to the general public [6].

In his article, Çeri talked about maintenance and repair in elevators in general, mentioned how important maintenance and repair practices are for elevators, and conveyed what kind of accidents can occur in maintenance and repairs that do not comply with the standard [7].

Karahan created a primary risk analysis table by determining hazards and risks for elevator maintenance works in his thesis titled "Assessment of Risks in Elevator Maintenance Works and Suggestions for Solutions". He emphasized that inappropriate or insufficient lighting may cause occupational accidents [8].

Cıcık determined the risk factors as a result of the observations made in the elevator assembly works in five different construction projects under construction in Ankara and Malatya [9].

Şeren studied at 20 different construction sites of 9 elevator installation companies operating in İzmir within the scope of the thesis study titled "Evaluation of Elevator Assembly Processes from Occupational Safety and Ergonomic Aspects". The assembly processes of electric elevators with 4-16 stops and a capacity of 400-1.000 kg were evaluated in terms of occupational safety and ergonomics [10].

MATERIAL AND METHODS

Periodic Control of Elevators

Elevator periodic inspection is the annual inspection that shows that elevators carrying people, people, and loads or only loads are operating safely and in a way that does not endanger life and property safety. Control studies; It is carried out by A-type inspection bodies authorized by the Ministry of Industry and Technology, accredited by the Turkish Accreditation Agency, and contracted with the relevant administrations [8].

Type A inspection bodies attach information labels prepared in the form of a coated sticker, at least 16x8 cm in size, with the necessary explanations in black on a green blue yellow, or red background, to each elevator that is periodically inspected. These organizations provide the necessary equipment for periodic control. Required equipment includes a lux meter, tachometer, force gauge, triangle switch, low voltage detector, flashlight, and personal protective equipment.

In the TS EN 81-20 standard, the features that must be found in disabled lifts have also become mandatory. According to the zoning regulation, it is aimed to construct disabled ramps for disabled people to access the buildings and to enable disabled people to access the elevators safely.

Definition of elevator and elevator types

Elevators are vehicles that serve at certain levels, are inflexible, have a car that moves on fixed rails that form an angle of more than 15° in the horizontal plane, and carry people and goods [12]. In electric elevators, the principle of the drive motor moving the car in the desired direction is valid. These elevators, in which the counterweight and the car work together, are called friction driven elevators. In drum elevators, a chain or rope works by wrapping around the pulley [13] [14] [15].

In hydraulic elevators, there is a lifting mechanism that moves the car directly or indirectly. Hydraulic fluid is transmitted to this mechanism and the movement is provided by an electric pump. Hydraulic elevators are preferred in small buildings due to the small footprint and quiet operation of the drive mechanism [13].

Basic components of elevators

Key components of elevators include hoistway, machine room, cabin, guide rails, balancing weight, drive machine, control panel, speed regulator, electrical panel and installation, landing and cabin doors, suspension ropes, limit breakers, buffers, and parachute brake assembly [13].

Elevator Legislation

Information about elevators in our country was included in the TS 863 standard for the first time in 1971 by the Turkish Standards Institute. The first regulation of the sector was published by Bandırma Municipality in 1975 with the name of "Elevator Installation Technical Regulation". In 1989, T.C. The "National First Elevator Regulation" was published by the Ministry of Industry, and the "95/16/AT Elevator Regulation" became mandatory throughout the country in 2005. Various changes were made in the 95/16/AT Elevator regulation in 2007, 2008, 2009, 2011. Elevator operation, maintenance, and periodic control regulations were published in 2015. In addition, the regulation on amending the elevator periodic control regulation, which includes the procedures and principles regarding the periodic controls of elevators and the authorization and inspection of type A inspection bodies that will take part in these controls, was published in 2022.

Some Examples of Safety Measures in Elevators

It is seen that innovations, increased measures, and many concepts are defined in detail in the TS EN 81-20 standard.

-The illumination intensity for the machine and pulley room passageways should be at least 50 lux. Thus, the risks that may arise from ergonomic and mechanical hazards on the access roads to the engine room can be reduced [11].

-The entrance door to the engine room must be at least 2 m high and 0.6 m wide. When the engine room floor cover is closed, it must be able to carry the load of two people, each 1000 N, in an area of 20 m × 0.20 m [11].

-There must be permanent electric lighting of at least 200 lux required to operate machine areas and reel rooms at floor level, and at least 50 lux at floor level between work areas [11].

-At least 50 lux lighting has been made mandatory between the working areas in the engine room. At least 200 lux lighting is required in front of the emergency test panel. Thus, it is aimed to reduce the risks that ergonomic hazards can create.

-The ropes may have slipped over the drive pulley or the machine may have been stopped with an electrical safety device. In this case, the counterweight or the empty car must be prevented from reaching the dangerous position [11].

-The main switch of the elevator power circuit and the circuits connected to it, the cabin lighting circuit, and the electrical installation rules applied to the circuits connected to it should also be applied to the well lighting and the circuits connected to it. With these measures, it is aimed to reduce the risks that may arise from electrical hazards.

Fire extinguishing systems should only work when the elevator is stopped the elevator electrical supply and lighting equipment are turned off, and the automatic fire and smoke detection system is turned off [11].

- Emergency doors may be used when the horizontal distance between two consecutive cars does not exceed 1 m. Each cabin must have means of determining the cabin position that allows the rescued persons to be brought to the level of the rescue ground. Emergency doors must be at least 1.8 m high and 0.4 m wide [11].

In addition to these, the suitability of the well wall, the use of laminated glass on the well wall, the protrusions on the well wall, the guide rails, the fasteners, the safety area at the top of the pit, the pit ladder, the pit emergency stop device, the inspection control station, the bypass device, the cabin and the regulations regarding landing doors, overspeed regulator suitable for the cabin and interior lighting are explained in the same standard.

Periodic Control Method of Elevators

In the periodic inspection of elevators installed before 15/8/2004, TS EN 81-80 standard requirements, TS EN 81-1 standard requirements, and 1/9 standard requirements for elevators supplied to the market between 15/8/2004. Also, 1/9/2017 TS EN 81-20 standard requirements are sought for elevators supplied to the market after.

Employee in charge of inspection works are responsible for taking safety measures according to Occupational Health and Safety instructions by protecting the safety of themselves, the environment, and the inspection. Occupational health and safety measures are taken by the elevator installer or its authorized service, which has signed the maintenance contract, while performing fault repair, maintenance-repair, and periodical control operations. These measures are taken in accordance with the Occupational Health and Safety Law dated 20/6/2012 and numbered 6331 and the provisions of the relevant legislation.

RESULTS AND DISCUSSION

Periodic Control Results of Elevators in Çorum

All periodical control results of the elevators in Çorum in 2017, 2018 and 2019, including the pre-registration periodical controls, are examined. As a result of the controls, the results were expressed graphically according to the label colors attached to the elevators.

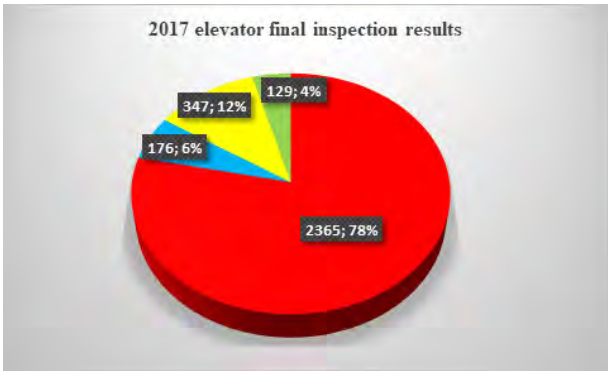


Figure 1. 2017 elevator periodic control results

In 2017, a total of 3017 elevators were periodically checked, including periodic checks before registration. As a result of the controls, red labels were attached to 2365 elevators, yellow labels to 347 elevators, blue labels to 176 elevators and green labels to 129 elevators. According to these results, only 10% of the elevators inspected could pass the inspection as slightly defective or flawless.

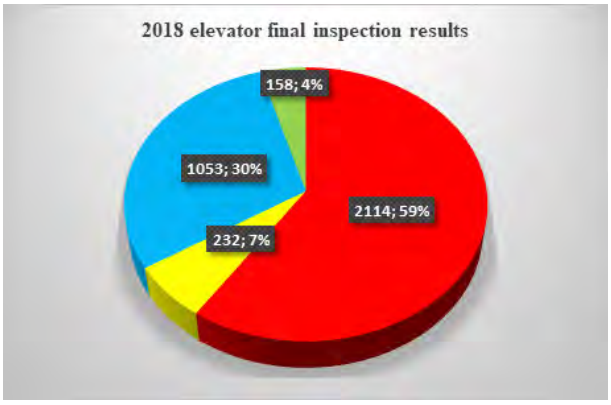


Figure 2. 2018 elevator periodic control results

In 2018, a total of 3557 elevators were periodically checked, including periodic checks before registration. The reason for the increase in the number of elevators inspected compared to the previous year is the addition of the periodical checks of the newly built elevators to the number of pre-registration checks and the existing elevators that have been newly detected. As a result of the controls, red labels were attached to 2114 elevators, yellow labels to 232 elevators, blue labels to 1053 elevators, and green labels to 158 elevators. According to these results, 34% of the elevators were directly inspected as slightly defective or flawless.

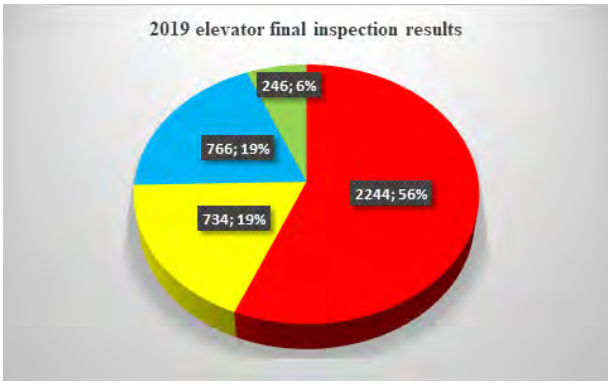


Figure 3. 2019 elevator periodic control results

In 2019, a total of 3990 elevators were periodically checked, including periodic checks before registration. As a result of the controls, red labels were attached to 2244 lifts, yellow labels to 734 lifts, blue labels to 766 lifts, and green labels to 246 lifts. The rate of elevators that passed the inspection as slightly defective or faultless was 25%. Compared to the previous year, it is noteworthy that the rate of elevators that were directly examined as slightly defective has decreased and the rate of defective elevators has increased. It can be said that the color changes made in the elevator control list by the Ministry of Industry in 2018 caused this result, albeit partially.

While the number of elevators controlled in line with the data obtained from the inspection institution increases every year, it is seen that the rate of red labels received by the elevators has decreased. When the control reports are examined in detail, rather than the labels received by the elevators during the periodic controls, it is seen that the total number of nonconformities written has decreased considerably in the following years. In other words, while too many serious faults or defects are written on an elevator that was given a red label in the first years of the inspections, fewer faults or serious defects are written in the recent inspections. There are also elevators that have been given a red label for only one serious defect. This situation also shows the false perception of people that the elevator given a red label has a lot of shortcomings, and the elevator that is given a yellow label has few shortcomings.

Explanations about the shortcomings encountered:

The inspection hatch at the top of the elevator shaft must be smaller than 50×50. Situations such as being larger than these dimensions and not having a cabin or counterweight buffer have been encountered. There are also cases where the bumper in question is deformed.

There is a second safety system in the floor door locks that prevents the elevator from moving even when the plug contact connection is provided. In the examinations, it was observed that the second safety device did not work, especially in the first years.

Regulator system; It consists of many components such as lower pulley, rope extension contact, rope-cab connection, upper pulley, and contact. In the controls made, it was encountered that the elevator rated speed and the regulator operating speed were different when they should have been the same. There are situations where the rope throw safety contact and the regulator contact are not suitable or do not work.

One of the defects encountered is that the breakers that will stop the engine before contacting the bumpers when the elevator exceeds the level of the lowest or the top floor are not suitable.

Picture 1. Deformed rope and worn pulley

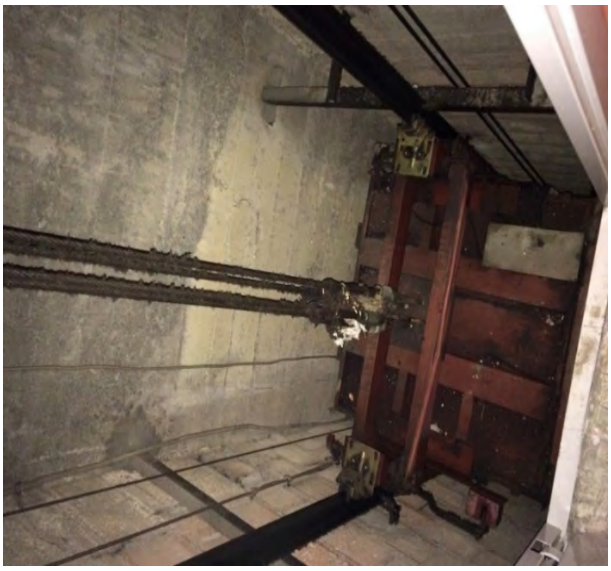
There are cases where the suspension ropes are deformed, there is excessive lubrication, and there are missing nuts, gupilya, and terminal blocks in the cabinet and counterweight connections. There have been cases where the on-board maintenance control did not work, there were no direction signs, the stop and revision buttons were not protected against accidental operation, and the revision limit breakers did not work. The most common deficiency in 2017 is the unsuitability of the cabin skirt sheets. Even if there is no skirt sheet, it is considered as a serious defect if it does not comply with the standards.

Since 200 lux lighting is required in front of the floor level and control, electrical panels, the engine rooms seem to be bright, but the measurements made with the device could not provide sufficient lighting intensity. Situations were encountered when the rescue instruction label was not prepared in accordance with the standard of the lift and it was requested to attach the appropriate label. In order for the person staying in the elevator to be rescued easily, there are cases where there are no direction signs on the flywheel indicating the direction of movement of the car, they are wrong or there are no rope floor markings.

In case there is no one of the 3 phases required for the elevator motor to work or the phases are reversed, the elevator should not move in the opposite direction of the desired direction. In this case, it has been encountered that the required phase sequence protection relay is not available or does not work.

In cases where the cabin load exceeds 10%, the door must be opened by giving an audible and visual warning and an overload warning in the cabin and the elevator must not move. During the inspections, elevators that did not meet this requirement were observed.

It has been determined that some elevators do not have the necessary guardrail for the personnel on the car to work safely.



Picture 2. Absence of guardrail on the cabin and maintenance control

When the elevator exceeds 115% of its rated speed, it has been encountered that the brake system that activates and locks the car to the rails does not work or is not in accordance with the standard. In particular, while the sudden braking safety device should be used in elevators with a maximum speed of 0.8 m/s, there have been cases where it is used in elevators with a speed of 1 m/s.

It has been encountered that the elevator safety circuits (stop, inner door, outer door) are not protected against electric shocks with a 30 mA residual current relay or the residual current relay is canceled by shunting.

It is requested in elevators after 2012 that the system to prevent the car from moving unintentionally during loading and unloading while waiting at the stop with the elevator door open should not work. It has been seen that this system does not exist, is broken, or has been canceled.

Emergency lighting, alarm, and communication in the cabin are fed by a 12V dry battery on the cabin so that it can be activated when the elevator electricity is cut off. Since the life of these used batteries is short, they are included in the inspection reports every year as a defect.

There have been cases where the mounting bolts of the drive machine's machine stand are mounted in reverse, the brake lever does not or does not work, and the brake adjustment is not appropriate.

Picture 3. Worn pulley and lack of rope tension adjustment

There are cases where there is no 30 mA residual current relay in the electrical panel, it is canceled by shunting, 300 mA is used instead of a 30 mA residual current relay, and the lighting circuits are not protected by a residual current relay.

Elevator Accident Examples

Two hijacked planes on September 11, 2020, crashed into the twin towers of the World Trade Center, causing serious damage to the elevator system, which has a total of 198 elevators. An estimated 200 to 400 people died in the express elevators leading to the 78th-floor sky lobbies or in the elevators near the upper floors. At least 21 people were stranded and managed to escape. 80 people survived because the doors were open [16].

In the elevator accident that took place in Wuhan, China in 2012, 19 people lost their lives in the elevator falling from 100 meters at a construction site [17].

At a construction site in Istanbul, an elevator descending to 32 floors caused the death of ten people [18].

Our country, which ranks first in the world and Europe in sectors such as mining and construction, unfortunately, ranks first among European countries in elevator accidents. 70% of fatal elevator accidents in Europe are experienced in our country. In our country, where an average of 200 accidents are detected annually, 20% of the accidents result in loss of life [19].

CONCLUSION

It is necessary to take precautions against the foreseen dangers and possible consequences related to these hazards during the periodic checks of the elevator and to avoid behaviors that may lead to work accidents. In addition, before the observation, the maintenance staff should be given protective materials such as helmets, work clothes, safety belts, dust masks, earplugs, protective glasses, steel-toed shoes, and gloves.

With the Regulation on the Amendment of the Elevator Maintenance and Operation Regulation published in the Official Gazette dated November 5, 2011 and numbered 28106, the annual controls of elevators after January 1, 2012; As of the date of the elevator's release to the market, at the end of the first year, and then at least once a year, it is required that the building be made by the A-type inspection institutions by the local administration [20].

Inspection of newly assembled elevators every year has been effective in preventing the elevator company from dismantling parts after installation. It is also obligatory to guarantee 3 years for newly installed elevators. The use of the elevator, which is marked as unsafe by getting a red label, is stopped by the building supervisor. The building supervisor will make the elevator safe within a maximum of sixty days. At the end of the period, the A-type inspection organization carries out a follow-up control, and the elevator that is not secured is sealed by the relevant administration. So the elevator is out of use [21].

According to this statement in the Elevator Periodic Control Regulation, Çorum Municipality has sealed the structures that have passed sixty days and still have not received a blue or green label. Elevators that have been banned from service can only be opened by obtaining the signature of the building manager stating that the deficiencies will be corrected within ninety days with the "Reseal Unseal Report". It is an expected result that this sanction will increase the rates of blue and green labels received by elevators.

When the 2017 and 2019 inspection reports are compared; It can be said that the objections and expenses made in the first years of the elevator controls decreased over time. There are elevators that are regularly maintained and whose deficiencies are corrected, as well as elevators that are poorly maintained, do not have a maintenance company, and are operated despite significant defects. Considering the qualified and regularly maintained elevators, the inspections may seem unnecessary. With the inspections made once a year, the control of the buildings without a maintenance contract cannot be done and these structures are forced to sign a maintenance contract. Even though regular monthly maintenance is carried out, the quality of the maintenance may be insufficient since the results of the studies are not inspected. In addition, deficiencies arising from the caregiver are also revealed in the examinations made every year.

Even if the deficiencies in the elevators are reported by the maintenance companies, there are also cases where they are pushed into the background by some managers due to financial difficulties. This causes the elevator to operate in an unsafe manner. With annual inspections, this situation also disappears.

During the inspections, it was observed that there were elevator operators who changed parts unnecessarily to earn money, although there was no problem with the elevator part. For example, although there is no problem with the suspension ropes or the drive pulley, there have been cases where the elevator operator wanted to make unnecessary changes by convincing the manager.

As can be seen, elevator inspections are necessary in many ways and enable users to use elevators safely.

The elevator is a complex product that combines many materials with its ever-changing technological structure and its importance is increasing day by day. It is not possible to inspect and control the elevator without knowing it. Vocational high schools and schools that deal with the issue of elevators at the academic level are almost nonexistent in Turkey. Apart from minor efforts based on Vocational High School, the subject has been neglected [22].

Maintenance fees are objected to in all types of buildings and settlements where elevators are used. Regardless of the structure, location, certificate status of the elevator maintenance company, technical staff qualification, and failure responseability, the choice made only according to the price can affect the performance of the elevator [23].

REFERENCES

Peterson L A. Elisha Graves Otis 1811-1861 and his influence upon Vertical Transportation. Presentation to the Newcomen Society American Branch in New York 1945.

Gürpınar A, Tutsak M. Türkiye'de Asansörün Dünü ve Bugünü, Elektrik Mühendisleri Dergisi, Sayı 452 (2014).

Matsuoka H. Development of Ultra-High-Speed Elevator that Achieved the World's Fastest Elevator with a Speed of 1,200 m/min. Hitachi Review 66-3, (2017) 219-230.

Baran N. Asansörlerde Karşı Ağırlık Kaynaklı Riskler. Mühendis ve Makine Dergisi, 55-658 (2014) 16-17.

Eriş B, Akışın H, Güneş Z. Asansör Kontrollerinde İş Güvenliği, Mühendis ve Makine Dergisi, 55-655 (2014) 49-52.

Tekin A. Isparta Süleyman Demirel Üniversitesi, Isparta'daki Asansörlerin periyodik kontrollerinin sonuçları ve asansörlerde yeni nesil güvenlik önlemleri, (2015).

Çeri G. Asansörlerde Bakım Onarım Yetersizliğinden Kaynaklanan Kazalar. Mühendis ve Makine Dergisi, 52-623, (2011) 67-73.

Karahan U. Asansör Periyodik Kontrol Faaliyetleri. Asansör Sempozyumu, 13-15 Ekim, İzmir, 39-43 (2016).

Cıcık S. Asansör montaj işlerinde İş Sağlığı ve Güvenliği Risk Faktörlerinin Değerlendirilmesi, Tez, Ankara, Çalışma ve Sosyal Güvenlik Bakanlığı, (2016).

Şeren T, Öz E, Asansör Montaj İşlemlerinin Ergonomik Yönden Değerlendirilmesi, Mühendislik Bilimleri ve Tasarım Dergisi 6 (ÖS: Ergonomi2017), 40 – 48, 2018, e-ISSN: 1308-6693.

TS EN 81-20, 2014c Türk Standardı, Asansörler - Yapım ve montaj için güvenlik kuralları - İnsan ve yük taşıma amaçlı asansörler - Bölüm 20: İnsan ve yük asansörleri, TSE Ankara, 2014.

Tavasoğlu S, Asansörlerde Pratik Bilgiler. TMMOB Elektrik Mühendisleri Odası, İzmir, 665 s, (2013).

İmrak C. E, Gerdemeli, İ. Asansörler ve Yürüyen Merdivenler, Birsen Yayınevi, İstanbul, 300 s, 2000.

Annett FA, Elevators. Elevator World; 3rd Limited Editi-on., New York, 388 p. (1990).

Hymans F, Electric Elevators: Books I-II. Elevator World Inc. 366p. (1992).

Cauchon D, Moore M, Elevators were disaster within disaster. USA Today. (2002). https://usatoday30.usatoday.com/news/sept11/2002-09-04-elevator-usat_x.htm (13.06.2023).

Anonim, 19 workers in Wuhan killed after elevator plunges 100m, Global Times, (2012) https://www.globaltimes.cn/content/733145.shtml (13.06.2023).

Anonim, 2014a. 10 people killed in Istanbul elevator accident. Associated Press, https://apnews.com/article/83ec564a502a4fbd9520c6aa7c7d8b64 (13.06.2023)

Anonim, 2014b. Asansör kazalarında ilk sıralardayız, https://www.sozcu.com.tr/2014/gundem/asansor-kazalarinda-ilk-siralardayiz-597108/ (13.06.2023).

Aydın B, Asansör Denetiminin Dünü ve Bugünü. Elektrik Mühendisliği Dergisi, 449, (2014) 52-53.

Anonim 2018a. Asansör Periyodik Kontrol Yönetmeliği. Bilim, Sanayi ve Teknoloji Bakanlığı, Resmî Gazete No:30411, Ankara, 11 s.

Doğan G, Asansör Uygulamalarında AB ve TR Arasındaki Denetim Farklılıkları. Asansör Sempozyumu, 13-15 Ekim, İzmir, 1-5, (2016).

Yıldırım İ, Asansörün İnsan İçin Önemi ve Maliyet. Asansör Sempozyumu, 4-6 Ekim, İzmir, 23-26, (2012).

HITIT JOURNAL OF OCCUPATIONAL HEALT & SAFETY

e-ISSN: 3062-0198
Volume: 1 • Number: 1 • ID: 024005
March 2024

ANALYSIS OF HAZARDS AND RISKS IN A FRUIT FUICE PRODUCTION FACILITY WITH THE FINNEY KINNEY METHOD

Şenol YAVUZ[1]
Burak Mert ÇAĞLAR[2]
Aylin YAVUZ[2]

[1]*Hitit University, Osmancık Ömer Derindere Vocational School, Department of Property Protection and Security, Çorum, Turkey.*

[2] *Hitit University, Graduate Education Institute, Çorum, Turkey.*

Article Information

Article Type: Research Article
Doi: -
Received: 02.10.2023
Accepted: 01.11.2023
Published: 01.03.2024

Cite As

Yavuz Ş., Caglar M. B. & Yavuz A. Analysis of Hazards and Risks in a Fruit Fuice Production Facility With The Finney Kinney Method. Hitit Journal of Ocuupational Health & Safety. 2024; Vol.1 Number 1 ID: 024005.

Author Contributions: Şenol YAVUZ; planning the study, literature review, choosing the risk assessment method, applying the method, interpreting the results and writing the article. Mert Burak ÇAĞLAR; application of risk assessment method, workplace application, evaluation of results. Aylin YAVUZ; literature review, article writing, evaluation of results.

Review: Single anonymized - Two Internal (Editorial board members) and Double anonymized - Two External Double-blind Peer Review It was confirmed that it did not contain plagiarism by similarity scanning (Turnitin).

Ethical Statement: It is declared that scientific and ethical principles have been followed while conducting and writing this study and that all the sources used have been properly cited.

Complaints: hjohs@hitit.edu.tr

Conflicts of Interest: The author(s) has no conflict of interest to declare.

Grant Support: This work; It is not supported by any institution.

ANALYSIS OF HAZARS AND RISKI IN A FRUIT JUICE PRODUCTION FACILITY WITH THE FINNEY KINNEY METHOD

Şenol YAVUZ[1] | Burak Mert ÇAĞLAR[2] | Aylin YAVUZ[2]

[1]Hitit University, Osmancık Ömer Derindere Vocational School, Department of Property Protection and Security, Çorum, Turkey.

[2] Hitit University, Graduate Education Institute, Çorum, Turkey.

** Corresponding Author: Şenol YAVUZ, E-mail: senolyavuz@hitit.edu.tr ; Phone: +905352136271*

ABSTRACT

According to the Occupational Health and Safety Law No. 6331, which aims to ensure the occupational safety, continuity and sustainability of the employees in the enterprises, employers are obliged to make or have workplace-specific risk assessments. Lack of risk assessment is the reason for stopping work. The employees' work in the fruit juice production facility was observed at the permissible level, and the risk scores were calculated by analyzing the dangers and risks with the Finney Kinney Risk assessment method. The work done by the employees in the enterprise was analyzed by dividing them into sections. The studies carried out in the enterprise were divided into six sections and analyzed, and as a result of the analysis, a total of 38 risks were identified. Of these risks, 22 were evaluated as Possible Risks, ten as Significant Risks, five as Essential Risks and one as Intolerable Risks, and regulatory and preventive actions were suggested for the risks. According to the employer's compliance with the recommendations, the scores of the risks will be re-evaluated later and added to the conclusion part of the risk assessment. While making the risk assessment, Comparing the risk score before and after proposed regulatory and preventive actions is possible. Sometimes lead to negative results. This study and the suggestions obtained will positively contribute to the literature.

Keywords: Occupational Health and Safety, Food Industry, Finney Kinney, Analysis

INTRODUCTION

The aim of the enterprises is to ensure that the food products necessary for people's healthy living and nutrition are delivered to people in solid or liquid form in packaged form by producing. In the production process, employees inside and outside the enterprise are exposed to many hazards and risks. It is necessary to evaluate the hazards and risks exposed and to show a protective approach against work accidents and occupational diseases. Ensuring the protection and sustainability of the enterprise and its employees is possible by providing occupational health and safety services to its employees by the employer. The aim of occupational health and safety services is based on the principle of showing a protective approach towards employees[1,2].

There are basic principles on which Occupational Health and Safety practices are based. In line with these principles, it is aimed to ensure occupational safety in the working environment[3]. These;

✓ Protective approaches towards employees,

✓ Protective approaches to production,

✓ Protective approaches to enterprise,

✓ Protective practices that ensure the sustainability of production,

✓ Approaches to increase the health and efficiency of the work,

✓ Applications that enable employee participation,

There are three basic elements in the implementation and providing continuance of occupational health and safety; state, employer and employee. State; makes and supervises legislation, employer; learns the legislations and applies them to their workplaces, and the employee adopts and obeys all the practices regarding the accepted and trained legislation[4].

In the enterprise, there are some practices that the employer should do in the provision of occupational health and safety services [5,6]. These;

✓ Training of employees against the hazards and risks associated with the work carried out[7],

✓ Identification of hazards and risks against work accidents and occupational diseases,

✓ Conducting risk assessment by establishing a risk assessment team,

✓ Preparing an emergency report for emergencies, Establishing emergency teams,

✓ Conducting an emergency drill once a year,

✓ Applying the developments in technology to the workplace by following the developments in science and technology,

✓ Providing basic occupational health and safety training in certain periods,

✓ Establishment of the occupational health and safety committee,

✓Environmental measurements and periodic checks to be made in the workplace,

✓Preparation of annual evaluation report, annual training report and annual work report,

✓Determination of the employee representative by election or appointment,

✓Ensuring the vocational qualification training required for certain professions,

The number of work accidents, occupational diseases and permanent incapacity to work in our country seems to be above the European average despite adequate occupational safety practices [8]. According to Ecole Nationale Supérieure Des Arts Decoratifs (ENSAD) data, 83.2% of the total 32705 accident records in the energy sector are caused by humans, 16.3% by natural disasters and 0.5% by conflict [9]. There are elements that contain many sources of danger due to reasons such as the physical structure of each workplace, the working method used, the existing equipment and time management [10].

With the Labor Law No. 4857 and the Occupational Health and Safety Law No. 6331, the employer is obliged to make or have the Risk Assessment, which evaluates the hazards and risks, at the beginning of the practices to be carried out for the safety of the workplace, the health of the employees and the sustainability of the production in the enterprise. With the risk assessment, corrective and preventive actions are put forward and precautions are taken against work accident or occupational disease. Measures taken; activities that reduce the severity of the risk, the level and probability of the hazard. Necessary information about basic OHS training, periodic health examinations, information on personal protective equipment suitable for the job, preparation of emergency scenarios and actions to be taken in case of work accident are presented to the employer with a risk assessment[10,11].

Risk assessment is mandatory in all workplaces. According to the type of danger, it should be revised at the latest every two years in very dangerous places, at the latest every four years in dangerous places, and at least every six years in less dangerous places. Apart from these, in case of work accident and occupational disease, the new production process in the workplace, the use of new manufacturing methods, and the change of address and title of the workplace should be revised [10,12].

While making the risk assessment, various methods are used according to the structure of the sector, the level of hazard and risk, and the frequency of accidents. Risk assessment methods are divided into three groups as qualitative, quantitative and mixed[13]. If hazards and risks are expressed with numerical data, then quantitative methods are used, if they are expressed with verbal expressions or figures, qualitative methods and if both verbal and numerical data are available, then mixed risk analysis methods are used. There are over a hundred risk analysis methods available. In practice, at most, 5x5 Risk Matrix and Finney Kinney Risk assessment methods are used [14,15].

In the literature, there are academic studies based on examining the repetitive movements of employees. These academic studies are mostly ergonomics-based studies. REBA (Rapid Entire Body Assessment), RULA (Rapid Upper Body Assessment) and NIOSH (Lifting Equation Calculation) methods that determine the risk level by examining the neck, upper arm and torso movements of the employees[16, 17].

Some of the risk analysis methods in the literature are divided into two groups as qualitative and quantitative and classified as follows [18,19],

Qualitative Risk Assessment Analysis;

✓Preliminary Hazard Analysis – PHA,

✓Job Safety Analysis - JSA,

✓What if ?,

✓Risk Assessment Decision Matrix,

✓Failure Mode and Effects Analysis - FMEA,

✓Hazard and Operability Studies - HAZOP,

✓Fault Tree Analysis - FTA,

✓Event Tree Analysis - ETA,

✓Hazard Analysis and Critical Control Points,

✓Preliminary Risk Analysis - PRA,

✓Preliminary Risk Analysis Using Checklists - PRA,

✓Safety Audit

Quantitative Risk Assessment Analysis;

✓Monte Carlo Simulation,

✓Markov Analysis,

✓Bayesian Networks,

✓Decision Tree,

Occupational health and safety experts in our country use the qualitative 5x5 Matrix and Finney-Kinney Risk analysis in determining hazards and risks, calculating the risk score and categorizing the results, and creating regulatory and preventive action plans [19,20].

In this study, the hazards and risks in a fruit juice production company were evaluated by the risk assessment team and the preventive activities were determined by Finney Kinney Risk assessment method. With this study, it creates an awareness in terms of being aware of the same hazards and risks in similar enterprises. At the same time, a new field of application will be added to the literature.

MATERIAL AND METHOD

This study has been tried to be implemented by focusing on the potential situations and possibilities that may cause work accident or occupational disease that employees in the production may be exposed to with the Finney Kinney Risk Assessment method of a fruit juice production company. In the Finney Kinney method, the calculation is made by taking into account three parameters while making the risk assessment. While verbal expressions are similar in literature and practice, the tables used are the same. Only the figures used vary according to the interpretation of the practitioner.

The scale tables used to calculate the risk score according to the Finney Kinney Risk assessment are available in table 1 [10].

Table 1. Fine-Kinney Method severity, frequency, probability scale table

S: Severity of the Event (Degree of Damage)		F: Frequency of the Event (Frequency of Exposure to the Hazard Over Time)		P: Probability (Probability of Hazard Occurrence)	
40	Fatal accident, serious environmental damage	6	Frequent (once or several times a day)	6	high, quite possible
15	Permanent damage, job loss,creating environmental barrier,	3	Occasionally (once or several times a week)	3	Possible
7	Significant damage, injury, need for external first aid	2	Not often (once or several times a month)	1	Possible but low
3	Minor damage, injury, need for internal first aid	1	Rare (several times a year)	0,5	Unexpected but possible
1	Get off cheap, no environmental damage	0,5	Very rare (Once a year or less)	0,2	Unexpected

With the Finney Kinney Risk Assessment, the risk score (R=OxFx$) is calculated by multiplying the probability, frequency and severity. The score level obtained is evaluated by looking at the Finney Kinney Risk score table. In Table 2, there are data on whether the risk can be accepted and precautions should be taken according to the risk scores[10].

Table 2. Finney Kinney Method Risk Degree Scale

Risk Value = Probability X Severity X Frequency			
Risk Rating		Risk Assessment Result	
1	R<20	Insignificant Risk	Necessary Measures Should Be Taken Immediately / Work Should Be Stopped
2	20<R<70	Possible Risk	Should be Improved in a Short Time
3	70<R<200	Significant Risk	It should be improved during the year in line with the plan
4	200<R<400	Fundamental Risk	Should be Improved in a Short Time
5	400<R	Intolerable Risk	Necessary Measures Should Be Taken Immediately / Work Should Be Stopped

Differences were observed in the machinery equipment used in the production and supply of fruit juice according to the type and structure of the enterprise. There are changes in the regulatory and preventive activities carried out according to the production departments of the enterprise. The enterprise where Finney Kinney Risk assessment was carried out was divided into six sections and a risk analysis study was conducted. These;

1- Risks covering the whole enterprise,

2- Risks in the filling and tetrapark section,

3- Risks in process, chips and boiler preparation section,

4- Risks in fruit processing and clear concentrate section,

5- Risks in the milk acceptance section,

6- Risks in the workshop, waste and treatment department,

RESULTS and DISCUSSION

The risks in the enterprise are examined in six sections, respectively (in Supplementary File)

CONCLUSION

Finney Kinney Risk assessment was conducted in order to evaluate the hazards and risks in a fruit juice production and packaging enterprise and to demonstrate proactive approaches. As a result of the risk assessment, 22 possible risks, 10 significant risks, 5 fundamental risks and 1 intolerable risk were determined, and current measures taken and recommended regulatory actions were determined. Before the risk assessment is carried out, a risk assessment team is established, training is given to the team, and the risk score is calculated by analyzing the existing risks together with the team, and is presented to the employer by suggesting regulatory and preventive actions. During the field surveillance, the risk score in the final analysis is calculated according to the suitability of the measures to reduce the severity of the existing risks, and the document is added to the occupational health and safety file. Although the risk score ranges are the same in the studies in the literature, there are differences in the way of expression of the risk levels[17,21,22].

The risks that employees will be exposed to during work in the food production and packaging sector are slightly lower than in other sectors. The number of unacceptable and intolerable risks is less, the number of possible risks and significant risks is slightly higher. In this respect, compared to very dangerous places such as mines, construction, shipyards, the food packaging sector contains less danger, it is in a dangerous or less dangerous business line.

Şensoy and Kaya (2019) conducted a 5x5 risk analysis study for the biological factors that

employees may be exposed to during the studies carried out during the disposal of hazardous wastes. Risk analysis studies were carried out by Cündübeyoğlu and Kayabaşı (2022), for the studies carried out in the ceramic factory, for the hotel business by Gündüz and Hüner (2021), and for a port business by Bayram and Kaya (2022). Although the level of risk scores obtained as a result of the studies and the definition of risk are not the same, their ranges are close to each other. The important thing is to examine the studies in the enterprises, to evaluate the risks and as a result, to suggest protective approaches to the employees. Numerical values vary according to the hazard-risk perception of the risk assessment team. Failure to carry out a risk assessment in the workplace is the reason for the suspension of the work.

Various risk analysis methods are available in the literature and in practice. The most preferred is the 5x5 Matrix and Finney Kinney analysis. What distinguishes Finney Kinney from the 5x5 Risk Matrix is the frequency factor. The frequency factor is an important factor in terms of including the frequency of that event.

REFERENCES

Yavuz, Ş. "Finney Kinney Risk Analizi İle Gıda Mamüleri Dağıtımı Yapan Bir İşletmedeki Tehlike ve Risklerinin Değerlendirilmesi*", International Social Mentality and Researcher Thinkers Journal*, (Issn:2630-631X) 7(46): 1320-1331, (2021).

Acar, B. & Sönmez, İ. Güneş Enerji Santralleri Kurulum Aşamasında Alınacak Olan İş Sağlığı Ve Güvenliği Önlemleri. *Doğu Fen Bilimleri Dergisi, 3 (2),* 95-108,(2020).

Mertoğlu, B. İSG 501 – İş güvenliği mühendisliği ders notları. İstanbul: Okan Üniversitesi,(2018).

Resmi Gazete 6331 *Sayılı İş Sağlığı ve Güvenliği Kanunu*, 52/28339, (2012).

Odaman, S. İş Sağlığı ve Güvenliği Açısından Tarafların Önemli Hak ve Yükümlülükleri İle Uluslararası Standart, *Legal, İHSGHD*, s.11, c.3, s. 886, (2006).

Caniklioğlu, N.*6331 Sayılı İş Sağlığı ve Güvenliği Kanununda Öngörülen İşveren Yükümlülükleri*. Türkiye Toprak, Seramik, Çimento ve Cam Sanayii İşverenleri Sendikası, Çalışma Mevzuatı Seminer Notları, Antalya, 26- 30 Eylül 2012, s. 27-84,(2012).

Pelit, E. & Gülen, M. İş-Çalışan Sağlığı ve Güvenliği Kapsamındaki Uygulamaların İşgörenlerin Kuruma Güvenlerine Etkisi Üzerine Bir Araştırma: Beş Yıldızlı Otel İşletmeleri Örneği. İşletme Araştırmaları Dergisi*, 10(3),* 767-787,(2018).

Çetin, M. & Gögül, P. K. Occupational Accidents And The Economic Impact Of Workers' Deaths In Turkey And A Policy Proposal. *Istanbul Journal of Sociological Studies,* 51(51), 1-29, (2015). doi:10.18368/IU/sk.60129

Burgherr, P.& Hirschberg, S. Comparative risk assessment of severe accidents in the energy sector. *Energy Policy*, 74, 45-56, (2014). doi:10.1016/j.enpol.2014.01.035.

Cündübeyoğlu, İ. & Kayabaşı, R. Seramik Fabrikasında Fine-Kinney Yöntemi ile Risk Değerlendirmesi. *Avrupa Bilim ve Teknoloji Dergisi, (35)*, 633-642, (2022).

Bayram, H. & Çelenk Kaya, E. Fine-Kinney Metodu İle Risk Analizi: Trabzon Liman Örneği. *Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi*, 11 (2), 760-783, (2022).

Erol, M., & Erdebilli, B. Firmaların İş Sağlığı ve Güvenliği Performansının Çok Kriterli Karar Verme Yöntemleri Yardımıyla Ölçülmesi. *Düzce Üniversitesi Bilim ve Teknoloji Dergisi*, 9, 336-358, (2020).

Lingard, H. & Rowlinson, *S. Occupational Health and Safety in Construction Project Management.* London: Taylor & Francis Group, (2005).

Hughes, P. & Ferrett, E.*Introduction to Health and Safety at Work: The Handbook for NEBOSH National General Certificate (4th Edition*). Oxford: Elsevier Limited,(2009).

Gündüz, B&Güner, H.Otel İşletmelerinde İş Sağlığı ve Güvenliği Risklerinin Fine-Kinney Yöntemi ile Değerlendirmesi, *Karaelmas Journal of Occupational Health and Safety*, c. 5, sayı. 1, ss. 55-65,(2021).

Kırcı, B.K., Özay, M. E. & Uçan, R. A Case Study in Ergonomics by Using REBA, RULA and NIOSH Methods: Logistics Warehouse Sector in Turkey, *Hittite Journal of Science and Engineering, 7 (4),* 257–264, (2020).

Yavuz, Ş., Gür, B., Çakır, A. D. & Köse, D.A. Investigation of The Posture Positions of The Apparel Workshop Employees with The Rapid Entire Body Assessment(REBA) and Rapid Upper Limb Assessment(RULA) Method. *Hittite Journal of Science and Engineering, 8(2),* 149 – 160, (2021).

International Organization for Standardization. ISO 31000:2009 *Risk Management – Principles and Guidelines on Implementation*,(2009).

Gür, B, Yavuz, Ş., Çakır, A. D. & Köse, D. A. Determination of Hazards and Risks in a Solar Power Plant Using the Matrix Risk Analysis. *European Journal of Science and Technology,* (23), 497-511,(2021).

Şenol, M. & Yılmaz, N. İş Sağlığı Ve Güvenliği Risk Değerlendirme Süreci İçin Bulanık Çok Kriterli Bir Model ve Uygulaması. *Gazi Üniversitesi Mühendislik Mimarlık Fakültesi Dergisi*, 32 (1), 0-0,(2017).

Birgören B. Fine Kinney Risk Analizi Yönteminde Risk Analizi Yönteminde Risk Faktörlerinin Hesaplama Zorlukları ve Çözüm Önerileri. *Uluslararası Mühendislik Araştırma ve Geliştirme Dergisi, 9(1)*, 19 – 25,(2017).

Ölçücü Şensoy, H. & Ersöz Kaya, İ.Tehlikeli Atık Bertaraf Tesislerinde Karşılaştırmalı Risk Analizi ve Biyolojik Faktörler Açısından Risk Değerlendirmesi. *Avrupa Bilim ve Teknoloji Dergisi, (17),* 1375-1382,(2019).

SUPPLEMENTARY FILES

Supplementary File 1. Risks covering the whole enterprise,

Number	Activity	Hazard	Risk	Current Measure	Possibility	Severity	Frequency	Risk Score	Risk Class	Suggestions
1	Security-Administrative Building	Vehicles do not park in the direction of exit	Difficulty evacuating in an emergency	Vehicles are parked in the exit direction.	0,5	15	3	22,5	Possible Risk	Controlling the parking of vehicles facing the exit direction.
2	Security Point	Be attacked	Injury, Work Accident, Death	Checking whether it is a company vehicle	1	40	2	80	Significant Risk	Always be repared for external ttacks.
3	Diesel Tank Station	Intervention by non-officers	Flash, Explosion, Fire, Work Accident, Death	There is a no smoking warning sign. There are defined smoking areas.	1	40	2	80	Significant Risk	Preventing anyone other than the officer from intervening in the diesel tank area.
4	Diesel Tank Station	Lack of chemical spill response equipment at diesel tank station	Environmental Damage	A chemical spill kit has been allocated.	1	8	7	56	Possible Risk	Keeping chemical spill response equipment ready for use near the station.
5	Floor	Slippery floor	Fall, Injury	It is not left wet or a slippery floor warning sign is used	0,5	15	6	45	Possible Risk	Employees should be provided with slip-resistant work shoes, and employees should not move fast and running on slippery floors. Warning signs indicating that there is a risk of slipping into the environment in case the floor is washed should be hung.
6	Stacking Process	Switching between stacked materials	Work accident, injury, occupational disease,	Stacking areas have been de-termined.	1	8	5	40	Possible Risk	Stacking areas should be determined and the entrance of other than authorized personnel should be prohibited. Existing drawn pedestrian paths should be used.
7	Hygiene	Staff cleaning care	Bacterial growth, dangerous disease	Hygiene training is pro-vided.	6	15	4	360	Fundamental Risk	The staff have been made aware of cleaning, especially due to their job requirements. Bones, gloves and aprons that prevent contact with food are used during food preparation and service.

Supplementary File 2. The risks in the filling and tetrapark section,

Number	Activity	Hazard	Risk	Current Measure	Possibility	Severity	Frequency	Risk Score	Risk Class	Suggestions
1	Electric	Absence of insulated mats	Electric shock, injury, death	Isolated mats are available	1	40	3	120	Significant Risk	It is necessary to ensure that the insulated mats in front of the electrical panels are used continuously.
2	Fire Extinguishers	Failure to carry out periodic controls of fire extinguishers	Delay in fire response	Periodic cont-rols of fire extinguishers are carried out.	2	7	4	56	Possible Risk	It is necessary to ensure that fire extinguishers are periodically checked every six months.
3	Machines	Emergency stop buttons not working	Work accident, injury, death	Emergency buttons are in working condition	1	15	5	75	Significant Risk	It must be ensured that all emergency stop buttons are always operational. Operators should be informed to check the machines before using them.
4	Machines	Climbing on the machines	Work accident, serious injury	It is explained in Basic OHS trainings that you should not be climbed on the machine.	2	15	4	120	Significant Risk	Personnel outside the job description should not be allowed to climb onto the machines. In addition, in cases where it is necessary to climb on the machine, it should be intervened after taking the necessary safety precautions.
5	Stairs	Getting up and down fast	Fall from height, injury,	In basic OHS trainings, employees are given what they need to do while working at height.	0,5	15	6	45	Possible Risk	It is necessary to move slowly when climbing the stairs. The 3-point rule should be applied. Accordingly, while on the ladder, 2 feet, 1 hand or 2 hands and 1 foot should be in contact with the ladder.
6	Chemical Use	Unlabeled chemicals	Work accident, poisoning, injury,	No precautions	1	15	6	90	Significant Risk	It should be ensured that all chemicals have labels with the name of the chemical and its hazards, and that chemicals without a label are not used.
7	Use of nitrogen gas	Leaving tubes haphazardly without fixing them	Explosion, fire, injury,	No precautions	0,5	40	3	60	Possible Risk	Nitrogen tubes must be kept fixed and protected against impacts.

Supplementary File 3. Risks in process, chips and boiler preparation section,

Number	Activity	Hazard	Risk	Current Measure	Possibility	Severity	Frequency	Risk Score	Risk Class	Suggestions
1	Electric	Insufficient condition of warning signs in electrical panels	Electric shock, injury death	None	2	40	2	160	Significant Risk	Warning signs stating that there is a risk of electric shock and that it is forbidden for anyone other than the attendant to intervene in all electrical panels must be hung.
2	Electric	Opening of electrical cables, deformation	Electric shock	None	1	40	2	80	Significant Risk	Bare condition, deformed etc. cables should never be used. Cables should not be passed through water. The cables should not be affected by the humidity and temperature in the environment.
3	Fire Extinguishers	Failure to carry out periodic controls of fire extinguishers	Delay in fire response	Periodic checks of fire extinguishers are carried out.	1	7	3	21	Possible Risk	Fire extinguishers should be checked periodically every six months.
4	Machines	Emergency stop buttons not working	Work accident, injury, death	Emergency buttons are in working condition	1	7	3	21	Possible Risk	It must be ensured that all emergency stop buttons are always operational. Operators should be informed to check the machines before using them.
5	Stairs	The stairs are not fixed to the floor	Fall, injury	None	0,5	15	6	45	Possible Risk	Stairs must be fixed to the ground to prevent them from moving.
6	Chemical Use	Careless working in the presence of chemicals	Work accident, injury	None	0,5	15	8	45	Possible Risk	In the studies carried out in the fields where chemicals are found, the study should be carried out by taking into account the üinformation in the MSDS form of the chemical. For üexample, fiery work should not be done next to chemicals that can easily ignite.
7	Bearings	Bearings not working, workers pushing with body power	Musculoskele-tal disorders,	None	1	15	3	45	Possible Risk	It must be ensured that the bearings are always in working condition.

Supplementary File 4. Risks in fruit processing and clear concentrate section,

Number	Activity	Hazard	Risk	Current Measure	Possibility	Severity	Frequency	Risk Score	Risk Class	Suggestions
1	Fruit Processing and Clear Concentrate	Loading more than the capacity of the hoist	Work accident, injury	None	0,5	7	6	21	Possible Risk	It should be used within the usage limits of the hoist. Employees should not enter the restricted area. It should not load a load above the capacity of the hoist.
2	Electric	Absence of insulated mats	Electric shock, injury, death	Isolated mats are available	2	40	1	80	Significant Risk	It is necessary to ensure that the insulated mats in front of the electrical panels are used continuously.
3	Machines	Disabling safety measures	Injury, death	None	0,5	15	6	45	Possible Risk	Safety measures such as safety switches, beam barriers, etc. of all equipment and machines must always be in active operation. Work should not be carried out with equipment that does not work with safety measures.
4	Machines	Absence of grounding of metal body equipment	Electric shock	Metal body grounding is available.	2	30	4	240	Fundamental Risk	All equipment with metal body must have body grounding. Equipment without grounding should not be used..
5	Machines	Failure to make necessary checks before starting work	Work accident	None	0,5	15	6	45	Possible Risk	Before starting to work with the machine, the operators should check the machine environment and start working after making sure that no one is inside.

Supplementary File 5. Risks in the milk acceptance section,

Number	Activity	Hazard	Risk	Current Measure	Possibility	Severity	Frequency	Risk Score	Risk Class	Suggestions
1	Chemical Use	Chemicals are unlabeled	Work accident, poisoning	None	0,5	15	4	30	Possible Risk	Personnel outside the job description should be prevented from geting on the machines. In addition, in cases where it is necessary to climb on the machine, it should be intervened after taking the necessary safety precautions.
2	Tanks	Inappropriate-ness of the exit ladder on top of the tank	Falling from high	None	1	15	3	45	Possible Risk	There must be a ladder that is obstructed to the exit of unauthorized personnel, where the ladder on the top of the tank has a fixed protection. Stair steps must be non-slip.
3	Eye and Body Shower	Eye and body shower not working	Increasing se-verity of injury	Body and eye shower are in working condi-tion.	2	20	2	80	Significant Risk	It must be ensured that the eye and body shower is always in working condition.
4	Vehicle Loa-ding	No wedges in front of vehicle wheels	Work accident	Wedges are available.	1	7	6	42	Possible Risk	In order to prevent the vehicles from moving uncontrollably, wedges should be placed in front of the vehicle wheels.
5	Emergency	Inappropriate-ness of emergency lighting	Difficulty evacuating in an emergency	None	3	100	2	600	Intolerable Risk	Emergency lighting should provide sufficient lighting in case of a possible emergency and should illuminate for at least 120 minutes. These lightings need to be fed from a separate electricity source.

Supplementary File 6. Risks in the workshop, waste and treatment department,

Number	Activity	Hazard	Risk	Current Measure	Possibility	Severity	Frequency	Risk Score	Risk Class	Suggestions
1	Spiral	Leaving the unused spiral plugged into the socket,	Work accident, injury	None	2	8	6	96	Fumdamental Risk	Ensuring that unused hand tools are not left plugged into the socket,
2	Grinding machine	Burr splashes in the eyes of unauthorized personnel approaching the work area while working on the grinding machine	Work accident, injury	None	1	7	6	42	Possible Risk	While working on the grinding machine, other unauthorized personnel without glasses should be prevented from approaching the work area.
3	Grinding	Grinding work	Work accident, injury, fire, explosion	None	0,5	40	3	60	Possible Risk	Flammable, explosive materials and dust should be removed or protected near the place where the grinding work is performed. * If the grinding work is done in a closed environment, explosive and flammable materials in the environment should be removed and there should be no cracks or gaps on the walls or floor of the room where gas can enter. * Appropriate type and size of fire extinguisher should be available while grinding work. * No personnel other than properly trained personnel should perform the grinding work. * While the grinding work is being done, if necessary, a watcher should be kept in case of fire or explosion, and emergency exits should be kept appropriate and open.

4	Oxygen cylinders	The presence of a holding valve in the hose of oxygen cylinders	Work accident, injury, fire, explosion	There is one holding valve	2	40	2	160	Fundamental Risk	Attaching one more safety valve to the oxygen cylinder hoses
5	Use of Personal Protective Equipment	Personal materials suitable for the work of employees wearing protective equipment	Work accident, occupational disease	None	0,5	15	6	45	Possible Risk	Employees should be ensured to use personal protective equipment such as masks, goggles, work shoes, gloves, headphones, etc. in accordance with their work.
6	Welding Works	Operation of electrode welding current generators without grounding	Electric shock, Work accident, occupational disease, death	Grounding is done.	0,5	40	3	60	Possible Risk	Grounding must be done.
7	Waste Water Treatment and Waste Storage Area	Personnel not using personal protective equipment	Injury, Work Accident, Illness	Personal protective equipment is available.	1	15	6	90	Fumdamental Risk	Work shoes/boots, work gloves, overalls, safety glasses, ear protectors, dust masks, etc., for the personnel to use in the working area. active use of necessary personal protective equipment.

HITIT JOURNAL OF OCCUPATIONAL HEALT & SAFETY

e-ISSN: 3062-0198
Volume: 1 • Number: 1 • ID: 024006
March 2024

EXAMINATION OF OCCUPATIONAL SAFETY SPECIALISTS' OPINIONS ON THE IMPLEMENTATION OF OCCUPATIONAL HEALTH AND SAFETY LEGISLATION: CASE OF ÇORUM PROVINCE

Emre BAŞOĞLU[1]
Cem KOÇAK[1]

[1]*Hitit University Graduate Education Institute Occupational Health and Safety Department Çorum/ Turkey*

Article Information

Article Type: Research Article
Doi: -
Received: 20.09.2023
Accepted: 18.10.2023
Published: 01.03.2024

Cite As

Basoglu E. & Kocak C. Examination of Occupational Safety Specialısts' opinions On The Implementation of Occupational Health and Safety Legislation: Case of Corum Province. Hitit Journal of Occupational Health and Safety. 2024 Vol.1 Number 1 ID: 024006.

Author Contributions: Author Contributions: The idea of the research was put forward by Emre Başoğlu and the data was collected. Research Prof. Dr. It was carried out under the consultancy of Cem Koçak. Both authors prepared the manuscript and analyzed the data. Conclusions and recommendations were written by both authors.

Review: Single anonymized - Two Internal (Editorial board members) and Double anonymized - Two External Double-blind Peer Review It was confirmed that it did not contain plagiarism by similarity scanning (Turnitin).

Ethical Statement: It is declared that scientific and ethical principles have been followed while conducting and writing this study and that all the sources used have been properly cited.

Complaints: hjohs@hitit.edu.tr

Conflicts of Interest: The author(s) has no conflict of interest to declare.

Grant Support: The author(s) acknowledge that they received no external funding to support this research.

EXAMINATION OF OCCUPATIONAL SAFETY SPECIALISTS' OPINIONS ON THE IMPLEMENTATION OF OCCUPATIONAL HEALTH AND SAFETY LEGISLATION: CASE OF ÇORUM PROVINCE

Emre BAŞOĞLU[1] | Cem KOÇAK[1]

[1]Hitit University Graduate Education Institute Occupational Health and Safety Department Çorum/ Turkey
** Corresponding Author: Emre BAŞOĞLU, E-mail: basogluemre078@gmail.com; Phone: +905536621082;*

ABSTRACT

Occupational Health and Safety Law No. 6331 is an important law that covers the duties and responsibilities of employees regarding Work Accidents and Occupational Diseases. Employers, occupational safety specialists, workplace physicians and employees must fulfill their obligations specified in the law to ensure that it reaches its aim. In this study, the compliance of employers, workplace physicians, occupational safety specialists, and employees with occupational health and safety regulations outlined in Law No. 6331 was examined through in-depth interviews, a qualitative research method. The study aimed to gather insights from occupational safety specialists regarding the adherence to these regulations. The study findings indicated that occupational health and safety specialists often view their roles as primarily administrative and cost-incurring rather than hands-on. It also revealed that occupational safety specialists exhibit knowledge gaps in their job responsibilities, while occupational physicians rarely fulfill their duties related to identifying occupational diseases. Additionally, employees are often unaware of their role in safeguarding both themselves and their colleagues. The study delves into a comprehensive discussion on potential solutions to address these issues.

Keywords: Occupational safety specialist, Workplace Physician, Employee, Employer, Implementation of occupational health and safety legislation, In-depth interview, Occupational Health and Safety Law No. 6331

INTRODUCTION

Occupational health is a field of science that aims to protect and maintain the physical, mental and social well-being of employees and to prevent or minimize the dangers that may arise from the materials and equipment used in the work area [8]. Occupational safety, on the other hand, includes all the technical studies carried out to eliminate or reduce the risks that may harm health and the hazard arising from the execution of the work [2]. Occupational health and safety represents a multidisciplinary field that collaborates with various industries and connects with disciplines such as medicine, ergonomics, physics, chemistry, technology, economics, and law, among others. [1] The International Labour Organization (ILO) has calculated that approximately 2.2 million individuals lose their lives annually due to work-related accidents or occupational diseases, and it is possible that these figures are on the rise. Moreover, the ILO approximates that there are about 270 million non-lethal accidents causing injuries worldwide. [17] As work-related accidents and occupational diseases continue to be prominent challenges within the workplace, the significance of occupational health and safety is steadily growing, with increasing importance across social, economic, and technological dimensions [5]. In Turkey, the Occupational Health and Safety Law No. 6331 was issued in the Official Gazette on 30.06.2012 [10]. This law includes various regulations regarding occupational health and safety measures in Turkey as legal obligations. In fact, it is clear that if these obligations, regulated by law, are completely fulfilled, many problems related to occupational health and safety may disappear. Based on the preliminary insights derived from interviews with occupational health and safety specialists, it was apparent that their salaries are funded by employers. The specialists also pointed out that implementing health and safety measures can be seen as an added financial burden for employers, there is a knowledge gap among the workers, and certain laws or regulations in Turkey tend to be more theoretical than practical when it comes to their application on-site. This study addressed the extent to which the occupational health and safety law numbered 6331 is implemented in Turkey. It is important to determine which articles of the Occupational Health and Safety Law No. 6331 are fully or partly implemented and which articles are not implemented at all, since this may direct individuals and institutions to take measures to protect workers' health and reduce work accidents. A comprehensive discussion has been generated regarding the perspectives of occupational safety specialists concerning the proper implementation of occupational health and safety practices by occupational health and safety specialists, employers, employees, and workplace physicians, as well as the shortcomings within the legal framework.

Aim of the Study

The Occupational Accident and Occupational Disease Statistics between 2012 and 2020 shows that occupational accidents and diseases are increasing [12]. Various datasets and statistical analyses [12, 19, 22] prompt inquiries regarding the integration and comprehensive enforcement of occupational health and safety laws, including

Occupational Health and Safety Law No. 6331, within the working environment. As such, this study seeks to assess the extent to which occupational health and safety practices align with legal provisions and pertinent regulations.

Method

The research utilized the semi-structured in-depth interview method, which is one of the qualitative research methods [18,21]. This interview method aimed to reveal the participants' thoughts on the subject [18, 21]. A questionnaire consisting of 46 questions was developed by the researchers to carry out the in-depth interviews. It included the articles of the Occupational Health and Safety Legislation No. 6331 and was administered to the occupational safety specialists. New questions that emerged during the course of interviews were also posed to the participants. During the interviews, when a participant felt uneasy about a question, that question was skipped and the interview continued with other questions. The researcher had the opportunity to systematically ask in-depth and detailed questions starting from general questions, and it was ensured that the participants focused completely on the subject [21].

The interviews were audio and video recorded, and the necessary ethics committee permissions and informed consent of the participants were obtained before the study. During the interview, the researcher asked questions other than the questions in the questionnaire so that the participants could elaborate on their responses. The researcher made brief notes during the interviews, occasionally pausing the video recording to capture additional insights from participants' non-verbal cues such as gestures, facial expressions, and body language, in addition to their verbal responses [3,18].

Population and Sample

The population was determined as the business sector in the province of Çorum, and no sector limitation was imposed to reveal the situation in general. In qualitative research approaches, the sample size is typically more limited compared to quantitative research methods. [20] In qualitative studies, instead of large samples, samples that meet the objectives of the research and contribute to data saturation are selected. Saturation is defined as the stage where the process of collecting data ceases to provide fresh or pertinent information. [20] For this reason, the quality and knowledge of the individuals in the sample about the subject are taken into consideration rather than the quantity of the individuals [23]. The goal of this study is to obtain in-depth insights from a limited sample size with a strong understanding of the subject matter. In qualitative research, there are no strict guidelines regarding the precise number of interviews required [18]. The research received ethical approval from a relevant committee, and researchers have the flexibility to determine the sample size based on the purposive sampling method. In this study, conducting interviews with 10 occupational safety specialists was deemed sufficient. However, during the data collection phase, after interviewing approximately 6 specialists, the researchers observed that participants were providing consistent or very similar responses. To enhance the representativeness of the population, the researchers decided to continue the interview process, ultimately including all 10 participants in the study [23].

Data Collection Tools

Measurement tools used in the data collection phase were the 46-item questionnaire containing the articles of the Law No. 6331, approximately 45 minutes of video recordings or audio recordings of the interviews with each of the 10 occupational safety specialists selected as the sample, and the additional questions that arose during the course of the interviews.

Statistical Method and Evaluation Process

Frequency distributions were obtained using the SPSS program in the analysis. In the evaluation and interpretation of the data, common answers were determined and classified by comparing the answers given to the questionnaire items or additional questions during the interview. In addition, the detailed analysis feature of the in-depth interview method was employed to interpret different answers, opinions or attitudes.

Theoretical Framework

Obligations of Employers According to the Occupational Health and Safety Law No. 6331

In accordance with the Occupational Health and Safety Law No. 6331, employers are mandated to prevent occupational hazards by implementing various precautions such as training and information, organizational adjustments, provision of necessary tools and equipment, and adapting health and safety measures to evolving conditions. Furthermore, employers are responsible for continuous monitoring and inspection to ensure compliance with occupational health and safety protocols within the workplace and for taking appropriate actions to rectify any non-compliance. Additionally, employers must either perform a risk assessment themselves or have it conducted, assess employees' suitability for positions concerning health and safety, and implement necessary measures to restrict access to areas posing potential risks to life and safety, except for individuals who have received comprehensive information and instructions [10].

Employers, while fulfilling their responsibilities, can seek advice from external specialists and organizations. Nevertheless, it is important to note that seeking such services does not exempt

employers from their duties. It is worth emphasizing that the obligations of employees in terms of occupational health and safety should not be seen as diminishing the responsibilities of employers. Additionally, it is not acceptable for employers to transfer the costs associated with occupational health and safety measures to their employees, as stipulated in reference [10].

According to the law, one of the important obligations of employers is to make a risk assessment or have a risk assessment done [9]. Employers can carry out risk assessment, but this does not eliminate employers' obligation to ensure occupational health and safety in the workplace. If employers assign a person or a group of people to carry out the risk assessment, they are also obliged to provide all necessary information and documents [9].

Based on the result of the risk assessment, obligations such as providing protective equipment or equipment, taking precautions, evaluating working styles, renewing production methods, improving the protection of employees from occupational accidents, and performing necessary control, measurement, inspection or research activities may arise. Employers have the duty to guarantee that the required inspections, assessments, analyses, and research are conducted to enhance employees' health and safety protection and identify the hazards they may encounter in the workplace [10].

In line with the Occupational Health and Safety Law No. 6331, some important obligations of employers are related to emergency plans. These obligations are taking preventive and restrictive measures by pre-evaluating the emergencies that may occur, making the necessary measurements and evaluations for the emergencies that may occur, preparing emergency plans, assigning a sufficient number of people who are trained in prevention, protection, evacuation, firefighting and first aid, organizing training and exercises, ensuring that teams are always ready, and contacting organizations outside the workplace when necessary. The responsibilities of assigned employees regarding emergencies do not relieve employers of their obligations [10,13].

Furthermore, according to the law, employers bear the significant responsibility of educating their workforce. This entails the provision of occupational health and safety training to employees, both prior to commencing their duties and throughout their employment. Furthermore, it encompasses the scenario of workplace equipment modifications, the introduction of new technology, or a change of work environment. It is essential for employers to develop and implement training programs while continuously adapting them to evolving risks and demands. Regular and recurring training sessions should be conducted, offering appropriate facilities, tools, and equipment. Employers must ensure that all employees actively engage in these training initiatives and furnish certificates of attendance upon their completion [10,11].

Obligations of Occupational Safety Specialists According to the Occupational Health and Safety Law No. 6331

As specified under the Law No. 6331, the responsibilities of occupational safety specialists encompass advisory functions. These include tasks like the strategic planning, organization, and execution of occupational safety efforts. Additionally, they are tasked with providing recommendations to the employer concerning matters such as the selection, procurement, usage, maintenance, preservation, and examination of personal protective equipment. They are obliged to formally communicate safety measures to be taken to the employer in writing. Furthermore, they are required to conduct inquiries into the root causes of workplace accidents and occupational illnesses, making suggestions to the employer regarding preventative actions to avert future occurrences. In cases of events that may not result in fatalities or injuries but have the potential to endanger employees, equipment, or the workplace, they should investigate the causes and provide recommendations to the employer [14].

According to the regulations stipulated in the law, occupational safety specialists bear specific responsibilities related to risk assessment and workplace surveillance. In terms of risk assessment, their duties encompass active participation in risk assessment procedures and subsequent studies, wherein they offer recommendations to the employer regarding health and safety measures to be adopted based on the outcomes of these assessments [14]. Simultaneously, they are obligated to oversee the working environment, strategize the scheduling of periodic maintenance, inspections, and assessments within the workplace, ensuring their proper execution. Additionally, these specialists actively contribute to prevention efforts concerning accidents, fires, or explosions in the workplace by providing suggestions to the employer. They are involved in upholding occupational health and safety protocols, engage in the development of contingency plans for contingencies like natural disasters, accidents, fires, or explosions, verify the execution of relevant periodic training sessions and drills, and consistently supervise and confirm the implementation of emergency plans [14].

In accordance with the guidelines in the law, occupational safety specialists are entrusted with specific duties encompassing training, information dissemination, and reporting, as well as collaborative efforts with relevant units. These responsibilities entail the formulation of occupational health and safety training plans for employees, aligning them with pertinent legislation, and seeking approval

from the employer. They are further responsible for conducting these training sessions, crafting an annual evaluation report in collaboration with the workplace physician, which compiles the results of occupational health and safety endeavors and workplace surveillance. In addition, specialists work closely with the employer to prepare informational activities for employees, gain approval for their implementation, and subsequently ensure their execution. They are also tasked with creating occupational health and safety instructions and work permit procedures where deemed necessary, with a focus on gaining employer approval and verifying adherence to these protocols. Moreover, they are responsible for relaying the latest information concerning occupational health and safety issues, as specified by the Ministry, to the Occupational Health and Safety clerk. Furthermore, occupational safety specialists engage in cooperative endeavors with pertinent departments, evaluating work-related accidents and occupational diseases in conjunction with the workplace physician. This collaboration extends to the development of preventive action plans to avert the recurrence of hazardous situations and vigilantly monitoring the implementation of these precautionary measures. They are also responsible for formulating the annual work plan, encompassing activities related to occupational health and safety for the subsequent year, within the workplace. Their work is conducted in close cooperation with the occupational health and safety committee and extends to lending support to the employee representative and auxiliary staff [14].

Obligations of Workplace Physicians According to the Occupational Health and Safety Law No. 6331

In accordance with the Occupational Health and Safety Law No. 6331, workplace physicians are bound by a set of responsibilities that encompass guidance. These duties encompass providing guidance to employers on a range of factors, such as the health surveillance of employees, workplace environment monitoring, and workspace design, including considerations related to job tasks and workplace modifications. They also play a vital role in planning, organizing, and executing work tasks, which includes selecting appropriate materials and making recommendations to ensure the adherence to occupational health and safety regulations and general workplace health guidelines when selecting personal protective equipment. Workplace physicians are further responsible for suggesting activities aimed at enhancing the health of employees in the workplace and actively participating in occupational health and safety studies. They carefully consider the physical and mental capabilities of employees concerning ergonomic and psychosocial risks, seeking to ensure a harmonious alignment between job responsibilities and the workforce. Moreover, they conduct assessments to safeguard employees against stress-inducing factors within the work environment and integrate research findings into their guidance efforts. These professionals are continuously monitoring the overall hygiene conditions of various workplace areas, including canteens, cafeterias, dormitories, nurseries, breastfeeding rooms, changing rooms, showers, and toilets. Workplace physicians also provide employees with advice on their dietary needs and the availability of suitable drinking water. Additionally, they investigate the root causes of workplace accidents and occupational diseases, offering recommendations to employers to prevent their recurrence. When events arise with the potential to damage equipment or the workplace, workplace physicians investigate these circumstances and provide written suggestions and notifications to the employer regarding the necessary occupational health and safety measures [15].

Furthermore, as prescribed by the law, workplace physicians have specific duties related to risk assessment. These obligations encompass active participation in risk assessment studies and practices in the realm of occupational health and safety. They play a key role in advising employers on the implementation of health and safety measures following risk assessments. Additionally, they are tasked with monitoring and providing protection for groups requiring specialized policies, which includes pregnant or breastfeeding women, individuals under 18 years of age, those diagnosed with occupational diseases or at risk, employees with chronic medical conditions, the elderly, people with disabilities, and those affected by alcohol, drug, or substance addiction. This also extends to individuals who have experienced more than one occupational accident [15].

In accordance with the law, workplace physicians bear responsibilities pertaining to health surveillance. These obligations encompass several aspects, including notifying employees about employment and periodic health check-ups, securing their consent for these assessments, and administering the periodic health examinations. Workplace physicians are also responsible for monitoring the health status of employees, particularly those working night shifts. They must rigorously evaluate the outcomes of employment and periodic health examinations, and any other necessary tests to ascertain whether employees are fit for their designated roles. This includes the preparation of comprehensive reports after conducting essential health assessments for the placement of employees who require special considerations. These special cases may involve employees diagnosed with occupational diseases, those with chronic health conditions, individuals battling substance abuse, and those who have encountered multiple work-related accidents.

Additionally, workplace physicians are tasked with conducting repeat health assessments for other employees in the workplace environment when an individual is diagnosed or pre-diagnosed with an occupational disease. They are required to investigate potential links between employee absenteeism due to health issues and workplace-related health hazards. Whenever deemed necessary, workplace physicians must design and propose measures concerning the work environment. They are also responsible for obtaining approval from the employer and subsequently evaluating the results to ensure the well-being of the employees. Moreover, they are in charge of overseeing return-to-work examinations, providing necessary hygiene training to manage the spread of communicable diseases, and conducting preventive and immunization initiatives. Further duties encompass maintaining detailed records related to workplace surveillance and collaborating with occupational safety specialists to assess occupational accidents and diseases.

Workplace physicians are also responsible for creating action plans to prevent the recurrence of hazardous incidents and formulating an annual work plan that aligns with their responsibilities and is subject to approval by the employer. To ensure compliance with the regulation concerning the roles, authorities, responsibilities, and training of workplace physicians and other health personnel, they prepare annual evaluation reports. Additionally, they are responsible for verifying the expiration of medical reports indicating the suitability of temporarily assigned employees and subcontractor employees for their respective roles. Workplace physicians must conduct periodic examinations within specific intervals, depending on the job category. These intervals consist of assessments every five years for positions classified as less dangerous, every three years for roles in the dangerous category, and annual examinations for jobs considered very dangerous. For employees in special categories such as children, young individuals, and pregnant workers, workplace physicians are required to perform these examinations six times a year. Nevertheless, these timeframes may be adjusted to shorter periods should workplace physicians deem it necessary [15].

In line with the law, workplace physicians are entrusted with specific responsibilities concerning education, information, and reporting. These obligations encompass various facets, including the formulation of plans for occupational health and safety training in adherence to pertinent legislation. These plans are presented for approval by the employer. Workplace physicians are further tasked with implementing or overseeing these training programs. They are also responsible for coordinating the provision of first aid and emergency response services within the workplace, along with imparting requisite training to personnel, as dictated by the legislation. Workplace physicians play an essential role in providing education to managers, members of the occupational health and safety committee, and employees. This education encompasses a broad spectrum, encompassing general health, occupational health and safety, hygiene, the hazards associated with the use of addictive substances, personal protective equipment, and collective protection methods. It is vital that this training remains consistent and uninterrupted.

Moreover, workplace physicians are required to inform employees about the risks prevailing within the workplace, health surveillance, employment procedures, and periodic examinations. Collaboration with occupational safety specialists is essential, and they jointly prepare an annual evaluation report, which includes the recording of results from occupational health and safety studies and health surveillance, all in accordance with the legal framework. To uphold these obligations, workplace physicians must also communicate with the General Directorate regarding matters concerning occupational health and safety, as specified by the Ministry. This communication is facilitated through the occupational health and safety clerk system [15].

According to the law, workplace physicians are mandated to engage in cooperative efforts with pertinent entities. These obligations encompass several crucial facets, which include the assessment of measurement outcomes, coupled with recommendations for conducting necessary measurements within the scope of workplace environment surveillance. This cooperation is executed hand in hand with occupational safety specialists. The obligations extend to collaborating with relevant stakeholders to facilitate the delivery of occupational health and safety training within the workplace. Workplace physicians also actively participate in the evaluation of analyses, practices, as well as advancements in technology and equipment aimed at averting work-related accidents and occupational diseases. They play a pivotal role in contributing to the development of programs intended to enhance existing practices. Collaboration with hospitals authorized to issue Health Board reports regarding occupational diseases, as outlined by pertinent regulations, is another important duty. Moreover, workplace physicians engage in the rehabilitation of workers who have experienced work-related accidents or have been diagnosed with occupational diseases. This process necessitates close cooperation with relevant units. Active participation in studies related to the field of occupational health and safety is part of their duties. Furthermore, they provide invaluable assistance to occupational safety specialists in crafting occupational health and safety instructions, along with work permit

procedures, whenever the need arises. These professionals are actively involved in preparing the annual work plan, encompassing activities related to occupational health and safety for the following year, alongside the occupational safety specialist. In this collaborative environment, they also offer support to employee representatives and support staff within the workplace [15].

Obligations of Employees According to the Occupational Health and Safety Law No. 6331

In accordance with Occupational Health and Safety Law No. 6331, employees bear specific responsibilities. These duties encompass refraining from actions that may jeopardize the well-being and safety of their fellow colleagues. Additionally, employees are expected to operate machinery, devices, tools, equipment, hazardous materials, transport apparatus, and other production instruments in strict adherence to established guidelines. Moreover, they should correctly utilize safety equipment and personal protective gear, ensuring their own safety as well as that of others. If employees encounter any health or safety risks within the workplace or identify shortcomings in protective measures, it is their obligation to promptly notify either the employer or the employee representative. Following such reports, employees are also required to collaborate with the employer and the employee representative to rectify any deficiencies and violations of the legislation discovered during inspections. Cooperation with the employer and employee representative is a key aspect of the employees' responsibilities, especially when it comes to upholding occupational health and safety within the scope of their duties [10].

Other Points in the Occupational Health and Safety Law No. 6331

This section summarizes risk assessment, workplace emergency, occupational health and safety training, employee representatives and personal protective equipment within the scope of the Occupational Health and Safety Law No. 6331.

Risk Assessment

As mandated by the Law No. 6331, the process of risk assessment should undergo regular updates based on the level of workplace risk. Specifically, workplaces categorized as very dangerous, dangerous, and less dangerous necessitate renewal at intervals of no longer than two, four, and six years, respectively. Furthermore, the risk assessment must also undergo partial or complete revision under the following circumstances: when there is a relocation of the workplace or structural modifications within the premises; modifications in the technological infrastructure, materials, or equipment used; alterations in the production procedures; instances of occupational accidents, occupational diseases, or near-miss incidents; legislative changes pertaining to environmental safety thresholds; results of workplace measurements and health surveillance indicating a need for revision; and the emergence of new hazards external to the workplace but with the potential to impact the workplace [13].

Emergency Response and Evacuation methods according to the regulation on Emergencies at Workplaces

While establishing emergency response and evacuation methods, the provisions of the Regulation on Fire Protection of Buildings, which was put into effect with the Council of Ministers Decision dated 27.11.2007 and numbered 2007/12937, are taken into consideration. The employer creates the emergency teams in the workplaces and classifies them as Fire team, Rescue team, Protection team, and First aid team. The employer assigns support personnel to each of the teams according to the hazard class of the workplace. At least one specially equipped and trained employee is assigned for up to every 30 employees in workplaces in the very hazardous class, for up to every 40 employees in the workplaces in the hazardous class, and for up to every 50 employees in the workplaces in the less hazardous class. In workplaces with less than 10 employees, it is sufficient to assign at least one specially trained and appropriately equipped employee as a support staff for all fire, rescue and protection teams [13]. For the first aid teams to be formed, it is obligatory to have one first aider for every 20 employees in less dangerous workplaces, one first aider for every 15 employees in dangerous workplaces, and one first aider for every 10 employees in very dangerous workplaces. Within the scope of the Ministry of National Education training program, teachers to provide first aid training are required to receive 16 hours of first aid training [6].

One of the subjects in Law No. 6331 is the practice process. In order to monitor the implementation steps of the prepared emergency plan regularly and to ensure its applicability, drills are held at the workplaces at specified intervals; they are inspected and reviewed, and necessary corrective and preventive measures are taken. After the drill is carried out, the drill form, which includes the date of the exercise, the deficiencies observed and the arrangements to be made in line with these deficiencies, is filled in. As a result of the drill, emergency plans are reviewed and necessary corrections are made according to the deficiencies, if any, and the experience gained [13].

Another issue regulated in the Occupational Health and Safety Law No. 6331 is the recording and reporting of work accidents and occupational diseases. According to the law, the employer is obliged to keep a record of all work accidents and occupational diseases, to make the necessary examinations and prepare reports about them, and to examine the incidents that occur in the

workplace and cause damage to the workplace or work equipment, but not cause injury or death, and to prepare the relevant reports. In addition, the employer has to report occupational accidents within three working days after the accident, and within 15 working days from the date of learning about occupational diseases notified to him by the health service providers or workplace physician. Then, the workplace physician or health service providers refer the cases they have pre-diagnosed with occupational diseases to the health service providers authorized by the Social Security Institution [10].

Another important point in the Occupational Health and Safety Law No. 6331 is occupational health and safety training. The employer should ensure that employees receive on-the-job training before starting to work. These trainings can be given by the employer or by knowledgeable and experienced employees assigned by the employer. On-the-job training should be based on practice and ensure the protection of the employee against dangers and risks. The training to be given before starting work is organized for at least two hours for each employee. The periods spent in these trainings are not counted as the basic training periods. Trainings on risks that may arise due to changes in workplace or job, change of work equipment, and application of new technology are also given. Additional training and refresher training are given to those who return to work after a work accident or occupational disease, who are out of work for more than six months for any reason, at least once a year in workplaces in a very dangerous class, at least once in two years in workplaces in a dangerous class, and at least once in three years in workplaces in a low hazard class. The employer is responsible for checking the documents showing that the employee has completed basic training at the previous workplace [11].

Occupational Health and Safety Training Periods

Employees are required to undergo fundamental training sessions scheduled at regular intervals, which consist of a minimum of eight hours for workplaces with lower levels of risk, a minimum of twelve hours for workplaces classified as dangerous, and a minimum of sixteen hours for workplaces categorized as very dangerous [11].

Employee Representatives at Workplaces

According to the Occupational Health and Safety Law No. 6331, taking into account the risks in different parts of the workplace, there must be one employee representative in the workplaces with 2 to 50 employees, 2 representatives in the workplaces with 51 to 100 employees, 3 representatives in the workplaces with 101 to 500 employees, 4 representatives in the workplaces with 501 to 1000 employees, 5 representatives in the workplaces with 1001 to 2000 employees, and 6 representatives in the workplaces with 2001 and over employees [10].

The employee representative is elected among the employees in case there is no authorized union in the workplace. In the event that the employee representative is determined by election, s/he must be announced at the workplace by the employer. Employer may appoint a representative in cases where election cannot be made [4,10].

Employee representative is authorized to participate in the work related to occupational health and safety; to monitor the work; to request measures to eliminate the source of danger or to reduce the risk arising from the danger; to make proposals; and to represent employees. As they carry out their duties, the rights of employee representatives and support staff cannot be restricted. Some opportunities are provided by the employer for them to fulfill their duties. The employee representative is obliged to keep confidential the professional secrets and the private information of employees [4,10].

Personal Protective Equipment

All personal protective equipment should be suitable for preventing the related risk without posing any additional risks and for the conditions in the workplace, the ergonomic requirements and health status of the user. Personal protective equipment is utilized for the purpose of offering collective safeguards in circumstances where technical measures, work arrangements, and work practices are insufficient to prevent or curtail risks. It serves as a means to avert work-related accidents or occupational diseases, safeguard workers from health and safety hazards, and enhance overall health and safety conditions. Employers prioritize implementing collective safety measures before resorting to personal protective measures [16].

Findings

This section presents the answers given by 10 selected occupational safety specialists to the questionnaire items prepared in accordance with the Occupational Health and Safety Law No. 6331.

The opinions of occupational health and safety specialists regarding the employer's obligations are presented in SF 1 (SF: Supplementary File).

As seen in SF 1, nine occupational safety specialists stated that employers do not reflect the costs of occupational health and safety measures to their employees. This finding clearly demonstrates that employers fulfill their obligation not to pass on the costs related to occupational health and safety to employees.

According to SF 1, 3 out of 10 occupational safety specialists stated that employers do not have sufficient knowledge about occupational health and safety, and they think that this task must be

performed by occupational safety specialists. This finding indicates that employers do not fulfill their obligations when they believe that occupational safety specialists should assume the responsibility of occupational health and safety. Frequencies in the other responses for not fulfilling the obligations of employers are only 1. These small frequency values show that occupational safety specialists think that employers fulfill their obligations to a great extent. However, according to SF 1, employers fulfill their obligations only in matters for which they can be penalized, and the occupational safety specialist is responsible for occupational health and safety.

One of the important obligations in the field of occupational health and safety is risk assessment. The frequency distributions related to the obligations of occupational safety specialists to make a risk assessment are presented in SF 2 and SF 3 in detail.

As seen in SF 2, all the occupational safety specialists stated that risk assessment is made in the workplaces they serve. This finding can be interpreted as the general fulfillment of the duty of risk assessment in workplaces. However, a more important issue is how the risk assessment is made or whether risk assessment is made according to the Law No. 6331. In this context, according to SF 2, 6 out of 10 occupational safety specialists stated that employers have no knowledge of occupational health and safety, and 3 of them stated that employers only sign the relevant report without looking at the risk assessment. Occupational safety specialists further stated that employers see risk assessment only as the job of occupational safety specialists and they can only participate in risk assessment when there is a significant risk. These findings show that employers are generally not knowledgeable in risk assessment and see this job only as a paper work. This is a negative result in terms of the employer's risk assessment obligation. While the risk assessment should be done together with the risk assessment team according to the law, 7 out of 10 occupational safety specialists stated that the risk assessment was carried out directly by the occupational safety specialists (SF 2). Only one occupational safety specialist stated that the risk assessment is done by the risk assessment team. These findings revealed that risk assessment is not carried out by the risk assessment team as stated in the law, and it can be said that the occupational safety specialist and the risk assessment team do not fulfill the risk assessment task in accordance with the law.

According to the law, when a serious health or safety problem is encountered, the situation of the employees should be conveyed directly to the employer. However, according to SF 2, approximately 8 out of 10 occupational safety specialists stated that the situation was not communicated directly to the employer. This finding is important in terms of showing that employees do not have sufficient level of knowledge and awareness on this subject. According to the law regarding the liabilities of the employees, employees should use the production tools and machines in the workplaces in accordance with the rules and instructions. However, as seen in SF 2, 9 out of 10 occupational safety specialists stated that employees do not use production tools such as machinery and equipment in their workplaces in accordance with the rules. This suggests that serious loss of property and life may occur. According to the law numbered 6331, an important obligation of employees is not removing the protective equipment from the production tools. As seen in SF 2, all 10 occupational safety specialists stated that employees remove protective equipment from production equipment while they are working. Employees state that they remove protective equipment from machinery and equipment as the safety equipment prevents their work, which shows that employees can act unconsciously and thoughtlessly in protecting the health and safety of themselves and others around them. This also reveals that there is not enough control over employees.

When asked what information should be collected while identifying hazards at the risk assessment stage of the Law No. 6331, only 2 out of 10 occupational safety specialists gave partially correct answers (SF 3). These partially correct answers include observing the process of the workplace, controlling the product entry and exit, getting the list of the machines used in the workplace, looking at the input and output of the chemicals, examining the storage areas, and checking all the tools and equipment. However, as seen in SF 3, 5 out of 10 occupational safety specialists stated that they collect information in a way that does not comply with the law. The information collected by occupational safety specialists are observing the events that the employees consider dangerous, visiting the field, checking the machines, checking the emergency exit doors, receiving information from the employee representative, getting information about the previous occupational accidents, paying attention to the main sources of the hazards, collecting information about electricity and fire, and trying to understand the dangers that may come from neighboring businesses.

Although there are activities performed to reduce occupational health and safety hazards, they can be considered partially correct and they do not fully cover the activities required by the Occupational Health and Safety Law No. 6331 and the Occupational Health and Safety Risk Assessment Regulation. In addition, one occupational safety specialist stated that the risk assessment is made on paper by copying and pasting the previous risk assessment report from the computer or by updating the previous risk

analysis to a certain extent. These findings reveal that the occupational safety specialists did not or could not make the risk assessment in accordance with the Law No. 6331 and that some risk analyses were made only on paper. Occupational safety specialists and perhaps their stakeholders also stated that they do not collect information in accordance with the law on risk assessment. For the majority of the occupational safety specialists (8/10), occupational health and safety measures are not taken in case of a negativity about risk assessment and according to the results of the risk assessment. This finding makes us think that risk assessment is done on paper and the employer and the occupational safety specialist do not fulfill their responsibilities in this regard to a large extent.

SF 3 shows that according to 10 occupational safety specialists, risk assessment is renewed when required in the workplaces they serve, which is a positive result in terms of the application of Law No. 6331. It is also noteworthy that the job of the occupational safety specialist or the employer to fully perform the task of renewing the risk assessment is also a legal obligation that the state controls, and probably this task is done on paper.

The frequency distributions of the occupational safety specialists' opinions on the questions regarding the knowledge and responsibilities of occupational safety specialists are given in SF 4.

As seen in SF 4, 5 out of 10 occupational safety specialists have the misconception that their main duty is identification and recommendation, which does not comply with the law numbered 6331. This finding shows that nearly half of the occupational safety specialists have a significant lack of knowledge, as they think that their main duty is only identification and recommendation. Although not included in the Occupational Health and Safety Law No. 6331, occupational safety specialists also believe that they have responsibilities such as preventing work accidents in the workplace, ensuring that employees work in a comfortable working environment, and improving themselves. These findings show that the majority of occupational safety specialists (7/10) do not exactly know about their duties, authorities, and responsibilities specified in the law. Only 2 occupational safety specialists in the study stated that they are aware of their duties specified in the law, such as providing consultancy and guidance against any danger, making risk analysis, keeping records in the certified report, and informing the employer in case of emergency. These findings show that the vast majority of occupational safety specialists do not fully know their main duties, which is a remarkable negative result.

As seen in SF 4, 4 out of 10 occupational safety specialists stated that they investigated the causes of the accident by conducting root-cause analysis in accordance with the law numbered 6331, and informed the employer by writing the results in the certified report. In addition, it has been stated that the negative situations are not only caused by the occupational safety specialists themselves, but also by the indifference of the employer. These findings are important in terms of showing that occupational safety specialists do not fulfill their duties of informing the employer about accidents and occupational diseases sufficiently.

SF 4 shows that 6 out of 10 occupational safety specialists make recommendations to the employer in accordance with the law. This finding can be considered as a positive result in that more than half of the occupational safety specialists fulfill their duty of making recommendations to the employer regarding the incidents that have the potential to harm the employees.

When SF 4 is examined, it is understood that all of the 10 occupational safety specialists work on a training plan in accordance with the law, and 8 of them are in cooperation with the employee representatives and support staff. This finding is a positive one in terms of showing that occupational safety specialists fulfill their duties of training and cooperating with employee representatives and support staff to a large extent.

The frequency distribution of the opinions of the occupational safety specialists regarding the duties and responsibilities of the workplace physician is given in SF 5.

SF 5 shows that according to all the occupational safety specialists, workplace physicians do not fulfill any of their duties in the law. Nine occupational safety specialists stated that the duties of occupational physicians are the same as the duties of the occupational safety specialists in the law, and they also made a clear criticism that occupational physicians do not fulfill almost any of their duties.

Another important finding in SF 5 is that according to 8 occupational safety specialists, workplace physicians do not fulfill the duty of informing the employer by investigating the causes of occupational accidents and diseases, and 9 specialists stated that workplace physicians do not fulfill their duty of making suggestions to the employer regarding the events that do not cause loss of life and property in the workplace, but have the potential to harm the workplace and the employees. 9 participants clearly stated that workplace physicians do not fulfill their duty of planning training, and 8 participants said that physicians do not fulfill their duty of cooperation with employee representatives and support staff. In addition, all the occupational safety specialists in the study reported that workplace physicians perform health surveillance and periodic tests. These findings indicate that according to occupational safety specialists, workplace physicians do not

fulfill almost any of their duties other than health surveillance of employees. One of the important findings is while the main task of the workplace physician is to diagnose the occupational diseases of the employees, almost all of the occupational safety specialists (9/10) stated that workplace physicians do not fulfill this main duty.

The frequency distribution of the occupational safety specialists' opinions on the questions related to the employee representative are given in SF 6.

As seen in SF 6, all the occupational safety specialists stated that there is an employee representative in the workplaces they serve. Thus, it is seen that the obligation to have an employee representative in the workplaces according to the law numbered 6331 is fully met. However, 7 occupational safety specialists stated that the employee representatives were appointed by the employer. In other words, there was no election process. Other negative findings are that the majority of occupational safety specialists do not report the dangers and risks in the workplace to the employer on behalf of the employees, and the employee representatives do not participate in occupational health and safety studies. These findings indicate that employers only fulfill the legal obligation of assigning an employee representative on paper, and employee representatives do not fulfill their duties to a large extent.

The frequency distribution of the opinions of the occupational safety specialists regarding the questions on health and safety indicators is given in SF 7.

SF 7 shows that according to all 10 occupational safety specialists, health and safety indicators are used in the workplaces they serve and employees are trained on health and safety indicators. These findings indicate that health and safety indicators are used in workplaces and relevant trainings are given.

The frequency distribution of the opinions of occupational safety specialists on questions regarding occupational accidents and diseases is given in SF 8.

As seen in SF 8, all 10 occupational safety specialists stated that occupational accidents and occupational diseases occurring in their workplaces are recorded. This finding shows that the duty of recording work accidents and occupational diseases in the workplaces is fulfilled.

The frequency distributions of the opinions of occupational safety specialists on questions about personal protective equipment are given in SF 9 and SF 10.

As seen in SF 9, only 2 occupational safety specialists reported that personal protective equipment is used in their workplace. This finding shows that there are problems in the use of personal protective equipment in the workplace. The occupational safety specialists stated that they struggle about the use of personal protective equipment as many employees do not want to use personal protective equipment, and occupational safety specialists keep the necessary minutes and ensure that administrative penalties are applied. Employees have problems in using personal protective equipment. Some employees use it, while some do not. Although occupational safety specialists recommend purchasing personal protective equipment, they stated that some employers do not buy the equipment as they consider purchasing personal protective equipment as an extra financial burden. Nine occupational safety specialists stated that their personal protective equipment was purchased by the employer and stated that there was no violation of the law in this regard.

As seen in SF 9, 3 occupational safety specialists stated that there is a CE mark on personal protective equipment. The findings in SF 9 suggest that the rate of use of personal protective equipment may be approximately 50%. It can be said that some employers do not prefer CE-marked products due to the high cost. Moreover, 8 occupational safety specialists stated that the personal protective equipment is not stored in healthy conditions and employees do not pay attention to this issue.

According to the Occupational Health and Safety Law No. 6331, it is necessary to take both collective protection measures and personal protective measures in the workplaces. As seen in SF 10, 9 out of 10 occupational safety specialists stated that employers avoid collective protection measures and take personal protection measures because of the high cost.

As seen in SF 10, 9 out of 10 occupational safety specialists stated that when personal protective equipment is broken, it is not immediately replaced with a new one. This finding is a result that is against the law numbered 6331. 6 out of 10 occupational safety specialists stated that employers are not notified by employees to replace the broken personal equipment with a new one. These two findings are compatible with each other. In general, the rate of timely notification of defective personal protective equipment to the employer is low, and defective personal equipment is not immediately replaced by the employer, even if timely notification is made.

In addition, all the occupational safety specialists in the study stated that employees endanger the health and safety of themselves or other employees. It is understood that they can endanger themselves and other employees with unconscious behaviors such as jokes among employees or smoking in dangerous areas.

The frequency distributions of the occupational safety specialists' opinions on questions about

occupational health and safety training are given in SF 9 and SF 10.

SF 10 shows that according to all the occupational safety specialists in the study, employees are given occupational health and safety training and these trainings are given in all the subjects specified in the law. This finding is important in terms of showing that occupational safety specialists fulfill their duties in the occupational health and safety trainings. However, 6 occupational safety specialists stated that they gave fewer trainings than specified in the legislation. This negative situation seems to stem from the fact that according to the occupational safety specialists, employers do not prefer to allocate the working hours of their employees for training.

Conclusion and Recommendations

Although the Occupational Health and Safety Law No. 6331 has some deficiencies, it is an important law that includes duties and responsibilities for reducing work accidents and occupational diseases.

In this study, we conducted an in-depth interview with occupational safety specialists and revealed their opinions on whether employers, occupational safety specialists, workplace physicians, employees and workplace representatives carry out activities in accordance with the occupational health and safety legislation numbered 6331 or not.

Employers are seen as the main responsible for the implementation of the Occupational Health and Safety Law No. 6331, and they have many duties and responsibilities. According to the opinions of occupational safety specialists included in our research, the duties and responsibilities of employers in the occupational health and safety legislation, which they fulfill largely or completely: Not passing on occupational health and safety costs to employees, fulfilling their general obligations, having an employee representative or representatives in the workplaces, To ensure the use of health and safety signs in workplaces, to provide training to employees regarding the use of health and safety signs, to take personal protective measures, to ensure the renewal of risk assessment, to ensure that occupational accidents and occupational diseases occurring in the workplace are recorded and to ensure that personal protective equipment is provided to employees, are listed as. According to the occupational safety specialists, employers cover the expenses arising from occupational health and safety. Other duties performed by employers are those that require signatures, that are carried out on paper, and that can be controlled through periodic audits. Thus, it can be said that employers largely or completely fulfill their duties and responsibilities that should be done on paper. It can also be stated that employers do not want to waste time on occupational health and safety as they see it as a chore.

According to the occupational safety specialists, there are many tasks that employers largely do not fulfill or never fulfill. According to occupational safety specialists, the duties that employers do not fulfill to a large extent or at all are: To have knowledge in risk assessment, to ensure that employees use protective equipment, to take occupational health and safety measures in the workplace according to the risk assessment results, to appoint employee representatives by election, to involve employee representatives in occupational health and safety activities. ensuring their participation, taking collective protection measures, ensuring that personal protective equipment is replaced immediately when it is damaged, purchasing personal protective equipment with the CE marking, and ensuring that employees' occupational health and safety training is provided in accordance with the legislation.

It is noteworthy that the tasks that employers do not fulfill are those that require practice and money. For example, occupational safety specialists explain the reason why employers do not have knowledge in risk assessment. Since the employer gives the salary of the occupational safety specialist, they believe that risk assessment must be done by occupational safety specialists. In fact, the reason why employers do not perform some of the duties we listed above that require control and activity is that they think that these duties should be done by the occupational safety specialists whose salary they give. At this point, the Occupational Health and Safety Law No. 6331 can be criticized. In order for employers to fulfill their duties to a large extent or completely, the law should be amended and the salaries of occupational safety specialists should be paid by the state. In this way, occupational safety specialists will not depend on employers, and employers will fulfill their duties and responsibilities. They will also be able to punish employers without hesitation when there is a situation contrary to the legislation in the workplace.

According to occupational safety specialists, the other and perhaps the most important reason why employers do not fulfill some of their duties specified in the legislation is the cost burden imposed on the employer by occupational health and safety measures. For example, while employers take personal protective measures to a large extent, they refrain from taking collective protective measures. This is because collective protective measures are much more costly than personal protective measures. Thus, it is seen that employers do not perform the duties that bring additional costs to the employer, such as replacing defective personal protective equipment immediately and purchasing personal protective equipment with CE mark. In fact, some employers

care so much about money that they may consider even the training on occupational health and safety during working hours as a loss. Thus, occupational safety specialists are obliged to give occupational health and safety trainings in shorter periods. While it is correct to suggest that occupational safety specialists should receive their salaries from the state, it would not be fair to say that the state should cover the employer's occupational health and safety costs because these costs faced by the employer are actually a part of production costs as a requirement of the work done. In some cases, employers can be overwhelmed by high health and safety costs. However, in many cases, it can also be said that employers' attempt to avoid occupational health and safety costs is due to their ambition to make more profits.

Based on our research and the input from occupational safety specialists, the responsibilities and obligations outlined in the occupational health and safety legislation are largely and effectively fulfilled: to carry out studies to ensure that employees use personal protective equipment, to carry out risk assessment, to renew the risk assessment. These further include planning training for employees, cooperating with employee representatives and support staff, making recommendations to the employer regarding events that have the potential to harm employees, training employees on health and safety signs, and providing occupational health and safety training to employees. It can be stated that these duties performed by occupational safety specialists are generally for the protection of employees and especially for the occupational health and safety training of employees. Occupational safety specialists also stated that they train employees to use personal protective equipment, try to persuade them and force them when necessary. Occupational safety specialists ensure that many employees who do not want to use personal protective equipment are subject to administrative fines by keeping minutes.

Another important finding is that occupational safety specialists urge employers to purchase quality personal protective equipment. It can be said that they fulfill the duties of protecting and training employees and they struggle with employees and the employer while performing these duties. One of the tasks performed by occupational safety specialists is risk assessment. However, this duty cannot be fulfilled in full accordance with the Law No. 6331 because it should actually be done by the risk assessment team according to the law; however, occupational safety specialists have to do this task themselves to a large extent. The risk assessment team and the employer usually get things done with just one signature on paper. This is because the only person who gets paid for risk assessment is the occupational safety specialist, and other stakeholders see risk assessment as a waste of time. Thus, considering that there are some practical deficiencies in the risk assessment process in the Law No. 6331, it may be suggested to make some changes in the law.

According to the occupational safety specialists, the tasks that are largely not fulfilled, not fulfilled at all, or cannot be fulfilled are collecting information in risk analysis as specified in the Law No. 6331, knowing what the main duties of the occupational safety specialists in the law are, and giving occupational health and safety trainings to employees within the periods specified in the law. The findings revealed that although occupational safety specialists engage in activities and practices that may be beneficial, these activities may not be in accordance with the activities specified in the law. At this point, if the risk analysis information collection process articles in the law are not applicable in the field, it may be suggested that these articles be amended by lawmakers. However, if the reason why the occupational safety specialists carry out the risk analysis information collection process with applications different from the law is lack of knowledge, it may be recommended to train occupational safety specialists on the risk analysis information collection process. As stated earlier, occupational safety specialists carry out training activities for employees effectively and in accordance with Law No. 6331. However, they clearly state that the duration of the training they give to the employees is less than the periods specified in the law. This is because employers see trainings as a waste of time or employees are not open to education. Thus, it can be suggested that trainings and activities that will enable employers to transform the capitalist way of thinking on occupational health and safety into a social way of thinking should be performed, and consultancy and training activities should be carried out to ensure that employees give more importance to in-service training. According to the occupational safety specialists in the study, an important obligation that occupational safety specialists cannot fulfill is they lack knowledge about their main duties and duties in the law. Thus, it can further be suggested to eliminate these deficiencies by systematically subjecting occupational safety specialists to in-service training.

According to the participants, workplace physicians fulfill only two duties in accordance with the law. These are health surveillance and periodic tests of employees and recording of occupational accidents and occupational diseases. One of the most important findings in this study is that although occupational safety specialists have the same duties as workplace physicians as specified in the law, the occupational safety specialists in the study clearly stated that all of the duties other than supervising the employees and recording work accidents and occupational diseases are performed by occupational safety specialists. Perhaps, one

of the biggest shortcomings of the Occupational Health and Safety Law No. 6331 is the incorrect job descriptions that may go beyond the fields of expertise, such as assigning each task to both the employer, the occupational safety specialist, and the workplace physician. For this reason, it may be recommended to amend the law by redefining the duties of employers, occupational safety specialists and workplace physicians considering their fields.

According to the occupational safety specialists, employees do not fulfill any of their duties within the scope of the law to a large extent or completely. The duties that are largely not fulfilled, not fulfilled at all, or cannot be fulfilled by the employees are notifying the employer directly of a serious problem in terms of occupational health and safety, using production tools in accordance with the rules, using protective equipment in production tools, using personal protective equipment, storing the protective equipment in healthy conditions, and not endangering the health and safety of themselves or others. In fact, the above-mentioned duties are those that employees must fulfill in general according to the Law No. 6331. Two of these duties are not fulfilled at all and the other three are mostly unfulfilled.

The findings revealed that employees use the means of production in their own way, independent of the rules, do not want to use personal protective equipment even at the expense of an administrative fine, find it unnecessary to use the protective equipment of production tools, and smoke in dangerous areas believing that nothing will happen. In fact, the phrase "nothing will happen to me" is a frequently used phrase among workers, and it can be said that employees are indifferent to and unconscious about possible dangers. Considering that the greatest enemy of a society is ignorance, it is impossible in the short term to ensure that employees will eliminate these behaviors that may put their own life and the lives of others at risk. Such problems require educational activities on occupational health and safety since childhood and social and cultural behavior changes. It is clear that for many years, occupational safety specialists and other stakeholders will have to struggle to raise awareness of employees about occupational health and safety.

There are many reasons for the increase in work accidents and occupational diseases in Turkey, and in this study, the problems were revealed in detail by using in-depth interview data collection and qualitative research method on a study sample consisting of occupational safety specialists in Çorum. Future studies can discuss in more detail whether the occupational health and safety practices are carried out correctly and appropriately according to employers, workplace physicians, and employees. By discussing the shortcomings of all stakeholders, including the government, occupational accidents and occupational diseases can be reduced and healthier and safer work sectors can be created.

REFERENCES

Alli, B. O. 2008 Fundamental principles of occupational health and safety / Benjamin O. Alli; International Labour Office – Geneva: ILO, 17-18

Başbuğ, A. (2005) Labor Law, Ankara: Birlik Printing House .140-147

Bahçeci. F Qualitative Research Methods in Education Youtube Lecture Video 'https://www.youtube.com/watch?v=xXHJK93tOec '

Communiqué on the Qualifications and Election Procedures and Principles of Employee Representatives Related to Occupational Health and Safety Official Gazette 'https://www.resmigazete.gov.tr/eskiler/2013/08/20130829-5.htm'

Demirbilek, T. (2004) Occupational Safety Culture, Izmir: Dokuz Eylul University FEAS Publications. 130-139.

First Aid Regulation Official Gazette 'https://www.resmigazete.gov.tr/eskiler/2015/07/20150729-2.htm'

Health and Safety Signs Regulation Official Gazette 'https://www.resmigazete.gov.tr/eskiler/2013/09/20130911-6.htm'

Keçeci S. Theses Written in the Field of Occupational Health and Safety in the National Thesis Center

Bibliometric Analysis 52 ' https://dergipark.org.tr/tr/download/article-file/1322822'

Occupational Health and Safety Risk Assessment Regulation Official Gazette 'https://www.resmigazete.gov.tr/eskiler/2012/12/20121229-13.htm'

Occupational Health and Safety Law Official Gazette 'https://www.resmigazete.gov.tr/eskiler/2012/06/20120630-1.htm'

Regulation on the Procedures and Principles of Occupational Health and Safety Training of Employees Official Gazette 'https://www.resmigazete.gov.tr/eskiler/2013/05/20130515-1.htm'

Özdemir F. Ve Serin H. A Research on Occupational Accident and Occupational Disease Statistics by Employees and Sectors 'https://dergipark.org.tr/tr/pub/turkjforsci/issue/69737/1086595'

Regulation on Emergencies at Workplaces Official Gazette 'https://www.resmigazete.gov.tr/eskiler/2013/06/20130618-8.htm'

Regulation on Duties, Authorities, Responsibilities and Trainings of Occupational Safety Specialists 'https://www.mevzuat.gov.tr/File/GeneratePdf?mevzuatNo=16923&mevzuatTur=KurumVeKurulusYonetmeligi&mevzuatTertip=5'

Regulation on Duties, Authorities, Responsibilities and Trainings of Workplace Physicians and Other Health Personnel Official Gazette 'https://www.resmigazete.gov.tr/eskiler/2013/07/20130720-10.htm'

Regulation on the Use of Personal Protective Equipment in Workplaces Official Gazette 'https://www.resmigazete.gov.tr/eskiler/2013/07/20130702-2.htm'

Ronald J Burke, Sharon Clarke, Cary L Cooper Occupational health and safety Gower Publishing, Ltd., 2011

Seggie, F.N., & Bayyurt, Y. (2017). Qualitative Research Methods, Techniques, Analysis and Approaches Anı Publishing, Ankara 192-209

Social Security Institution Statistics Departments 'https://www.sgk.gov.tr/Istatistik/Yillik/fcd5e-59b-6af9-4d90-a451-ee7500eb1cb4/'

Shari L. Dworkin Sample Size Policy for Qualitative Studies Using In-Depth Interviews 'https://link.springer.com/article/10.1007/s10508-012-0016-6'

Şentürk Kara, E. (2021). A to Z Interview Data Collection Method in Qualitative Research Theory-Practice 67-75

Tekin B. Work accidents and occupational diseases within the framework of Social Security Institution Statistics www.mmo.org.tr 'https://www.mmo.org.tr/sites/default/files/010_5.pdf'

Tutar, H. ve Erdem, A. T. (2020). Scientific research methods and spss applications with examples (1stedition). Ankara: Seçkin Publishing 149-159, 268-270

SUPPLEMENTARY FILES

Supplementary File 1. Frequency Distribution of Occupational Safety Specialists' Views on the Obligations of the Employer (n=10)

QUESTION	RESPONSE	F
1. Taking occupational health and safety measures definitely brings a certain cost. Does the employer reflect these costs to the employees? (Occupational Health and Safety Law No. 6331, Article 4)	No, he does not.	9
	I don't know.	1
2. What obligations do employers fulfill when ensuring the health and safety of employees? (Occupational Health and Safety Law No. 6331, Article 4)	They fulfill as much as possible the obligations that they think may be punished by laws.	1
	Employers do not have enough knowledge about occupational health and safety. They think that the occupational safety specialist is responsible.	3
	I do not think that employers fulfill their legal obligations.	1
	They provide occupational health and safety services.	1
	Employers ensure that we have health examinations and provide personal protective equipment.	1
	They take general protective measures. First, they take collective protection. They believe that personal protection measures will be reduced in this way.	1
	They usually avoid them by giving employees personal protection.	1
	Recently, they have started to give personal protective equipment more easily.	1

Supplementary File 2. Frequency Distribution of Occupational Safety Specialists' Opinions on Risk Assessment Obligations (n=10)

QUESTION	RESPONSE	F
3. Is a risk assessment carried out in the workplaces you serve? (Occupational Health and Safety Law No. 6331, Article 10)	Yes, it is.	U
4. Do employers have information about risk assessment in the workplaces you serve? (Occupational Health and Safety Law No. 6331, Article 10), (Occupational Health and Safety Risk Assessment Regulation, Article 5)	They do not have enough knowledge. They do not open and look; they just sign the document and leave.	3
	Yes, they are knowledgeable.	4
	Employers expect occupational safety specialists to have knowledge about it.	1
	Most employers do not know about risk analysis. When we say that 'there is a risk here', they tend to show interest.	1
5. Who carries out risk assessment in the workplaces you provide service? (Occupational Health and Safety Risk Assessment Regulation, Article 6)	It is done by an occupational safety specialist.	7
	Corporate companies do it together with the risk assessment team, but in small businesses, the burden is on the occupational safety specialist and the workplace doctor.	2
	We do it together with the risk assessment team.	1
6. Do employees notify the employer when they encounter a serious and imminent danger in terms of health and safety in the machinery, devices, tools, equipment, facilities and buildings in the workplace and when they see a deficiency in the protection measures? (Occupational Health and Safety Law No. 6331, Article 19)	They do not inform.	3
	Employees may shy away from employers. Thus, they tend to tell people such as foremen.	3
	There are those who report and those who do not; there are those who try to handle it on their own. Of course, that is another problem.	3
7. Do employees use machinery, devices, tools, equipment, dangerous goods, transport equipment and other production tools in the workplace in accordance with the rules? (Law No. 6331 on Occupational Health and Safety, Article 19)	No, they do not.	9
	They generally do.	1
8. Do employees remove the protective equipment of the machinery, devices, tools and equipment in the workplace? (Occupational Health and Safety Law No. 6331, Article 19)	They take them off.	10

8.1 When asked for the reason, what do they say?	Since the thickness of the piece does not pass through the protector, workers take it off and do not put it back when it is finished.	1
	It prevents us from working. It is removed during maintenance and repair.	5
9. When identifying hazards during the risk assessment phase, what information should be collected according to its relevance to the working environment, employees and workplace? (Occupational Health and Safety Risk Assessment Regulation, Article 8)	I make observations and question the events that employees deem dangerous.	1
	Occupational safety specialists copy and paste the information previously collected.	1
	I visit the field, check the machines, check the emergency exits, and get information from the employee representative.	1
	We pay attention to occupational accidents that occur.	1
	I pay attention to the main sources of hazards. I inspect electricity wiring.	1
	I pay attention to situations such as fire. I am working on the dangers that may come from the business next door.	1
	I examine the risk analyses on the Internet. If my company is old, I examine the previous risk analysis a little more.	1
	We consider the work process. Where does the product come in? Where does it come out? We get the list of the machines, look at the input and output of the chemicals, examine the storage areas in the field, and as a result, make a risk analysis.	1
	Before starting the risk analysis, we check and list all of the tools and equipment in the workplace, including hand tools; we check the list again in the field; we check whether they are grounded or there are instructions on them.	1
10. Is the risk assessment renewed in the workplaces you serve? (Occupational Health and Safety Risk Assessment Regulation, Article 12)	Yes, it is.	10
11. Under what conditions is the risk assessment renewed in the workplaces you serve? (Occupational Health and Safety Risk Assessment Regulation, Article 12)	It is not easy to renew the assessment.	1
	When there is a change in the business or according to the specified periods in the legislation.	9
12. Are occupational health and safety measures taken in your workplace as a result of risk assessment? (Occupational Health and Safety Risk Assessment Regulation, Article 10)	According to the results of the risk analysis, occupational health and safety measures are not taken.	8
	They are mostly taken. Precautions are taken immediately in case of high level of danger. Some measures are spread over time, some 6 months, some 1 year.	1
	They are taken slowly. There is gradual awareness about it.	1

Supplementary File 3. Frequency Distribution of Occupational Safety Specialists' Opinions on Risk Assessment Obligations (SF 2 continued) (n=10)

QUESTION	RESPONSE	F
13. Is an emergency plan made in the workplaces you serve? (Occupational Health and Safety Law No. 6331, Article 11)	Yes, it is.	10
14. Do the employees and employers in the workplaces you serve know about the emergency situations that may occur in their workplaces? (Regulation on Emergencies at Workplaces Articles 4 and 15)	Information is given in the trainings, but they are not aware of the information included in the emergency plan.	3
	The Emergency Plan remains on paper.	4
	Apart from the employer and employees who are definitely knowledgeable, third parties should also have information.	1
	It would be wrong to say that they know exactly. They started to learn gradually with the trainings.	1
15. Are evacuation and drills held at the workplaces you serve? (Occupational Health and Safety Law No. 6331, Article 11) (Regulation on Emergencies at Workplaces, Article 13)	They are not done. Especially in small businesses, they are not performed.	1
	They are done in big companies, but not in small companies.	2
	Yes, they are done.	6
	They are done with the urge of the occupational safety specialist or when an inspector arrives.	1
16. Are there emergency teams in the workplaces you serve? (Occupational Health and Safety Law No. 6331, Article 11) (Regulation on Emergencies at Workplaces, Article 11)	Yes, there are.	10
16.1 Can you elaborate on emergency teams?	We have Fire, Rescue, First Aid, and Protection teams.	10
17. Is there a first aider in the workplaces you serve? (First aid regulation, Article 19)	Yes, there is.	10

Supplementary File 4. Frequency Distribution of Occupational Safety Specialists' Opinions on Questions Related to the Responsibilities of Occupational Safety Specialists (n=10)

QUESTION	RESPONSE	F
18. What are the duties of occupational safety specialists? (Regulation on Duties, Authorities, Responsibilities and Training of Occupational Safety Specialists, Article 9)	Our main task is to identify and make recommendations.	5
	We need to be an advisor. We should guide you against any danger and risk.	1
	They fulfill only a part of their duties in the legislation. Guidance, counseling, risk analysis etc.	1
	Providing consultancy, risk analysis, board meeting call, writing in the certified report, and informing the employer in case of emergency	1
	It is to prevent work accidents in the workplace and to ensure that employees work in a comfortable working environment.	1
	I think their main duty is to improve themselves first.	1
19. Do occupational safety specialists investigate the causes of work accidents and occupational diseases in the workplace and inform the employer? (Regulation on Duties, Authorities, Responsibilities and Training of Occupational Safety Specialists, Article 9)	Employers do not interfere too much. They assign a person, and when that person goes to the employer, he says we will do it later.	1
	Root cause analysis is carried out. The causes of the accident are investigated and written in the report.	4
	We keep a record and inform the employer.	1
	The reasons behind the accidents emerge through experience.	1
	Our main goal is to minimize work accidents and occupational diseases. Therefore, we ask the employer to take precautions.	1
	The employer does not always deal with it, so I inform the relevant person.	1
20. Do occupational safety specialists make recommendations to the employer regarding incidents that do not cause loss of life and property in the workplace, but have the potential to harm the workplace and employees? (Regulation on Duties, Authorities, Responsibilities and Training of Occupational Safety Specialists, Article 9)	We do not directly describe it as a near miss event, but we report the dangers.	1
	Occupational safety specialists do not conduct research on near misses.	2
	We create near-miss boxes, if any, inform the employees, and write them in the report.	2
	Yes, they do.	4
21. Do occupational safety specialists work on a training plan? (Regulation on Duties, Authorities, Responsibilities and Training of Occupational Safety Specialists, Article 9)	Yes, they do.	10
22. Do occupational safety specialists cooperate with the employee representative and support staff? (Regulation on Duties, Authorities, Responsibilities and Training of Occupational Safety Specialists, Article 9)	Often there is no collaboration because the employee representative and support staff do not assume this responsibility.	5
	It is done in corporate companies, but not so often in small businesses.	1
	Yes, we are in cooperation. When there is a problem, the employee representatives in the companies tell the employer or me.	3
	We did not receive such support from the support staff, but there are also employee representatives who work as coordinators.	1

Supplementary File 5. Frequency Distribution of Occupational Safety Specialists' Opinions on Questions Related to the Workplace Physician (n=10)

QUESTION	RESPONSE	F
23. What are the duties of workplace physicians? (Regulation on Duties, Authorities, Responsibilities and Training of Occupational Physicians and Other Health Personnel, Article 9)	For occupational safety specialists, occupational physicians have the same or similar duties in the legislation, but they do not perform their duties; they only write prescriptions.	9
	In fact, their biggest task is to prevent occupational diseases, just as we minimize work accidents.	1
24. Do workplace physicians investigate the causes of work accidents and occupational diseases in the workplace and inform the employer? (Regulation on Duties, Authorities, Responsibilities and Training of Occupational Physicians and Other Health Personnel, Article 9)	No, they do not.	8
	They investigate the causes in places with occupational diseases.	2
25. Do workplace physicians make recommendations to the employer regarding incidents that do not cause loss of life and property in the workplace, but have the potential to harm the workplace and employees? (Regulation on Duties, Authorities, Responsibilities and Training of Occupational Physicians and Other Health Personnel, Article 9)	No, they do not.	9
	If it is related to an occupational disease, the physician reports it. The occupational safety specialist reports the occupational accident.	1
26. Do workplace physicians make a training plan? (Regulation on Duties, Authorities, Responsibilities and Training of Occupational Physicians and Other Health Personnel, Article 9)	No, they do not.	9
	Of course, they do. Some issues in the regulation are related to the workplace physician.	1

27. Do workplace physicians cooperate with the employee representative and support staff? (Regulation on Duties, Authorities, Responsibilities and Training of Occupational Physicians and Other Health Personnel, Article 9)	No, they do not.	8
	Of course, they do. They especially visit places where occupational diseases may occur.	2
28. Are employees subject to health surveillance? (Regulation on Duties, Authorities, Responsibilities and Training of Occupational Physicians and Other Health Personnel, Article 9)	Yes, they are. They are definitely giving periodic tests.	10

Supplementary File 6. Frequency Distribution of Occupational Safety Specialists' Opinions on Questions Related to the Employee Representative (n=10)

QUESTION	RESPONSE	F
29. Is there an employee representative in the workplaces you serve? (Occupational Health and Safety Law No. 6331, Article 20)	Yes, there is.	10
30. How is the employee representative determined in the workplaces you serve? (Occupational Health and Safety Law No. 6331, Article 20)	The majority of them are determined by election. Sometimes, the employer selects and appoints the employee representative.	3
	Generally, no election is made. The employer appoints someone.	7
31. Does the employee representative report the dangers and risks in the workplace on behalf of the employees? (Occupational Health and Safety Law No. 6331, Article 20)	No, he does not.	8
	They report when possible, and when they do not, I go and ask if there is a problem. Then, they let me know when there is a problem.	1
	Of course, he does.	1
32. Does the employee representative participate in occupational health and safety activities? (Communiqué on Qualifications of Employee Representatives and Election Procedures and Principles Related to Occupational Health and Safety, Article 9)	No, he does not.	7
	They assist the occupational safety specialist.	1
	Yes, they do.	1

Supplementary File 7. Frequency Distribution of Occupational Safety Specialists' Opinions on Questions Regarding Health and Safety Indicators (n=10)

QUESTION	RESPONSE	F
33. Are health and safety indicators used in the workplaces you serve? (Health and Safety Indicators Regulation, Article 5)	Yes, they are.	10
34. Are employees trained on Health and Safety indicators? (Health and Safety Indicators Regulation, Article 6)	This subject is included in the general education and we talk about the indicators there.	10

Supplementary File 8. Frequency Distribution of Occupational Safety Specialists' Opinions on Questions Related to Occupational Accidents and Occupational Diseases (n=10)

QUESTION	RESPONSE	F
35. Are occupational accidents and occupational diseases that occur in the workplace recorded? (Occupational Health and Safety Law No. 6331, Article 14)	Yes, they are recorded.	10

Supplementary File 9. Frequency Distribution of Occupational Safety Specialists' Opinions on Questions Regarding Personal Protective Equipment (n=10)

QUESTION	RESPONSE	F
36. Is personal protective equipment used in the workplaces you serve? (Regulation on the Use of Personal Protective Equipment at Workplaces, Article 7)	It is mostly not used.	1
	Recommendations are made to the employer in the workplaces where there is a need. The employer sometimes buys it and sometimes does not.	1
	The employer sees purchasing personal protective equipment as an extra burden, or some employers buy them, but employees do not use them. It is used in corporate companies.	1
	There are problems about the use of personal protective equipment.	3
	We ensure that it is used as much as possible. There are those who do not use it, and there are those who object to using it. We keep the necessary minutes and impose administrative penalties.	1
	I can say that it is generally used.	1
	There are places where it is used and not used.	1
	We fought over it a lot. At first it was not that much, but now half of the employers started to buy it.	1
37. Who purchases the personal protective equipment? Employers or employees? (Regulation on the Use of Personal Protective Equipment at Workplaces, Article 6)	Employers buy it.	9
	Again, I will give an example from the construction sector. It is very difficult to obtain it in the sector. The job to get a plaster done takes three days. Employers may say that they cannot give shoes and helmets for a three-day job.	1
38. Is there a CE mark on the personal protective equipment used? (Regulation on the Use of Personal Protective Equipment at Workplaces, Article 6)	The employer does not question whether there is a CE mark or not.	2
	It is recommended to have a mark, but employers buy whatever equipment is financially suitable for them.	1
	We definitely state that there must be a CE mark on the personal protective equipment. We want them to pay attention to this when buying the equipment. Although it is proportionally very low, we also see personal protective equipment without CE marking.	3
	Yes, there is.	3
	This again changes from company to company. There is equipment without CE mark.	1

39. Where is the personal protective equipment stored? (Regulation on the Use of Personal Protective Equipment at Workplaces, Article 6)	The equipment is put here and there. Employees do not attach importance to personal protectors.	1
	Some employees put the equipment in their lockers, and some put it here and there.	7
	In the locker rooms, there is a section for clean clothes and a section for work clothes. They put it in the section for work clothes.	2

Supplementary File 10. Frequency Distribution of Occupational Safety Specialists' Opinions on Questions Regarding Personal Protective Equipment (SF 9 continued) (n=10)

QUESTION	RESPONSE	F
40. Are collective protection measures or personal protective measures taken against dangers and risks in your workplace? (Occupational health and safety risk assessment regulation, Article 10) (Occupational Health and Safety Law No. 6331, Article 5)	Collective protection needs to be taken, but employers take personal protection measures because of the cost.	9
	The main thing is collective protection. We cannot say that there is no need for personal protection. We should take both together, but the priority is collective protection.	1
41. Is the personal protective equipment replaced when it is broken or unusable? (Regulation on the Use of Personal Protective Equipment at Workplaces, Article 6)	No, it is not changed immediately.	9
	Yes, it is changed.	1
42. Do employees inform the employer about broken or out of order personal protective equipment? (Regulation on the Use of Personal Protective Equipment at Workplaces, Article 6)	They inform the employer, but new equipment is not bought right away.	2
	If the employees want to use it, they inform the employer, but if they do not want to use it, they do not.	2
	We see that the equipment is broken or out of order. We demand a replacement. Most of the time, it is not changed.	1
	Yes, they do.	4
	They generally do not.	1
43. Do employees endanger the health and safety of themselves or other employees? (Occupational Health and Safety Law No. 6331, Article 19)	Yes, they do. They joke about it. For example, they unconsciously drop a cigarette in front of the LPG tank.	10

Supplementary File 11. Frequency Distribution of Occupational Safety Specialists' Opinions on Questions Related to Occupational Health and Safety Training (n=10)

QUESTION	RESPONSE	F
44. Are employees given training on occupational health and safety? (Occupational Health and Safety Law No. 6331, Article 17)	Yes, they are.	10
45. In which periods and for how many hours are the trainings on occupational health and safety given? (Regulation on the Procedures and Principles of Occupational Health and Safety Training of Employees, Article 11)	They are given as 8, 12, and 16 hours according to the danger class during the periods specified in the legislation.	4
	We provide training for less than the time specified in the legislation.	6
46. On which subjects are employees given occupational health and safety training? (Annex-1 of the Regulation on the Procedures and Principles of Occupational Health and Safety Training of Employees)	We give training on the subjects covered by the Education Regulations.	10