RESEARCH ARTICLE

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Hazard and risk assessment in a dairy products factory in Iğdır province using the Fine Kinney Risk Method: recommendations for mitigation

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Abstract

Failure to implement adequate preventive measures in workplaces leads to the occurrence of occupational diseases and accidents at work. Effectively managing and accurately defining these risks is paramount. Risk assessment begins by assigning scores to identify existing workplace hazards, assess the likelihood of potential risks, determine the level of urgency, and determine the necessary precautions. It is a continuous cycle of implementation, monitoring and review. The aim of this study is the identification of existing or potential hazards and risks in a dairy products factory in Iğdır province, Turkey. The Fine Kinney risk assessment methodology was applied, and the results provided recommendations for mitigating identified risks based on relevant regulations. Initially, brainstorming sessions were held with relevant employees and managers to gain a general overview of the health and safety culture in the work environment. In addition, observational analysis and weekly checklists were used for assessment purposes. When examining the current status and operational procedures of the company in detail, various hazards containing risks that require immediate precautions have been identified. Electric shock (RS: 1440), injuries related to electricity (RS: 720), explosion (RS: 540), and risks associated with poisoning or drowning (RS: 720) have been determined to be present. It has been concluded that most of the environmental risks in the facility arise from factors such as defective or outdated equipment, lack of ergonomic workstations, inadequate training, and insufficient supervision.

Keywords: Food industry, Risk assessment, Fine Kinney, Occupational health and safety

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INTRODUCTION

The food industry is one of the largest industries in the world in terms of commercial volume. In this sector, food is purchased in raw form, processed and packaged before being placed on the market for human consumption. This process involves many critical steps and serves the basic need for nourishment. Factors such as population growth, industrialization and changing living conditions have rapidly increased the demand for and consumption of processed foods. The food industry covers a wide range of subsectors, each having distinct characteristics and features (Taş & Olum, 2020).

According to the statistics published annually by the Social Security Institute, the "food production" sector ranks among the top ten in terms of the number of workplaces, the number of employees and the number of occupational accidents (Can & Kargı, 2019). These data indicate that the sector faces significant occupational safety challenges and has a high incidence of work-related accidents. Food manufacturing jobs are often manual and require manual

dexterity, attention, and care (Tuğçe & Bayhun, 2021). Additionally, the chemicals and machinery used in this sector can pose risks (Pawlak, et al., 2014). Protecting workers from these hazards through proper equipment and compliance with occupational safety regulations is critical to preventing work-related injuries and illnesses.

The number of accidents at work in our country has shown that accidents in the food industry account for a significant proportion of the total number of accidents at work (Ozdemir & Serin, 2022). A significant number of accidents in this sector require hospital treatment, particularly due to incidents such as slips, trips and falls resulting in fractures or falls from heights. Other accidents are related to material handling and transportation, accidents involving the use of hand tools, and accidents caused by falling objects. These accidents often require more than 3 days of rest. (Parlak et al., 2020).

Whilst there are some shortcomings in the recording of occupational disease statistics in our country, a review of global statistics shows that approximately 5% of the food manufacturing workforce is exposed to work-related illnesses each year (Newman & Newman, 2015). A significant proportion of these conditions manifest as musculoskeletal disorders due to repetitive loading and unloading. In addition, continuous packing and similar tasks can cause discomfort in the upper limbs (Ariyanto, 2021). Furthermore, work-related stress and mental fatigue are recognised in the international literature as occupational diseases (Khamisa et al., 2015).

The food manufacturing industry also has common occupational diseases such as occupational asthma and allergic rhinitis related to exposure to flour and other organic dusts. (Talini et al., 2002). Skin disorders are also associated with exposure to food chemicals and other chemicals used in cleaning processes. Hearing loss due to working in noisy environments is another common occupational disease in the sector (Stevenson, 1989).

Respiratory system diseases caused by working with various substances such as enzymes, animals, grains, and flours are taken seriously by insurance companies in United Kingdom, which provide coverage for workers against accidents and occupational illnesses. Workers handling such substances and materials often suffer from high rates of respiratory diseases such as chronic cough and asthma (McDonald et al., 2005).

Chemicals in liquid, gas, or vapor form are used in the food industry for cooling, sterilizing, separating, and disinfecting purposes. However, these substances can also cause certain diseases. For instance, carbon monoxide (CO) is present in cooking rooms with smoke and fumes, grain silos, and fish storage areas, and its detection can be extremely difficult. CO poisoning can have fatal consequences (Moreau & Neis, 2009). Amonyak ciltte yanıklara, tahrişe ve su tutulmasına neden olabilir. Prolonged exposure and inhalation may cause bronchitis and pneumonia. Therefore, being aware of these chemicals and taking the necessary precautions is very important for those working in the food sector. (Gürler, 2020).

The polyvinyl chloride film used in packaging can cause thermal degradation when heated. It also emits an unpleasant odour and vapours that can irritate the eyes, nose and mouth. Narrowing of the airways can result from this condition (Akçay et al., 2020). Among workers in this sector, skin diseases are also a common problem. The most common skin conditions are contact dermatitis and eczema. To maintain cleanliness and sterility, continuous hand washing and disinfection with soap and ammonia-based solutions is essential. However, this can lead to contact dermatitis on the skin as a result of reduced hand moisture. Skin problems can also result from exposure to chemicals and additives. Skin problems such as eczema and allergic reactions can be caused by peptides and proteins produced during fermentation. Contact dermatitis has been reported to be caused by enzymes such as trypsin, chymotrypsin and protease. The use of personal protective equipment is the most effective way to protect against these diseases (Dickel et al., 2002). The correct use of gloves can prevent skin contact with external factors and can contribute to the prevention of disease. However, gloves made from latex material can cause skin allergies or hinder the skin's ability to breathe.

Infectious diseases are also common in sectors that work with animals. Workers in the meatpacking and dairy industries who have direct contact with infected animals are at higher risk for parasitic diseases and infections (Ogun & Akkoyunlu, 2019). Therefore, it is essential for workers in these sectors to adhere to personal hygiene rules and use appropriate protective equipment.

The advancement of technology plays a significant role in ensuring the healthy and safe nutrition of society. In the agricultural economy, dairy and dairy products account for a substantial portion, approximately 45%, of the animal protein requirement. However, in our country, only 27% of milk production takes place in modern facilities (Orhan, 2016). With technological advancements changing production processes and enabling faster production, addressing the hazards and risks that arise in production has become inevitable.

The dairy products manufacturing sector involves a series of process stages from the intake of milk to the final product's shipment, and these stages bring along a range of potential hazards and risks.

The aim of this study is to identify and assess the risks encountered by employees in the dairy products factory and contribute to the improvement activities that need to be implemented. Given the high importance of the industry, hygiene conditions should be at advanced levels, and it is crucial for the employees to adhere to

occupational health and safety guidelines and follow procedures. Within the framework of occupational health and safety, risk assessment studies conducted in workplaces not only ensure the safety of the workplace but also contribute to quality, reliability, and international reputation.

MATERIALS AND METHODS

This study was conducted in a cheese factory located in Iğdır Organized Industrial Zone. The factory operates for 45 hours per week, and the workers work from 07:30 to 17:00 on Mondays to Fridays, and from 8:00 to 12:00 on Saturdays. There are a total of 26 workers in the factory. The research was conducted between January 2022 and February 2022. Data for the study were collected through observational analyses and photographic reports.

The data related to occupational risks were collected from various areas of the factory, including milk collection, production, maintenance, storage, and offices. After preliminary observations indicated higher occupational risks for workers in these areas, specific locations were selected for the study (Figure 1.). The data collected from the observations were categorized based on departmental areas to group the types of hazards or exposure risks according to the work area. The potential study subjects included all 26 workers present in the various work areas. While it was not possible to examine all workers actively working at the same time, random visits conducted at different hours of the workday maximized the observation of workers' natural behaviors.

Data regarding occupational hazards, regulations, training, and risks faced by the workers were collected through observations, informal interviews, and a review of occupational health literature (Figure 1.). The

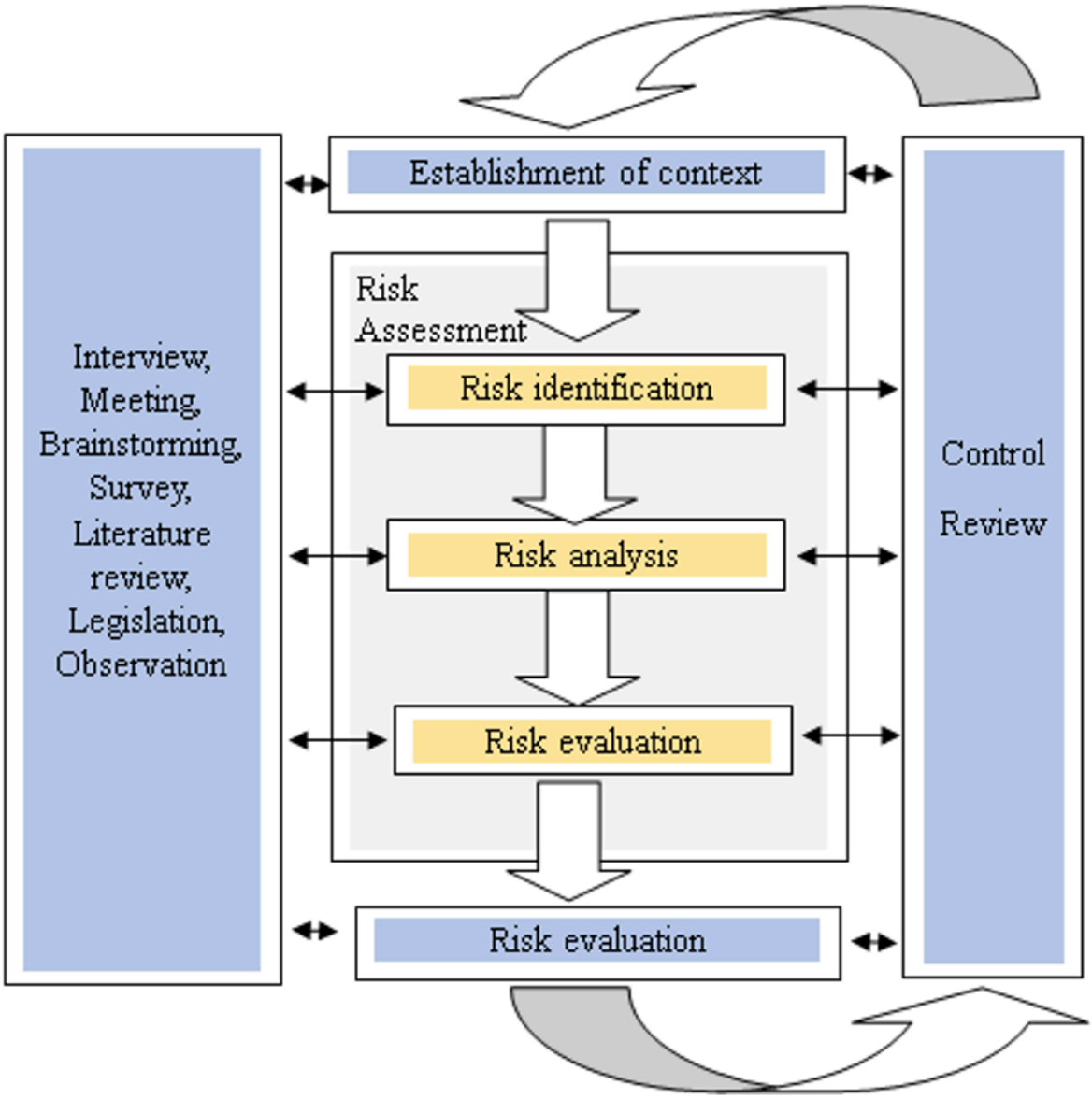

Figure 1. Risk assessment process

Table 1. Fine Kinney likelihood, frequency and severity rating

LIKELIHOOD	**Likelihood**	**Likelihood (%)**	**Likelihood of occurrence**
	0,2	2/100	Practically Impossible
	0,5	5/100	Very Unlikely
	1	10/100	Quite Unlikely
	3	30/100	Rare but Possible
	6	60/100	Highly Likely
	10	100/100	Very High Probability
FREQUENCY	**Frequency**	**Quantitative Frequency**	**Qualitative Rating**
	0,5	Very Rare	Once a year or less
	1	Quite Rare	Once or a few times a year
	2	Rare	Once or a few times a month
	3	Occasional	Once or a few times a week
	6	Frequent	Once or more per day
	10	Continuous	Continuously, more than once per hour
SEVERITY	**Severity**	**Severity**	**Rating**
	1	Should be Considered	Insignificant or trivial
	3	Significant	Low job loss, minor damage, first aid
	7	Serious	Significant damage, external treatment, workday lost
	15	Very Serious	Disability, loss of limb, environmental impact
	40	Bad	Fatality, total disability, severe environmental impact
	100	Catastrophe	Multiple fatalities, major environmental disaster

observations allowed us to make our own determinations about the types of risks encountered by the workforce, while the interviews provided insight into the workers' history and perspectives on occupational health in the cheese factory (Figure 1.).

The factory/production area was visited four times, each visit lasting between 1 to 3 hours. Each visit focused on a different department or workstation, with particular attention to all tasks performed in that area. Short follow-ups were conducted when further details were needed. During the first two visits to the production area, the workers provided guidance, and procedures in all areas were explained. Subsequently, the workers were asked questions about certain activities or aspects that may have seemed unclear. Smaller areas such as the warehouse, maintenance, and offices were each visited twice for a duration of 30 minutes to 1 hour. The milk intake area was visited three times for approximately 1 hour each time, including a specific visit to observe the cleaning of the milk tank. Short follow-ups were conducted again when additional data was required.

In this research, an electronic table was used to define the hazards, their causes, and consequences textually. Subsequently, the probability and severity (impact) of the risk occurrence were determined. Risk assessment was conducted using the Fine Kinney method to assess the risk levels.

This method is used to analyze the costs and risks of projects and provide information to decision makers. It essentially aims to identify the potential risks of the project and assess the impacts of these risks by considering various factors (Oturakci et al., 2015). These factors may vary depending on the project's characteristics and the organization's priorities. For each factor, a weight is determined, and the probability and impact of the risk are rated (Table 1.). Then, using the weight and rating factors, a risk score is calculated (1) (Table 2.). This risk score is used to determine the project's risk level. It assists decision-makers in determining the risk level and priorities of projects and contributes to the development of strategies for risk management.

The purpose of choosing the Fine Kinney method in the study is to provide both quantitative and qualitative assessment opportunities for risk evaluation. This approach quantitatively assesses the frequency of risk occurrence, the likelihood of recurrence, and its frequency over a continuous time frame, while qualitatively describes the frequency of risk occurrence using conceptual expressions such as rarely, occasionally, frequently, or continuously (Gul et al., 2018). This makes the study more comprehensive. Based on the obtained risk value, decision and action steps assist in determining priorities according to the severity of the risk. Depending on the risk level, it anticipates appropriate measures for managing acceptable risks, keeping moderate risks under control, and urgently addressing very high risks (Ak, 2020).

RS(risk score)=l(likelihood)xf(frekans)xs(severity) (1)

Table 2. Fine Kinney risk score, decision and action rating

Risk Score	Decision	Action
less than 20	Acceptable Risk	Emergency action may not be necessary
20-70	Certain Risk	Should be included in the action plan
70-200	Significant Risk	Should be closely monitored and addressed in the annual action plan
200-400	High Risk	Should be addressed in the short-term action plan
400+	Very High Risk	Work should be stopped and immediate action should be taken.

RESULTS AND DISCUSSION

In the dairy product manufacturing sector, farmers transport milk to the factory either using their own means or with the help of similar tanks provided by the factory owners. With the cooling feature of these tanks, the quality of the milk is preserved, and it is generally transported on vehicles. After the raw milk is accepted at the factory, samples are taken to determine both its quality and fat content. For the production of white cheese, the incoming milk undergoes processes such as filtering, cleaning, and separation, and then it is pasteurized to prepare it for cheese making under suitable conditions. The milk is placed in the cheese vat, and the rennet is added. The milk with added rennet is gently stirred and left to ferment for a certain period. When the curd matures after fermentation, it is cut. Then, the whey is removed, and the curd is subjected to pressing and straining. After the whey is removed, the curds are cut and placed in molds, where they are allowed to rest for a certain period. After the salting process is carried out, the cheeses are packaged and kept under appropriate conditions for maturation. In the production of Kashar cheese, pasteurized milk is placed in the fermentation tank. Then, the coagulated cheese is broken into small pieces using mixers, and the whey is removed. The cut cheeses are placed in molds and allowed to rest in the curing room for 24 hours. Afterward, the packaging process is carried out, and the cheese is introduced to the market. For the production of butter, raw cream is used. After the processes applied to raw milk, the separated cream is pasteurized and cooled. Then, the necessary steps for butter production are carried out.

As a first impression, the level differences on the floor, humps, and pits, open drainage channels, materials left in the middle, and exposed cables create high risk (*l: 3, f: 6, s: 15*) at the workplace. These risks can be eliminated by preparing Occupational Health and Safety (OHS) guidelines, providing training, and ensuring the continuous implementation of instructions (Zimolong & Elke, 2006).. Additionally, the observation indicates that the continuous wetness of the floor (*l: 4, f: 3, s: 15*) may cause employees to experience slip-related injuries. To address this issue, both the drainage channels in the production area and outside the building should be cleaned and covered with grates.

It has become a routine practice for personnel other than authorized electricians to intervene in electrical malfunctions that occur during work in the facility (*l: 6, f: 6, s: 40*). To prevent this, it is essential to provide the employees with necessary training and instructions, specifying that only authorized personnel are allowed to intervene. The fact that the panels of the existing machinery and machine control panels in the facility are left open exposes them to unauthorized intervention (*l: 3, f: 6, s: 40*), indicating a lack of proper instructions and trained personnel.

Cleaning and preparation tasks for boilers are critical operations conducted in enclosed spaces, and having inexperienced personnel perform these tasks (*l: 6, f: 6, s: 15*) could lead to severe consequences for both the employees' health and safety and the equipment's integrity. In such hazardous tasks, involving unskilled individuals may lead to potential risks that could result in disasters and significant material and human losses (Khatri et al., 2021).

The exposure of electrical cables to open areas in the facility, leading to deformation due to contact with water, moisture, and external elements, can pose risks (*l: 6, f: 3, s: 40*). However, appropriate measures can be taken to protect such cables from impacts and direct water contact. These measures can be implemented by passing the cables through suitable conduits, trays, and closed channels (Tosun, 2022).

The absence of residual current devices, inadequate grounding, and lack of lightning protection systems in electrical installations can lead to significant safety risks (*l: 6, f: 1, s: 40*). It is mandatory to have grounding and lightning protection systems regularly measured and inspected by authorized institutions and organizations at least once a year. Residual current devices are crucial devices that detect leakage currents in electrical panels, helping to prevent hazards such as electric shocks and fires (Pekeroğlu, 2017).

The lack of designated emergency exit points and exit routes (*l: 3, f: 2, s: 40*) and the absence of teams to respond to emergencies (*l: 6, f: 2, s: 15*) can result in ineffective management of emergency situations in the facility and pose serious security threats. Therefore, after preparing emergency response plans, it is of great importance to identify the locations of exit routes and doors according to the needs.

Employing unauthorized, untrained, and unaware personnel for tasks that require working at heights can increase the risk of falling from heights (*l: 3, f: 3, s: 40*)(Table3.). Taking effective safety measures and implementing appropriate permit procedures in situations involving work at heights is of utmost importance (Kamardeen, 2011).

In tasks involving measurements in laboratories or facilities, especially in microbiological experiments and analysis studies, frequent contact of personnel with sensitive materials such as milk and dairy products using bare hands can pose hygiene and health risks (*l: 6, f: 6, s: 7*). Appropriate hygiene measures and hand hygiene should be ensured, personnel should be conscious, trained, and cautious, and suitable personal protective equipment should be used during analyses.

The absence, malfunction, or incorrect installation of any safety equipment required for steam boilers (*l: 6, f: 3, s: 15*) can jeopardize the safe and healthy operation of the boilers (Table3.). İmportant measures must be taken to ensure the safety of the boilers. These measures include conducting annual inspections and tests of the boilers by qualified technical personnel, obtaining user manuals from the manufacturer or installer of the boilers, and ensuring that daily operation, maintenance, and inspection instructions are fully implemented by competent personnel (Landi et al., 2022).

The lack of regular maintenance of compressors (*l: 3, f: 2, s: 7*), continuous operation above the maximum operating pressure (*l: 3, f: 3, s: 15*), and the absence or malfunction of safety equipment on the compressors (*l: 3, f: 3, s: 7*) can jeopardize the safe and efficient operation of the compressors (Table3.). Periodic checks of the compressors should be conducted regularly, at least once a year. It is essential that the compressors display information such as the name of the manufacturer, the year of manufacture, the maximum operating pressure, and the type and quantity of compressed gas in a readable manner. This information provides details about the technical specifications of the compressors and is crucial for safe usage. It is critical to never operate the compressors above their maximum operating pressure, as such situations can subject the equipment to excessive stress and potentially lead to explosions (Aydoğan & Rüştü, 2022).

The inadequate thermal comfort conditions in the facility (*l: 3, f: 6, s: 7*), the presence of noisy machines and equipment (*l: 3, f: 3, s: 7*), and the insufficient lighting in various areas of the facility (*l: 3, f: 2, s: 7*) can pose significant occupational health and safety issues. Therefore, solutions and arrangements need to be implemented to address such problems. The lack of suitable thermal comfort conditions can cause discomfort and reduced productivity for the workers in the working environment. To mitigate this issue, proper heating and cooling arrangements should be made throughout the facility, ensuring that heat is evenly distributed. Specifically, for personnel working in noisy areas such as boiler rooms and generators, appropriate ear protectors should be provided and encouraged to be used (Rînjea et al., 2022). Proper illumination of workspaces enhances visual comfort for workers and prevents occupational accidents. Open areas, external pathways, passages, and similar places should have a minimum lighting level of 20 lux, while rough material handling, transfer, storage, and similar tasks areas should have a minimum lighting level of 50 lux. By ensuring appropriate lighting in the work areas, the working conditions of the employees can be improved, and the risk of work-related accidents can be reduced (Onur, 2012).

Tasks performed continuously while standing in the production process (*l: 3, f: 2, s: 7*) and the use of unhealthy desks, chairs, and furniture in jobs that require sitting (*l: 3, f: 1, s: 7*), as well as manual lifting and carrying tasks in offices, canteens, boiler rooms, production areas, and all other buildings and facilities (*l: 3, f: 2, s: 7*), and work involving screens (*l: 1, f: 3, s: 7*), can lead to health issues in the muscular and skeletal system of the employees (Table3.). Therefore, providing ergonomic training to all personnel working within the facility is essential. It is crucial to inform the employees, especially about the potential muscular and skeletal system diseases and other issues that may arise due to manual lifting and carrying tasks, work involving screens, and desk jobs (Engür & Chaush, 2019).

During the analysis and experiments, situations such as direct skin contact with acids, bases, and other chemicals or inhalation of these chemicals (*l: 1, f: 2, s: 15*) can pose serious risks. Additionally, unauthorized, untrained, and unaware personnel entering the laboratory and interfering with work (*l: 3, f: 2, s: 15*) and misuse of hand tools (*l: 1, f: 2, s: 7*) are significant issues concerning laboratory safety. It is of vital importance for laboratory workers to use appropriate personal protective equipment when working with chemicals. Having Material Safety Data Sheets for all chemicals in the laboratory and ensuring the availability of suitable personal protective equipment based on this information ensures the safety of the employees. Identifying personnel with access to the laboratory and prohibiting entry of unauthorized individuals is a critical step for laboratory safety. Allowing only trained and conscious personnel to enter the laboratory prevents potential accidents and hazards (Yılmaz & Bilici, 2020). Furthermore, it is essential to use hand tools only for designated purposes and prepare relevant instructions. Misuse of hand tools can lead to accidents and equipment damage. Therefore, providing training to employees on the proper use of hand tools and promoting safe usage is necessary.

During the interviews, several negative situations have been identified among the employees, including stress, job disillusionment, and bullying (*l: 3, f: 2, s: 3*), as well as

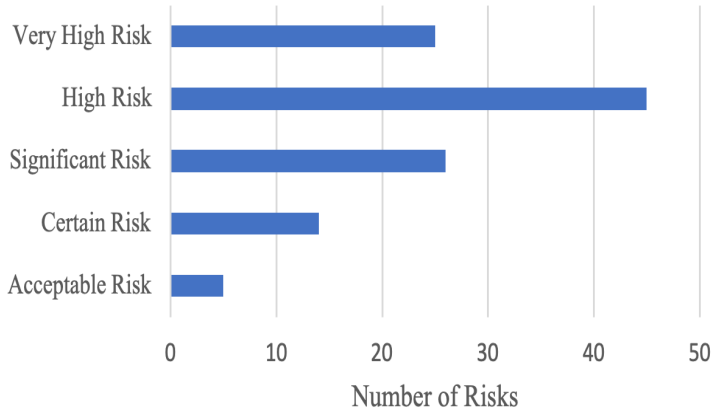

Figure 2. Distribution of risk score by number

Table 3. Risk assessment decision chart

Decision	Identified Risks	*l*	*f*	*s*	*RS*
Very High Risk	Due to the lack of authorized electrician, electric shock incidents may occur.	6	6	40	1440
	The use of portable electrical tools and equipment for transportation.	3	6	40	720
	Uncared and open electrical panels.	6	3	40	720
	Open panels of machines.	6	3	40	720
	Wet floor due to cheese whey and presence of movable electrical cables.	6	3	40	720
	Unauthorized, untrained personnel performing any work in confined areas.	6	6	15	540
	High ambient noise resulting in hearing loss.	6	6	15	540
	Slippery conditions due to the continuous wet floor.	6	6	15	540
High Risk	Lack of ventilation in confined space work.	3	3	40	360
	Maintenance of the generator by unauthorized and untrained individuals.	3	3	40	360
	Lack of grounding and residual current devices for electrical machines.	3	2	40	240
	Lack of safety equipment for steam boilers.	6	3	15	270
	Direct contact of personnel with dairy products using bare hands.	6	6	7	252
	Non-usage of the PPE during electrical maintenance and repairs.	6	3	15	270
	Undefined emergency exit routes.	3	2	40	240
	Non-usage of personal protective equipment (PPE) for chemical handling.	3	2	40	240
	Insufficient equipment usage while working at heights.	3	3	40	360
	Insufficient workplace health and safety training.	6	3	15	270
Signif. Risk	Continuous operation of the compressor at high pressure.	3	3	15	135
	Inadequate thermal comfort conditions.	3	6	7	126
	Unauthorized personnel entering the laboratory.	3	2	15	90
	Maintenance and repair works carried out by unauthorized personnel.	3	3	15	135
	Inadequate workplace hygiene conditions.	3	2	15	90
	Non-ergonomic equipment usage.	3	3	15	135
	Insufficient flow of information and communication.	3	6	7	126
	Long working hours.	3	2	15	90
	Absence of a trained emergency response team.	6	2	15	180
Certain Risk	Unauthorized access to the chemical storage area.	3	1	7	21
	Inadequate number of fire extinguishers.	1	3	15	45
	Manual lifting and carrying of heavy objects.	3	2	7	42
	Lack of clear delineation of responsibilities.	3	2	7	42
Accep. Risk	Inadequate warehouse stacking arrangement.	1	2	7	14
	Monotonous work routine.	0,5	1	7	3,5
	Misuse of hand tools for purposes other than their intended use.	3	2	3	18

Figure 3. Photographic report on working environment hazards. The different risks identified are illustrated in the photographic report. Physical and ergonomic risk. Physical and ergonomic risk (1,2,3), ergonomic risk (2,4,5), accident risk (1,8,9), physical risk (1,2,5,7) and (9), physical and accident risk (1,2,3,4,6), accident risk (8), hygiene risk (6).

incidents of violence and threats (*l: 3, f: 2, s: 3*). Moreover, unprofessional behavior (*l: 3, f: 2, s: 3*), lack of respect for employees' ideas, and insufficient information flow (*l: 3, f: 2, s: 7*) have been highlighted, alongside the issue of unclear definition of employees' authority and responsibilities (*l: 3, f: 2, s: 7*). It is essential to prevent any acts of violence and threats during work and strictly prohibit such behaviors within the hierarchical structure of the company. Providing employees with information about the company's business objectives and goals, as well as listening to their thoughts and opinions on work-related matters, are crucial steps that will enhance employee motivation and commitment (Serap, 2007). Clear definition of employees' authority and responsibilities, along with transparent task distribution, will increase work efficiency and prevent conflicts. Similarly, ensuring adequate and regular information flow will enable employees to be guided with accurate

information and carry out their tasks more effectively (Kocabaş et al., 2018).

During the observations and interviews conducted at the workplace, a total of 115 risks have been identified (Figure 3). A detailed analysis of these risks should be carried out, and appropriate measures should be taken (Figure 2). According to the reports, some of the identified risks have been categorized as 5 urgent risks requiring immediate improvement and intervention. Additionally, 14 risks have been evaluated within short-term plans, and the necessary measures have been planned accordingly. Furthermore, 26 risks have been considered significant and are expected to be carefully monitored and addressed within the annual plan, aligning them with long-term objectives. It is crucial to manage and keep these significant risks under control in line with the business's long-term goals (Figure 3).

On the other hand, 45 risks have been clearly classified as risks that need to be evaluated in the company's investment and future plans. Appropriate risk management strategies should be developed, taking into account the impact of these risks on the company's strategic decisions (Figure 2). Lastly, 25 risks fall within acceptable risk limits for the business and do not require inclusion in a specific plan. However, regular monitoring and evaluation of these risks are still essential to ensure that they can be kept under control with necessary measures if needed (Figure 3). All the data obtained forms the basis for determining the business's risk management strategies and implementing occupational safety measures. This way, the aim is to effectively manage the risks at the workplace and ensure the safety of the employees. The successful management of risks by the company holds great significance for sustainability and success.

CONCLUSION

The Fine Kinney method, which is used as a fundamental tool in occupational health and safety management in workplaces where industrial food production is carried out, is highly effective in evaluating and rating environmental risks. In the food sector, where various occupational hazards can cause occupational diseases, it facilitates the development of measures and actions to control risks, improve the working environment, and ensure the health and safety of employees.

Industrial food production involves risks at different levels. In the study, while serious risks were present at RS:1440 levels, 25 risks requiring urgent action were identified with a risk score above 540. In addition, 45 risks were evaluated as high risk and included in the annual plan for preventive measures. The study and investigations suggest a great responsibility for the employer in establishing occupational health and safety procedures in the workplace and taking action for precautions. Continuous training and increased inspections, especially in education, are among the first tasks to be carried out in this regard.

The Hazard Analysis and Critical Control Points (HACCP) method, widely used in the food production sector, can be used to carry out this study. However, since it requires teamwork, effective implementation of the risk assessment procedure is necessary.

These methodologies and practices help identify potential risks in the workplace and implement effective measures to protect the health and safety of employees. They also play a crucial role in enhancing the sustainability and productivity of the workplace. Ensuring the health and safety of employees not only improves their well-being but also positively impacts job performance.

COMPLIANCE WITH ETHICAL STANDARDS

Peer-review

Externally peer-reviewed.

Declaration of interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Author contribution

The author read and approved the final manuscript. The author verifies that the Text, Figures, and Tables are original and that they have not been published before.

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Not applicable.

REFERENCES

Ak, M. F. (2020). Comparison of risk assessment methods within the scope of occupational safety in the construction sector. *Avrupa Bilim ve Teknoloji Dergisi*, (18), 272-282.

Akçay, S., Törnük, F., & Yetim, H. (2020). Mikroplastikler: Gıdalarda bulunuşu ve sağlık üzerine etkileri. *Avrupa Bilim ve Teknoloji Dergisi*, (20), 530-538. (in Turkish)

Ariyanto, J. (2021). Control of the risk of musculoskeletal disorders in the food industry: Systematic review. *Annals of the Romanian Society for Cell Biology*, 4254-4261.

Aydoğan, S. Ö., & Rüştü, U. Ç. A. N. (2022). İş Sağlığı ve Güvenliğinin Saha Gözetimi ve İş Ekipmanları Açısından İncelenmesi: Yapı Sektörü. *Resilience*, *6*(1), 111-125. (in Turkish)

Can, G. F., & Kargı, Ş. (2019). Sektörlerin İş Sağlığı Ve Güvenliği Yönünden Risk Seviyelerinin Crıtıc-Edas Entegrasyonu İle Değerlendirilmesi. *Endüstri Mühendisliği*, *30*(1), 15-31. (in Turkish)

Dickel, H., Kuss, O., Schmidt, A., Kretz, J., & Diepgen, T. L. (2002).

Importance of irritant contact dermatitis in occupational skin disease. *American journal of clinical dermatology*, *3*, 283-289.

Engür, M., & Chaush-Ogly, K. (2019). Türkiye İş Sağlığı Ve Güvenliği Mevzuatında Ergonominin Yeri Üzerine Bir Çalışma. *Ergonomi*, *2*(2), 69-77. (in Turkish)

Gul, M., Guneri, A. F., & Baskan, M. (2018). An occupational risk assessment approach for construction and operation period of wind turbines. *Global Journal of Environmental Science and Management*, *4*(3), 281-298.

Gürler, G. (2020). *Yiyecek–İçecek sektöründe faaliyet gösteren bir işletmede risk değerlendirme çalışması* (Master's thesis, Başkent Üniversitesi Fen Bilimleri Enstitüsü). (in Turkish)

Kamardeen, I. (2011). E-OHS planning system for builders. *Architectural Science Review*, *54*(1), 50-64.

Khamisa, N., Oldenburg, B., Peltzer, K., & Ilic, D. (2015). Work related stress, burnout, job satisfaction and general health of nurses. *International journal of environmental research and public health*, *12*(1), 652-666.

Khatri, N., Priyanka, Dubey, A. K., Bharti, R., & Chopra, B. S. (2021). Occupational Health Hazards and Disaster Management in Laboratory Animal Facilities. *Essentials of Laboratory Animal Science: Principles and Practices*, 585-606.

Kocabaş, F., Aydın, U., Özgüler, V. C., İlhan, M. N., Demirkaya, S., Nihan, A. K., & ÖZBAŞ, C. (2018). Çalişma ortaminda psikososyal risk etmenlerinin iş kazasi, meslek hastaliklari ve işle ilgili hastaliklarla ilişkisi. *Sosyal Güvence*, (14), 28-62. (in Turkish)

Landi, R. G., Montedo, U. B., & Lahoz, C. H. N. (2022). Using systems theory for additional risk detection in boiler explosions in Brazil. *Safety science*, *152*, 105761.

McDonald, J. C., Chen, Y., Zekveld, C., & Cherry, N. M. (2005). Incidence by occupation and industry of acute work related respiratory diseases in the UK, 1992–2001. *Occupational and Environmental Medicine*, *62*(12), 836-842.

Newman, K. L., Leon, J. S., & Newman, L. S. (2015). Estimating occupational illness, injury, and mortality in food production in the United States: A farm-to-table analysis. *Journal of occupational and environmental medicine/American College of Occupational and Environmental Medicine*, *57*(7), 718.

Moreau, D. T., & Neis, B. (2009). Occupational health and safety hazards in Atlantic Canadian aquaculture: Laying the groundwork for prevention. *Marine Policy*, *33*(2), 401-411.

Ogun, H., & Akkoyunlu, Y. (2019). Mesleki Enfeksiyon Hastalıkları. Güncel Göğüs Hastalıkları Serisi 2019; 7 (2): 108-113. (in Turkish)

Onur, B. (2012). İşçi sağlığı ve iş güvenliği açısından aydınlatma. Sakarya Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi, Sakarya, Türkiye, 88 pp. (in Turkish)

Orhan, A. (2016). Süt ürünleri imalatında risk değerlendirmesi, TC Çalışma ve Sosyal Güvenlik, İş sağlığı ve Güvenliği Genel Müdürlüğü, Uzmanlık Tezi, Ankara, Türkiye, 52 pp. (in Turkish)

Oturakci, M., Dağsuyu, C., & Kokangül, A. (2015). A new approach to Fine Kinney method and an implementation study. *Alphanumeric Journal*, *3*(2), 83-92.

Özdemir, F., & Serin, H. (2022). Çalişan Ve Sektörlere Göre İş Kazasi ve Meslek Hastalığı İstatistiği Üzerine Bir Araştirma. *Turkish Journal Of Forest Science*, *6*(1), 275-285. (in Turkish)

Parlak, T., Barışık, T., & Yalçın, F. (2020). Gıda Ürünleri İmalatında Çalışan Personellerin İş Sağlığı ve Güvenliği Hakkındaki Farkındalık Durumlarının Tespiti Üzerine Bir Araştırma. *Ohs Academy*, *3*(1), 13-27. (in Turkish)

Pawlak, H., Maksym, P., & Pecyna, A. (2014). Analysis of awareness concerning the occupational health and safety of food sector employers. *Agricultural Engineering*, *18*(3), 129-137.

Pekeroğlu, M. F. (2017). Elektrik Tesislerinde Risk Değerlendirme. *Mayıs*, *22*, 2018. (in Turkish)

Rînjea, C., Chivu, O. R., Darabont, D. C., Feier, A. I., Borda, C., Gheorghe, M., & Nitoi, D. F. (2022). Influence of the thermal environment on occupational health and safety in automotive industry: a case study. *International Journal of Environmental Research and Public Health*, *19*(14), 8572.

Serap, Ö. Z. E. N. (2007). İşyerinde psikolojik şiddet ve nedenleri. *ISGUC The Journal of Industrial Relations and Human Resources*, *9*(3), 1-24. (in Turkish)

Stevenson, C. J. (1989). Occupational skin disease. *Postgraduate medical journal*, *65*(764), 374.

Talini, D., Benvenuti, A., Carrara, M., Vaghetti, E., Martini, L. B., & Paggiaro, P. L. (2002). Diagnosis of flour-induced occupational asthma in a cross-sectional study. *Respiratory medicine*, *96*(4), 236-243.

Taş, D., & Olum, E. (2020). Yiyecek-içecek sektöründe sürdürülebilirlik ve yenilikçi yaklaşımlar. *Türk Turizm Araştırmaları Dergisi*, *4*(3), 3082-3098. (in Turkish)

Tosun, S. (2022). Elektrikle Çalışmalarda İş Sağlığı ve Güvenliği Üzerine Bir Değerlendirme. *Sürdürülebilir Mühendislik Uygulamaları ve Teknolojik Gelişmeler Dergisi*, *5*(2), 232-246. (in Turkish)

Tuğçe, O. R. A. L., & BAYHUN, S. (2021). Gıda Paketleme Makinelerinin Kullanım Risklerinin HRNS Methodu ve FMEA Yöntemi İle Karşılaştırılması. *Black Sea Journal of Engineering and Science*, *4*(4), 168-178. (in Turkish)

Yılmaz, Ş., & Bilici, M. (2020). Üniversitelerin Mühendislik Fakülteleri Bünyesinde Bulunan Laboratuvarlarda İş Sağlığı Ve Güvenliği. *Ohs Academy*, *3*(2), 102-113. (in Turkish)

Zimolong, B., & Elke, G. (2006). Occupational health and safety management. *Handbook of human factors and ergonomics*, 673-707.