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A preliminary study of environmental risks through the gut matrix: application in an industrial kitchen

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Abstract

The lack of effective preventive measures can lead to occupational diseases and accidents at work. For the correct identification and treatment of these risks, the GUT matrix is a tool for prioritizing problems and risks by attributing notes for the aspects of gravity, urgency, and tendency. This work elaborated a particularized matrix for prioritizing the environmental risks raised in a university hospital's industrial kitchen. The work was developed in a Food and Nutrition Unit (FNU) of a University Hospital in Rio de Janeiro-RJ, in the industrial kitchen. Initially, a brainstorming session was held with all those involved to obtain an overview of the health and safety culture in the work environment. Additionally, observational analysis and the weekly verification guide or checklist were performed. The GUT matrix was used as a prioritization tool for identified risk sources. 4 physical, 4 chemical, 6 biological, 6 ergonomics, and 8 accident risks were identified. Therefore, it is concluded that the environmental risks in industrial kitchens are generated most of the time by materials, obsolete equipment or without maintenance, lack of ergonomic study of the workstations, lack of training, and deficit in supervision.

Keywords: risk analysis; occupational safety; food security.

Practical Application: This study provides a preliminary assessment of occupational risks in an industrial kitchen.

1. Introduction

Food services are offered by establishments that develop all stages of preparing ready-to-eat food, from the receipt of raw material to delivery to the consumer (Brasil, 2004).

Many studies have been conducted recently to produce foods with a safe microbiological standard and without synthetic preservatives. However, many studies are needed to prove that these substances are harmless to the worker's health, environment, and humans (Barboza et al., 2022).

Thus, after analyzing the risk agents in an industrial kitchen, it was found that toxicological, biological, chemical, mechanics, and environmental risks are agents that the work team exposes daily. However, the lack of effective preventive measures can lead to occupational diseases and accidents at work (Pereira & Quintão, 2016).

Additionally, environmental risks can be classified as physical, chemical, and biological, according to Regulatory Norm 09 published in Ordinance No. 3,124/1978 (Brasil, 2020). Although NR 9 (Brasil, 2020) does not mention ergonomic and accident risks, Ordinance No. 25 of December 29, 1994 (Brasil, 1994) included them in its annexes to classify occupational risks, considering ergonomic risks that cause discomfort to the worker. The risks of accidents are the use of equipment, products, installation of facilities, protections, and any type of risk that may generate accidents during the exercise of work activities (Brasil, 2020).

The GUT matrix is a decision tool for prioritizing problems by assigning grades to the aspects of gravity, urgency, and tendency. Regarding gravity, one must consider the intensity and depth of damage that the problem can cause if unacted upon. The urgency analyzes the time for the outbreak of damages or undesirable results if not acting on the problem. The tendency, observes the development that the problem will have in the absence of action. Each of these three aspects (G, U, T) are assigned numbers between 1 and 5, with 5 representing the greatest impact and 1 the least. The great benefit of using it is the help it will give the manager to quantitatively assess the problems or risks of the company, making it possible to prioritize corrective and preventive actions (Periard, 2011).

Regarding risk tools, the structured questionnaire proved to be a very effective tool to assess the risks and effects of the organizational environment on occupational accidents analysis of medical workers (Hu et al., 2022) and to assess knowledge about food safety and hygiene practices among street vendors (Hossen et al., 2021).

However, several companies in the food sector use the GUT Matrix to assess environmental risks; the ice cream industry (Rodrigues & Santana, 2010), food technology laboratories

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(Leite et al., 2018), bakeries (Novaski et al., 2020), among others. In this study, it is proposed to elaborate a particularized GUT matrix to prioritize the environmental risks raised in an industrial kitchen of a University Hospital.

2. Materials and methods

The work was carried out in a Food and Nutrition Unit (FNU) of a University Hospital in the city of Rio de Janeiro-RJ, in the industrial kitchen, a specific area for the production of large meals for patients (lunch and dinner) of regular consistency diets. Besides, pasty with its variations and the lunch for the employees of the outsourced company. The workday is 12h/day with a 12/36h shift for on-call workers and working hours from 7 am to 7 pm. For the first team, the hours are from 8 am to 8 pm, and for Monday, the day laborer works from Monday to Friday from 7 am to 4:48 pm. There are only two workers in the night team, with 12/36 hours shift labels from 7 pm to 7 am. The total number of workers is 54 on-call/shift workers and 8-dayworkers, totaling 116 workers.

Initially, a brainstorming session was held with all those involved to obtain an overview of the health and safety culture in the work environment. Subsequently, some meetings were held with the workers, in which questions were raised regarding the activities carried out, the sources of danger, the environmental risks, and the use of individual and collective protective equipment. In addition, observational analyses, photographic reports, and completion of the verification guide or weekly checklist were carried out (Genta et al., 2005). The period of analysis was from December 2021 to January 2022. Additionally, the GUT matrix (Kepner & Tregoe, 1981) was used as a prioritization tool for identifying risk sources for subsequent decision-making.

3. Results and discussion

The ranking with the priority of the risks identified in the GUT matrix is presented in Table 1. 4 physical, 4 chemical, 6 biological, 6 ergonomic, and 8 accident risks were identified. In the first place, the risk of an accident caused by a leak in the gas pipe that feeds the stove was identified, as it is severe, requires immediate action, and can have fatal consequences. The second position was occupied by biological hazards (fungi, molds,

Table 1. Prioritization of individualized environmental risks, obtained from the GUT matrix.

	Identified Risks	G	U	T	TT	P
Physical Risk	Vibrations from benches with unfixed equipment	2	3	1	6	10º
	Excessive heat from exhaustion problems	3	4	1	12	8º
	Wet floor	3	4	1	12	8º
	Noise caused by equipment without maintenance and works	3	4	1	12	8º
Chemical Risk	Dust from construction in the kitchen	2	3	1	6	10º
	Chemicals handled incorrectly	5	5	1	25	4º
	Smoke	3	3	1	9	9º
	The smoking area next to the kitchen window	3	3	1	9	9º
Biological Risk	Fungi	4	5	5	100	2º
	Mold	4	5	5	100	2º
	Bacteria	4	5	1	20	5º
	Mice	5	5	4	100	2º
	Insects	4	4	3	48	3º
	Other microorganisms	4	4	1	16	6º
Ergonomic Risk	Excessive physical effort	3	5	1	15	7º
	Lifting and transporting crates and vats	4	5	1	20	5º
	Excessive pace imposed due to shortage of workers	4	4	1	16	6º
	Inadequate posture to perform certain tasks	2	1	2	4	11º
	Psychological stress due to sudden menu change	2	2	1	4	11º
	Extended working hours due to lack of workers	3	3	1	9	9º
Accident Risk	Inappropriate layout	5	4	1	20	5º
	Fire or explosion due to gas leak	5	5	5	125	1º
	Lack of personal protection equipment	5	5	1	25	4º
	Use of latex gloves by a cook	5	5	1	25	4º
	Cloths are placed near the flame	4	3	1	12	8º
	Inadequate lighting	5	5	1	25	4º
	Exhaust hoods with loops and loose rods	5	5	4	100	2º
	Equipment without protection	5	5	1	25	4º

Adapted from Regulatory Standard 9 (Brasil, 2020) and Finelli (2021). Criteria for analyzing the GUT Matrix: [5] = G (extremely serious), U (Immediate action), T (worse right away); [4] = G (very serious), U (with some urgency), T (worse in the short time); [3] = G (serious), U (as early as possible), T (worse in the medium time); [2] = G (slightly serious), U (can wait a while), T (worse in the long run); [1] = G (no gravity), U (no rush), T (won't get worse). [TT] = Total: Result of multiplying the GxUxT factors. [P] = Priority in which actions will be implemented.

insects, and rats) and by the risk of accidents (exhaust hoods with loops and loose sticks). Biological risks can cause several types of diseases, such as respiratory diseases, leptospirosis, salmonellosis, trichinellosis, murine typhus, and damaging machines, equipment, pipes, and electrical wiring (Grings, 2006). There is, therefore, a strong relationship between biological risks and worker health, and to eliminate diseases acquired in the work environment, preventive measures are essential (Pivetta & Huet, 2001). Regarding the hoods with the loose fasteners, it appears that these are a constant danger and need immediate action by the supervisory bodies of the worker's health, as the risk of falling is imminent, also influencing the worker's psychological health.

In the third position, insects that often fall on food when preparing or portioning meals were identified. Besides being attracted to sugars and fruits, flies ingest feces and decompose food. These vectors in places that work with food handling represent a grave risk, as they can transmit more than 100 different types of diseases, such as cholera, dysentery, and others that put worker health and food safety at risk. Risk generates financial losses since disposal is mandatory in case of food contamination. Even the Health Surveillance can find an environment with flies and even interdict operations (Syngenta, 2001).

In the fourth place, chemical risks (chemical substances mishandled) and physical risks (lack of PPE, continuous use of latex gloves by the cook near the flames, inadequate lighting, and unprotected equipment) were identified. As for chemical risk agents, these were considered high due to improper handling and incorrect use of the products, which can result in residues on equipment and utensils and provide skin irritation, causing damage to the health of the worker. The continuous use of latex gloves by the cook (Figure 1C) denotes a misunderstanding regarding the awareness of correct hand hygiene, as many workers think that using gloves would be a sufficient hygiene measure. However, this practice contributes to the neglect of proper hand hygiene. In addition, according to CVS 5/2013 (Brasil, 2013), the use of latex is not allowed in processes that involve heat, such as cooking and frying. Inadequate lighting in the work environment can harm a worker's physical or psychological health, in addition to affecting their performance. This non-compliance in an industrial kitchen environment significantly increases errors and the feasibility of an accident at work. The lack of personal protective equipment and unprotected machinery and equipment increases work accidents in food services (Matos & Proença, 2003). Regarding the other priorities that are between the 5th

Figure 1. The photographic report of the UAN's industrial kitchen. Images from the photographic report, refer to the different risk groups identified. Physical risk (A), chemical risk (B), biological risk (C), ergonomic and accident risk (D), accident risk (E), accident risk (F).

(fifth) and 11th (eleventh) positions, there is a low degree of tendency (T= 1) concerning the others.

The results of the photographic report in the different sectors of the industrial kitchen are shown in Figure 1. The analysis observed excessive noise caused by equipment without maintenance (A). Area for smokers next to where the different meals are prepared (B). Use of Latex glove, enabling a foodborne disease (C). Worktable with inadequate height for the worker and absence of safety shoes (D). Maintenance of equipment with the use of a plastic bucket (E) and part of the gutter system without the correct fixation (F). Despite Brazilian legislation, the rates of accidents at work are still very high and usually result from poor conditions and lack of safety in work environments, added to the lack of supervision by competent bodies. Compliance with Regulatory Norms (NRs) is still a challenge for most companies, which in many cases prioritize product quality improvement rather than better environmental working conditions (Lacerda et al., 2005). Food safety is mandatory for the health of the worker.

4. Conclusions

The assessment of environmental risks through the GUT matrix is paramount for managing health and safety at work in industrial kitchens. With these data, it is possible to develop measures and actions to control risks, improve the work environment, and guarantee the workers' health and safety. It can be seen, then, that the environmental risks in the industrial kitchen of the FNU are generated mainly through materials and utensils, obsolete or maintenance-free equipment, lack of ergonomic study of the workstations, lack of standard operating procedures, and their due training and low-skilled management with a conformist profile within the scope of work safety.

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