ARTIGO

A SIMPLE DYNAMIC TO PROMOTE THE IMPROVEMENT OF GOOD MANUFACTURING PRACTICES AT A SCHOOL CAFETERIA OF BELO HORIZONTE, BRAZIL

UMA SIMPLES DINÂMICA PARA MELHORAR AS BOAS PRÁTICAS EM UMA CANTINA ESCOLAR DE BELO HORIZONTE, BRASIL

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ABSTRACT
A strategy to improve good manufacturing practices was applied at a school cafeteria (Belo Horizonte, Brazil). The Quality Signal in Food Services (SQUAN) consists of a strategy to evaluate the degree of compliance of food services to good practices, which includes classifying your sectors into different traffic-based colors. Inspections were performed in all cafeteria sectors for three months. Items evaluated were classified as “compliant” or “non-compliant” with the Resolution 216 from Brazilian Health Surveillance Agency. Sectors with 80-100% of compliance were assigned the “Green Signal”; 60-80% “Yellow Signal”; and less than 60% “Red Signal”. The present study aimed at evaluating whether the SQUAN was a good strategy to improve school’s cafeteria overall hygiene. Meat and side dish, salad, and dessert sectors displayed an improvement of 87%, 12%, and 35% regarding compliance to good practices, respectively. The salad sector reached the “Yellow Signal”, but the remaining sectors reached the “Green Signal” and remained there until the end of the study. To our knowledge, until this time no study proposes the use of traffic-light-based colors as an educational means for implementing good manufacturing practices in food service. In conclusion, SQUAN was an effective strategy to improve hygienic/sanity conditions at a cafeteria.
Keywords: Good practices. Food service. Traffic light colors.

RESUMO
Uma estratégia para melhorar as boas práticas de fabricação foi aplicada em uma cantina escolar (Belo Horizonte, Brasil). O Sinal de Qualidade em Unidades de

Alimentação e Nutrição (SQUAN) consiste em uma estratégia para avaliar o nível de conformidade de serviços de alimentação às boas práticas, o que inclui classificar seus setores em diferentes cores baseadas no sinal de trânsito. Inspeções foram realizadas em todos os setores da cantina durante três meses. Os itens avaliados foram classificados como “conformes” ou “não conformes” de acordo com a Resolução 216 da Agência Nacional de Vigilância Sanitária. Os setores com 80-100% de conformidade receberam o “Sinal Verde”; 60-80% “Sinal Amarelo”; e menos de 60% “Sinal Vermelho”. O presente estudo teve como objetivo avaliar se o SQUAN foi uma boa estratégia para melhorar a higiene geral da cantina escolar. Os setores de carnes e acompanhamentos, saladas e sobremesas apresentaram melhora de 87%, 12% e 35% quanto ao cumprimento das boas práticas, respectivamente. O setor de saladas atingiu o “Sinal Amarelo”, mas os demais setores atingiram o “Sinal Verde” e permaneceram assim até o final do estudo. De nosso conhecimento, até o momento nenhum estudo propõe o uso de cores baseadas em semáforos como meio educacional para a implementação de boas práticas em serviços de alimentação. Diante do exposto, o SQUAN foi uma estratégia eficaz para melhorar as condições higiênico-sanitárias em um refeitório.
Palavras-chave: Boas práticas. Serviço de alimentação. Semáforo.

1 INTRODUÇÃO

Food handling constitutes an important source of foodborne pathogens that causes several diseases (MEDEIROS *et al*., 2017). Such diseases are caused by the ingestion of microorganisms or toxins only – contributing, then, to worldwide morbidity and mortality (AUAD *et al*., 2019).

Despite industrial advancements and governments’ efforts to ensure food safety, the number of food poisoning cases have not reduced (ANDRADE *et al*., 2020). Thus, foodborne diseases still remain a major public health concern worldwide (AUAD *et al*., 2019; Saccol *et al*., 2016). According to the World Health Organization (WHO), approximately 600 million people are food poisoned every year - resulting in 420.000 deaths, worldwide (WHO, 2020). In 2018, Brazil registered 597 outbreaks of foodborne diseases that exposed 57,297 people to microorganisms/toxins. According to these data, 8,406 of these people became ill, 916 demanded hospitalization, and 9 died (BRASIL, 2018). Schools and day care centers were responsible for 9.0% of foodborne disease outbreaks, from 2009 to 2018, in Brazil (BRASIL, 2018).

Foodborne diseases not only have a major impact on the individual affected, but also play an important role in food services (SACCOL *et al*., 2016). In Brazil, manufacturing practices are enforced by the Brazilian Health Surveillance Agency (Agência Nacional de Vigilância Sanitária – ANVISA) to ensure food hygiene and quality. Food services must comply with manufacturing rules as described by the Technical Regulation of Good Practices for Food Services (RDC 216) (BRASIL, 2004). These include waste management, packaging, food preparation, storage,

transportation, consumption and handling (BRASIL, 2004).

Food handlers are important characters in every stage throughout meal preparation until its delivery. Since they must promote food safety, prior training on good manufacturing practices should be required from them (DEVIDES; MAFFEI; CATANOZI, 2014). However, knowledge itself is not enough to promote good practice (CUNHA *et al*., 2014; ZANIN *et al*., 2017). Therefore, new strategies to improve food safety in food services have been proposed (ANDRADE *et al*., 2020). Prevention programs as well as frequent inspections are extremely necessary. Prevention programs as well as frequent inspections are extremely necessary. To our knowledge, until this time no study proposes the use of traffic-light-based colors as an educational means for implementing good manufacturing practices in food service.

This paper presents the Quality Signal in Food Services (SQUAN - Sinal de Qualidade em Unidade de Alimentação e Nutrição), a strategy to monitoring of good manufacturing practice thus contributing to improve overall hygiene and prevent of foodborne illness. The strategy is based on assessing the degree of compliance of different cafeteria sectors to good manufacturing practices and classifying and grouping these practices into different traffic-based colors. The strategy was used in a school cafeteria of Belo Horizonte (Brazil). Thus, the present study aimed at evaluating whether the Quality Signal in Food and Nutrition Units (SQUAN - Sinal de Qualidade em Unidade de Alimentação e Nutrição) was a good strategy to improve school's cafeteria overall hygiene.

2 MATERIAL E MÉTODOS

Good manufacturing practice in the cafeteria of a private school located at Belo Horizonte (state of the Minas Gerais, Brazil) was assessed. This school was chosen based on convenience.

The cafeteria provided approximately 400 onsite meals per day to high school and elementary school students throughout the school year. The meals were cooked by 21 employees in the cafeteria itself. All the employees who were directly involved in meal production (preparation of meat, side dishes, salad, and dessert) participated in the present study. All participants signed two copies of a consent form. The school representative was also given a consent form.

An initial evaluation of the school cafeteria was conducted to confirm the need of hygienic improvement. Initial diagnostic evaluation was assessed during the production of meals via visual inspection, without any prior notice.

After the initial evaluation, a two-day, one-hour long, training course was offered to food handlers. The course focused on good manufacturing practices, covering the fundamental principles of proper food handling and environmental and personal hygiene to ensure food safety.

Next, a simple strategy to evaluate the school's cafeteria compliance to legislation was implemented. The results of each cafeteria sector were displayed to promote behavioral changes among employees regarding food handling.

A single trained researcher weekly monitored the cafeteria's compliance to good manufacturing practices, over a 3-month period. These weekly inspections were performed in all three cafeteria sections – meat and side dish preparation, salad preparation, and dessert preparation. Inspections were done with no prior notice to the school cafeteria to avoid bias.

Compliance to good practices in the school cafeteria was visually inspected following a checklist based on the RDC 216 (BRASIL, 2004). This checklist was subdivided into 34 items that were covered in the training course (food handling and environmental and personal hygiene) and there were only two possible answers: compliant or non-compliant. The following formula was applied to calculate the rate of compliance to good practices: (number of items in compliance x 100)/ total number of items in the questionnaire).

The results of each sector were presented weekly via traffic-light-based colors, publicly, on high visibility places. The colors and meanings were: (i) green, 80% to 100% of compliance; (ii) yellow, 60% to 80%; and (iii) red, less than 60%. We called this strategy Quality Signal in Food and Nutrition Units (SQUAN- Sinal de Qualidade em Unidade de Alimentação e Nutrição).

The present study was conducted according to the Declaration of Helsinki and was approved by the institutional research ethics committee (Protocol number 44933015.6.0000.5105).

Statistical analysis

Assumption of normality was checked using the Shapiro–Wilk test. The inter-sectors comparison were made using ANOVA with Games-Howell post hoc test. SPSS Statistics (IBM SPSS Statistics for Windows, Version 15.0) was used to analyze data. A significance level was set at $p < 0.05$.

3 RESULTADOS

3.1 Initial evaluation

During initial evaluation, the main identified problems were: (i) food handler's personal hygiene (incorrect hand washing prior food manipulation, large nails, and wearing adornments); (ii) improper food storage (temperature wise); (iii) entry of

non-employees that were not wearing caps; (iv) overall inadequate cleanliness.

3.2 Checklist application

The meat and side dish preparation and salad preparation sectors were 44.1% and 53.1% in compliance to good practices one week post the training course, respectively (Table 1).

Considering the 13 weeks of the study, the average of compliance to good practices (number of items ± standard deviation; %) was significantly different between the dessert (21.92 ± 6.46; 78.36%) and the salad sectors (21.23 ± 3.03; 66.1%) ($p<0.05$). Meat and side dishes preparation sector (25.08 ± 2.36; 64.52%) did not differ significantly from the other sectors (Table 1).

Table 1 – Conformity percentages of the good practices at a school canteen in Belo Horizonte

	Sector		
Week	Meat and side dishes[1,2]	Salad[2]	Dessert[1]
1	44.11%	53.12%	62.5
2	32.35%	62.5%	62.5%
3	52.94%	78.12%	75.0%
4	41.7%	62.5%	81.25%
5	70.58%	81.25%	81.25%
6	44.11%	71.87%	81.25%
7	64.70%	59.37%	81.25%
8	76.47%	68.75%	84.37%
9	85.29%	81.25%	81.25%
10	79.41%	65.62%	81.25%
11	82.35%	53.12%	81.25%
12	82.35%	62.5%	81.25%
13	82.35%	62.5%	84.37%

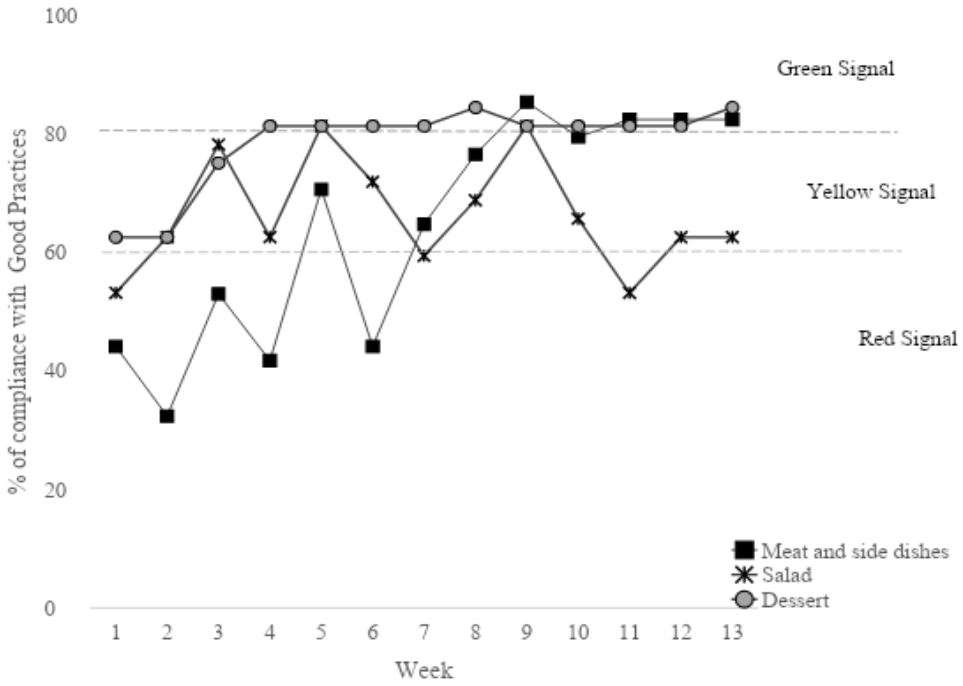
Different numbers indicate significant differences between cafeteria sectors ($p < 0.05$).

Fonte: Autoras (2022).

Figure 1 shows the classification of the sectors during the 13 weeks of the study. In the first week, the meat and side dish preparation and salad preparation sectors were classified as “Red Signal”. The Dessert preparation sector was the only one classified as “Yellow Signal” (62.5% of compliance). After, all the sectors reached the “Green Signal” (from the 4th week and 9th week onward in the meat and side dish preparation and dessert preparation sectors, respectively) except for the salad sector - which finished the study at the “Yellow Signal”, even though it reached the “Green

Signal" twice throughout the study period. Therefore, we observed an improvement regarding sectors' compliance to good practices (Figure 2).

Figure 1- Classification of the school cafeteria sectors as "Green Signal", "Yellow Signal" or "Red Signal" during the implementation of the Quality Signal in Food Services (SQUAN- Sinal de Qualidade em Unidade de Alimentação e Nutrição

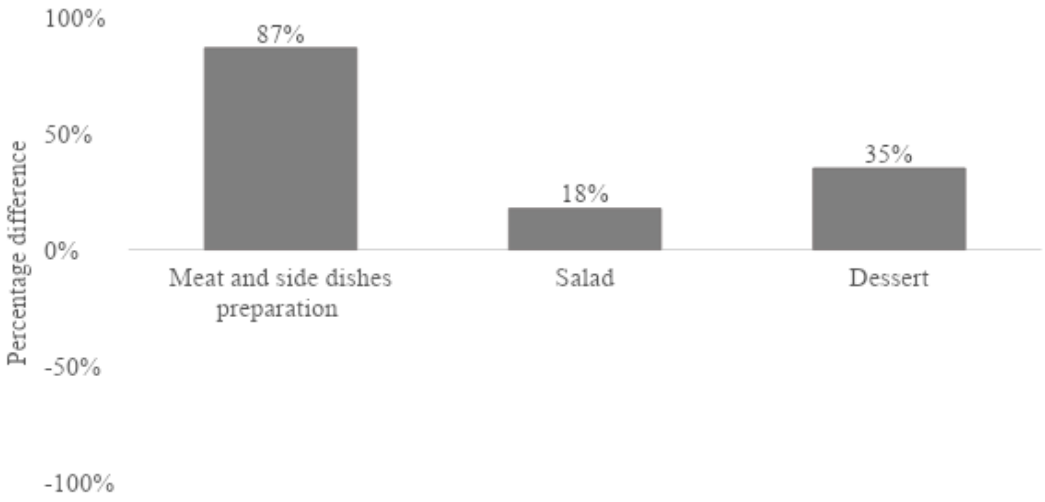


Fonte: Autoras (2022)

Food handlers must follow good manufacturing practices to ensure food safety. The present study monitored, over a 13 week period, a school cafeteria's compliance to good practices.

We observed some problems during the initial evaluation. These problems were related to hand hygiene, entry of improperly dressed non-employees into the cafeteria. Other studies also observed inadequate hygiene practices of employees (MARTINS; ROCHA, 2014; ROSSI *et al*., 2017) including wearing jewelry during food handling (ROSSI *et al*., 2017). Food handlers must be hygienic and follow strict guidelines imposed by the Brazilian sanitary regulations (BRASIL, 2004), which are: proper handwashing upon arrival at the work, after food handling, after touching contaminated materials, after bathroom visits, and upon necessity. Food handlers must also tie their hair and keep their nails short and enamel-free. Personal adornment and makeup must be removed. These requirements should also be followed by visitors Brasil, 2004).

Figure 2- Percentual difference of compliance to good practices between the first and last week of the Quality Signal in Food Services (SQUAN- Sinal de Qualidade em Unidade de Alimentação e Nutrição



Fonte: Autoras (2022)

Additional problems observed at the school cafeteria were related to improper food temperature, improper utensils, and equipment hygiene. Food must be kept in specific temperature and conditions that avoid microbial reproduction. Equipment, furniture and utensils must also be properly sanitized (BRASIL, 2004).

Our initial evaluation demonstrated the need to intensify school inspections. On the first week after training course, the three evaluated sectors evaluated demonstrated low compliance to Good Practices. Regular training is considered an important approach to reduce food contamination risk (SACCOL *et al*., 2013). However, some studies demonstrated that knowledge/training on its own is not enough (CUNHA *et al*., 2014; ZANIN *et al*., 2017). For this reason, some authors suggest that regular monitoring is the key of success (SACCOL *et al*., 2013). Strategies to encourage good practices among handlers are needed. In this sense, the present study proposed a potentially replicable activity to other food services. SQUAN motivates food handlers and encourage good practices.

The salad sector oscillated in terms of compliance to good practices. Throughout the 3 months of this study, one of this sector's employee was dismissed. The new employee underwent individual training on the same topics that were covered on the initial training, only several

weeks into the study, which may have contributed to this sector's fluctuation regarding compliance to good practices. Although the salad sector did not reach the "Green Signal" at the end of the study, it still improved its compliance to good practices.

The remaining sectors all achieved the "Green Signal" – and remained in it until the end of the study period. All sectors, in general, improved their compliance to good practices upon the use of the traffic light panel. Weekly exposure of results possibly promoted competition and motivation among sectors, demonstrating that incentive is necessary (AZEVEDO *et al*., 2014; SEAMAN, 2010). Food handlers should be aware of good practices' importance to students' health (MARZANO; BALZARETTI, 2013).

Finally, we observed an improvement in hygienic/sanity conditions in this school cafeteria upon SQUAN strategy application. Additional studies applying this strategy to other food services is also needed. Future studies should also evaluate SQUAN's efficacy longitudinally – that is, within longer periods of time.

5 CONCLUSÃO

The findings reported here demonstrate that the school cafeteria sectors were not complying to good practices in the first week after training. The salad sector only reached the "Green Signal" twice throughout the study but returned to the "Yellow Signal" and remained there until the end. The remaining sectors, however, reached and remained at the "Green Signal" until the end of the study. In general, all sectors improved their compliance to good practices in some extent. These results suggest that SQUAN is an effective strategy to improve hygienic/sanity conditions at a school cafeteria.

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