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Application of the PDCA cycle in the hygienic-sanitary quality control of a food service in a social assistance institution for children and adolescents

Aplicação do ciclo PDCA no controle de qualidade higiênico-sanitária de um serviço de alimentação em uma instituição assistencial para crianças e adolescentes

Abstract

Introduction: The PDCA cycle, which means plan, do, check, act, is a quality tool that can be used in the hygienic and sanitary control of food services. **Objective:** Verify the effectiveness of implementing the PDCA cycle in the hygienic-sanitary quality of food service in a social project. **Methods:** The research was developed by applying the PDCA cycle. The evaluation tool was the checklist of legislation n. 78/2009, used in 3 different moments between October 2022 and April 2023. Data was analyzed by frequency of conformities. **Results:** In the first application, 38.33% of conformities were found, 56.67% in the second, and 70.83% in the third, a total growth of 32.5%. Among them, action plans were elaborated and implemented, such as training, organization of the physical space, and purchase of materials and utensils. The categories that improved the most during the study were Handlers, going from 23.08% to 53.84%, Prepared Food Exposure to Consumption, from 33.33% to 50%, and Food Preparation, from 23.53% to 41.18%. **Conclusion:** This study concluded that the PDCA cycle was effective in improving the hygienic quality of food service in a social assistance project.

Keywords: Good Handling Practices. Quality Control. Collective Feeding. Meals.

Resumo

Introdução: O ciclo PDCA, cujo significado é *plan, do, check, act* (planejar, fazer, checar/revisar e agir), é uma ferramenta de qualidade que pode ser utilizada em diversos processos em serviços de alimentação. **Objetivo:** Verificar a efetividade de implementação do ciclo PDCA na qualidade higiênico-sanitária de um serviço de alimentação em um projeto social (SAPS) em uma cidade do Rio Grande do Sul. **Métodos:** A pesquisa foi desenvolvida através da aplicação da ferramenta ciclo PDCA. Para avaliação da qualidade higiênico-sanitária, foi utilizada a lista de verificação da Portaria SES/RS nº 78/2009, aplicada em três momentos distintos entre os meses de outubro de 2022 a maio de 2023. Os dados foram analisados em termos de frequências e realizou-se análise de variância (ANOVA) entre as aplicações. **Resultados:** Na primeira aplicação, foram encontrados 38,33% de adequação; na segunda, 56,67%; e na terceira, 70,83%, observando-se um crescimento total de 32,5%. Foram elaborados e implementados parcialmente cinco planos de ação – Treinamentos, Documentos, Compras, Reformas e Orçamentos –, utilizando a ferramenta 5W2H. As categorias que mais obtiveram melhoria durante o estudo foram manipuladores, de 23,08% para 53,84%; exposição ao consumo do alimento preparado, de 33,33% para

50%; e preparação do alimento, de 23,53% para 41,18%. **Conclusão:** No presente estudo, conclui-se que o ciclo PDCA foi eficaz para a melhoria da qualidade higiênico-sanitária do SAPS.

Palavras-chave: Boas Práticas de Manipulação. Controle de Qualidade. Alimentação Coletiva. Refeições.

INTRODUCTION

In the social assistance network, the nutritionist's work involves both the collective health area and collective feeding.¹ In assistance institutions, the professional must carry out, when necessary, the activities of the area of Food and Nutrition Units (FNUs), such as: coordinating the receiving and storage of foods, promoting waste reduction, training the team, developing and implementing standard operating procedures (SOPs), the good practices manual, and supervising the kitchen's hygienic-sanitary quality.¹

The absence of hygienic-sanitary quality in food services can cause diseases to the consumer. In Brazil, 6,347 disease outbreaks caused by foods were seen during 2012 and 2021, such as viral intestinal and non-specified infections. The foods that were most involved with the outbreaks were water, mixed foods (which have two or more groups in their composition), candies and deserts, and milk and its derivatives.²

Studies that evaluate good hygienic-sanitary practices have been conducted in several types of food services, such as university restaurants,³ schools,⁴ schools' kitchens,⁵ the fabrication of foods,⁶ and *self-service* restaurants, but without intervening in the units' improvements.⁴⁻¹⁰

Currently, there are quality control tools that can help with the process of adequacy to hygiene-sanitary requirements. One of them is the PDCA cycle – *plan, do, check, act*. It is a method of management that shows ways to achieve goals established by following the process in a continuous flow.¹¹ It is considered a base tool of the Quality Total Control, as it promotes continuous improvements when it is used. Initially, there is an action plan, followed by its execution and evaluation. Then, a new action is carried out, aiming at contemplating the points that were not successful in the first execution.¹²

In Brazil, food services must follow the RDC no. 216/2004, which provides for the Technical Regulation of Good Practices for Food Services; and in Rio Grande do Sul, the Ordinance of the Secretaria Estadual de Saúde (SES) (State Department of Health) No. 799/2023,^{13,14} which establishes good practice procedures for food services that complement the Resolution RDC No. 216, of September 15, 2004, and approves the Checklist on Good Practices for Food Services.¹³ By applying the PDCA cycle, checklists can be used as tools to evaluate the hygienic conditions of food services.

Some studies have used the PDCA cycle as an improvement tool for different applications, such as food industries,^{15,16} fish industry,¹⁷ and also to evaluate the degree of food waste in *fast food chains*¹⁸ since it can be interpreted as a dynamic method that helps with problem-solving.¹⁹ However, this research did not find studies that use the PDCA cycle for food services, nor studies that evaluate assistance projects.

In Itaqui, in Rio Grande do Sul, Brazil, there is the Associação de Ensino e Assistência Social (AEAS) (Association of Education and Social Assistance), which attends about 70 children and adolescents under social vulnerability in a shift that is opposite to schools'. Artistic, religious, and tutoring activities are carried out there. There is also a project linked to the Nutrition course of the Universidade Federal de Pampa (Federal University of Pampa), whose aim is to improve the nutritional and hygienic-sanitary quality of the food of the project participants.

Since the absence of hygienic-sanitary quality can lead to risks to consumers' health, such as outbreaks of foodborne diseases, it is essential for these services to have a process of continuous improvement. Thus, this study aims to verify the effectiveness of implementing the PDCA cycle in the hygienic-sanitary quality control of a food service in a social assistance institution.

METHOD

This is a qualitative-quantitative descriptive study of the action research type, carried out over seven months, between October 2022 and May 2023, in a social assistance institution in Itaquí. The institution's food service offers every child two meals in the morning – breakfast and lunch – and one meal in the afternoon – snack–, a supply of 125 meals a day. The employees include a food handler responsible for producing the meals and an assistant who helps with the distribution of the meals.

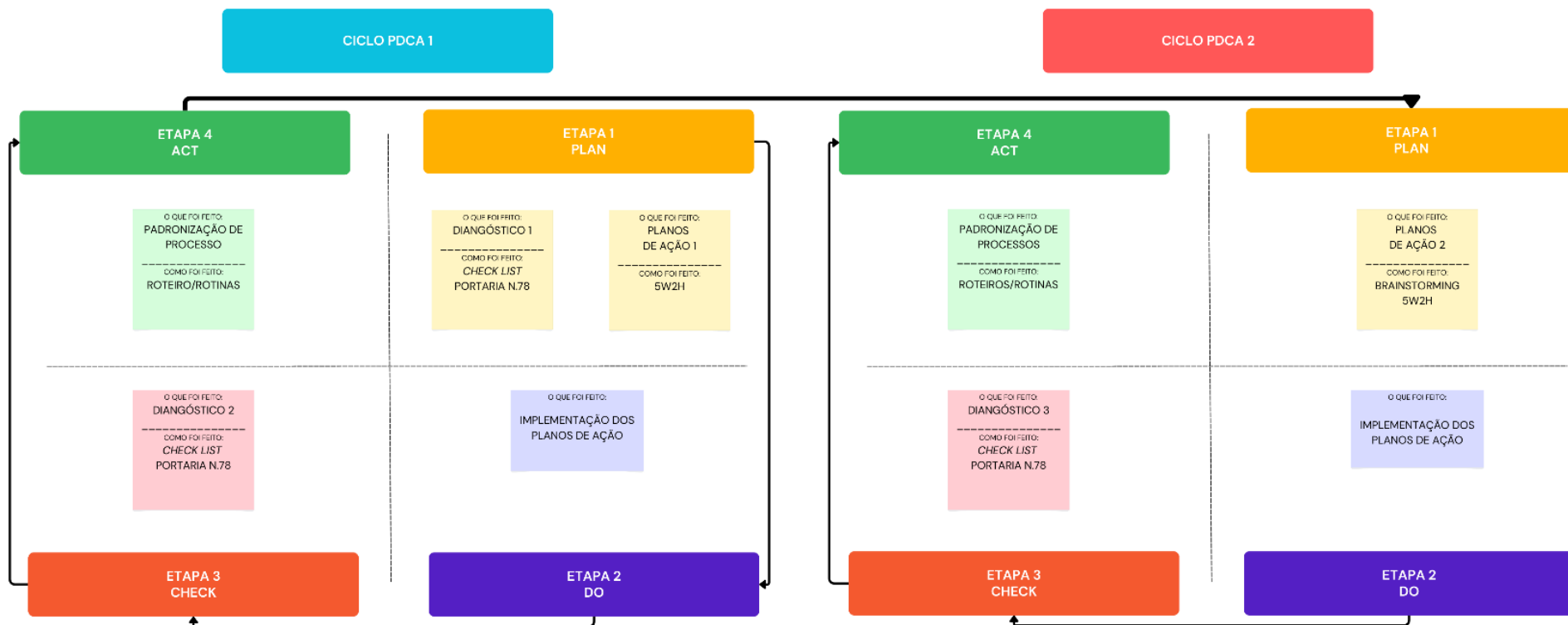
The study involved seven participants from the institution, including food handlers, religious women responsible for the project, and teachers who work at the site. The study was conducted by the advisor professor of the outreach project (registered at the university), by two students of the Nutrition course, and the nutritionist responsible for the food service.

The work was developed by applying the PDCA method. In the first stage (*plan*), the diagnosis of the food service was made through the *checklist* of Ordinance No. 78/2009,²⁰ and the percentage of adequacy to good practices was verified. Based on this diagnosis, action plans for the inappropriate items were developed. The 5W2H tool was used, which guides the plan through seven questions: *What, Why, Where, When? Who? How? How much?*¹¹ "Why" indicates the reasons why the inadequacy should be corrected. "Where?" tells where the inadequacy is. "When?" indicates the deadline for correcting. "Who?" indicates the person responsible for correcting the inadequacies. "How?" is how the correction of inadequacies will be carried out and, finally, "How much?" refers to the cost or value of the action.

The action plans were implemented in the second stage. In the *check* phase, the checklist of good practices was applied for the second time to verify the items that were adequate and to identify the remaining failures, that is, to verify which items should have been corrected with the action plan but were not. In the *Act* phase, the processes that had been corrected with the action plan were standardized.

The items that remained inadequate in these stages were inserted into a new PDCA cycle. In the *Plan* phase of the second cycle, the executing team used the *brainstorming* technique to look for causes and new solutions to the inadequacies, and a new action plan was developed.¹¹ *Brainstorming* is a tool that can help to produce ideas and suggestions on a subject, in a short period of time, and can be carried out in groups.¹¹ The plan was implemented in the *Do* phase, then went through the *Check* phase, in which compliance was verified, and the *Act* phase, in which the processes were standardized. Figure 1 presents the stages.

Figure 1. Stages of the PDCA cycle in a food service in a social assistance project.



To complete the data collection, the checklist was applied for the third and last time to evaluate the hygienic-sanitary quality of the kitchen. The checklist was applied three times at different times: 1) at the beginning of the work; (2) after implementing the first action plan in PDCA cycle 1; and 3) after implementing the second action plan in PDCA cycle 2.

The tool used for the diagnosis and subsequent evaluations was the checklist of Ordinance No. 78/2009,^a which includes 134 items distributed in 12 categories:²⁰ Building, Installations, Equipment, Furniture, and Utensils; Sanitization of Facilities, Equipment, Furniture and Utensils; Integrated Pest Control; Water Supply; Waste Management; Handlers; Raw Materials, Ingredients and Packaging; Food Preparation; Storage and Transportation of Prepared Food; Prepared Food Exposure to Consumption; Documentation and Registration and Accountability. Each item should be evaluated as “YES” when they fully comply with the legislation, “NO” when they do not comply, and “NO” when they cannot be applied in the unit. To evaluate the total compliances, this study used the classification of very poor (0% - 19%), poor (20% - 49%), regular (50% - 69%), good (70% - 90%), or excellent (91% - 100%).²¹

The answers were charted in Microsoft Office Excel software. Microsoft Office Excel, version 16.66.1 for Mac, was used for statistical analysis. This study evaluated the adequacy of the food service in the *checklist* three stages of application with the Cochran Q test, followed by the Dunn test. A 95% confidence interval and $p \leq 0.05$ were used for the analyses.

RESULTS

PDCA Cycle 1

First stage – Plan

In the diagnostic evaluation, the percentage of compliance with the legislation was 38.33%, classified as poor²¹ (Table 1). The categories with the highest compliance rates were: Water Supply (100%), Waste Management (100%), Integrated Pest Control (85.71%), Building, Installation, Furniture and Utensils (43.75%), Raw Materials, Ingredients, and Packaging (41.67%). From the first diagnosis, five action plans were developed to correct the non-conformities found – Training, Documents, Purchases, Renovations, and Budgets (Chart 1).

Table 1. Compliance with health legislation by implementing the PDCA cycle in food service of a social assistance project. Itaquí-RS, 2023.

Category	Rating 1 (%) [*]	Rating 2 (%) [*]	Rating 3 (%) [*]	Difference between ratings 1 and 3 (%)
Handlers	23.08	46.15	76.92	53.84
Prepared food exposure to consumption	33.33	83.33	83.33	50
Food preparation	23.53	52.94	64.71	41.18
Sanitization of facilities, equipment, furniture, and utensils	50	50	87.50	37.5

^a The Ordinance n. 78/2009 (SES-RS) was the legislation in force during the period of research development – October 2022 to May 2023. Ordinance n. 799/2023 (SES-RS), which revoked the Ordinance n. 78/2009 (SES-RS), was published on September 4th, 2023.

Responsibility	0	37.50	37.50	37.5
Raw materials, ingredients, and packaging	41.67	66.67	66.67	25
Building, installation, furniture, and utensils	43.75	59.38	65.63	21.88
Documents and record	0	0	16.67	16.67
Integrated pest management	85.71	85.71	100	14.29
Water supply	100	100	100	0
Waste management	100	100	100	0
TOTAL	38.33	56.67	70.83	32.5

*p<0.001 between evaluations 1 and 3, 1 and 2, and 2 and 3.

Table 1. Compliance with health legislation by implementing the PDCA cycle in food service of a social assistance project. Itaqui-RS, 2023. (Continues)

Category	Rating 1 (%)*	Rating 2 (%)*	Rating 3 (%)*	Difference between ratings 1 and 3 (%)
Responsibility	0	37.50	37.50	37.5
Raw materials, ingredients, and packaging	41.67	66.67	66.67	25
Building, installation, furniture, and utensils	43.75	59.38	65.63	21.88
Documents and record	0	0	16.67	16.67
Integrated pest management	85.71	85.71	100	14.29
Water supply	100	100	100	0
Waste management	100	100	100	0
TOTAL	38.33	56.67	70.83	32.5

*p<0.001 between evaluations 1 and 3, 1 and 2, and 2 and 3.

Chart 1. Action plans to adapt the facilities to the sanitary legislation of a food service in a project.

Item oflaw	Actionplan	Deadline	Cost (R\$)
2.4. Existence of separations between the different activities by physical or other effective means in order to avoid cross-contamination. (meat vs. salad joint processing)	1) Trainings	Short	0.0
2.13. Internal area of the establishment free of disused objects and the presence of animals.			
4.5. Existence of records that prove the control of vectors and urban pests, such as an evaluation report of the control measures carried out by the specialized company.			
7.1. Health control of handlers carried out in compliance with specific legislation, and records are kept.			
7.7. Handlers do not smoke, talk, whistle, sneeze, cough, eat, handle money, or engage in other acts that may contaminate food.			
7.10. Clothes and personal belongings stored in lockers reserved for this purpose, outside the production area.			
7.15. Visitors comply with the hygiene and health requirements established for handlers.			
8.2. Raw materials, ingredients, and packaging inspected upon receipt, following pre-established criteria for each product. Labeling products by specific legislation.			
8.3. Receipt of frozen food: - 12° C or lower or as labeled; II. Receipt of refrigerated food: 7° C or lower or as labeled; III. Existence of records proving the control of temperatures upon receipt, verified, dated, and initialed.			
8.4. Storage of frozen food: - 18° C or lower or as labeled; II. Refrigerated food: 5°C or lower or labeled; III. Existence of records proving the control of temperatures upon receipt, verified, dated, and initialed.:			
8.8. Regulated equipment for food that needs lower temperature.			
8.10. Batches of raw materials, ingredients, and packaging that are disapproved or expired are immediately returned to the supplier or identified and stored separately until their final destination.			
9.2. Measures are in place to minimize the risk of cross-contamination.			
9.4. Unused foodstuffs, packaged, and labelled according to their label.			
9.10. Defrosting conducted under refrigeration at a temperature below 5°C.			

Chart 1. Action plans to adapt the facilities to the sanitary legislation of a food service in a project. (Continues)

Item oflaw	Actionplan	Deadline	Cost (R\$)
<p>9.25. Eggs used according to the following criteria: I. Use of clean, intact eggs registered with the competent body; II. Eggs within the expiration date, with conservation and storage that does not promote cross-contamination and follow the indications on the label; III. Eggs washed with running water, immediately before use, when they are visibly dirty; IV. Foods with raw eggs, such as homemade mayonnaise, mousse, and meringue, among others, are not prepared and exposed for consumption; V. Foods prepared only with pasteurized, dehydrated, or heat-treated eggs, ensuring their safety; VI. Eggs subjected to cooking or frying have all the yolk hard; VII. Egg cartons are not reused for other purposes.</p>	<p>1) Trainings</p>	<p>Short</p>	<p>0.0</p>
<p>11.2. Handlers adopt procedures that minimize the risk of contamination of prepared food using hand antisepsis or disposable gloves.</p>			
<p>11.8. Absence of ornaments and plants in the production area and, when present in the consumption area, do not constitute sources of contamination for prepared foods.</p>			
<p>13.1. Responsible for food handling activities proven to have undergone a Training Course in Good Practices for Food Services, addressing at least: food contamination, foodborne diseases, hygienic food handling, and Good Practices.</p>			
<p>13.2. The establishment has the supporting document of the Training Course of the person responsible for food handling activities duly dated, containing the workload and syllabus.</p>			
<p>13.3. Responsible for food handling activities is updated through courses, lectures, symposiums, and other necessary activities, at least annually, on topics such as: personal hygiene, hygienic handling of food, and foodborne diseases.</p>			
<p>13.4. Existence of documents that prove the updates of the person responsible for handling the food.</p>			
<p>13.5. The person responsible for handling activities provides at least annual training in: personal hygiene, hygienic food handling and foodborne diseases for the team of food handlers under his/her responsibility.</p>			
<p>13.7. Responsible for food handling in case of outbreaks of foodborne illness makes compulsory notification to the Official Health Surveillance Bodies.</p>			

Chart 1. Action plans to adapt the facilities to the sanitary legislation of a food service in a project. (Continues)

Item oflaw	Actionplan	Deadline	Cost (R\$)
9.20. Existence of a record of refrigeration and freezing temperatures.	1) Trainings and 2) Documents	Short	0,00
9.21. Records of refrigeration and freezing temperatures checked, dated, and initialed.			
3.13. Non-disposable cleaning cloths, when used on surfaces that meet food, changed every 2 hours, not exceeding 3 hours.	1) Trainings and 3) Purchases	Short	150.00
3.15. Cleaning of cleaning cloths used on surfaces that meet food carried out in a proper place for this purpose, in exclusive containers for this activity, separated from other cloths used for other purposes. Drying the cloths in a suitable place.			
3.17. Cleaning sponges, when used on surfaces that meet food, are disinfected daily, by boiling in water, for at least 5 minutes or by another suitable method.			
9.5. Heat treatment ensures a temperature of at least 70° C in all parts of the food.			
9.6. When using temperatures below 70° C, heat treatment is guaranteed through combinations of time and temperature that ensure the hygienic and sanitary quality of the food.			
9.15. Verified, dated, and initialed hot storage temperature record.			
9.16. The temperature of the food prepared in the cooling process was reduced from 60° C to 10° C in a maximum of 2 hours.			
9.18. Prepared products frozen at temperatures of -18°C or below.			
2.20. Cleaning of the components of the air conditioning system, replacement of filters, scheduled and periodic maintenance of these registered, verified, dated, and initialed equipment.	2) Documents	Short	20.00
3.3. Existence of records of cleaning and/or disinfection operations of facilities and equipment, when not routinely performed.			
3.4. Record of cleaning and/or disinfection operations of facilities and equipment, when not routinely carried out, checked, dated, and initialed.			
7.3. Handlers' health is monitored on a daily basis.			
7.9. Existence of posters to guide handlers on correct hand hygiene and other hygiene habits, posted in appropriate places.			

Chart 1. Action plans to adapt the facilities to the sanitary legislation of a food service in a project. (Continues)

Item of law	Action plan	Deadline	Cost (R\$)
7.11. Handlers supervised and trained periodically (at least annually) in personal hygiene, food handling, and foodborne diseases.	2) Documents	Short	20.00
7.12. Proven training through documentation.			
7.13. Handlers trained on admission, addressing at least the following topics: food contamination, foodborne diseases, hygienic food handling and Good Practices.			
12.1. Food Services has a Manual of Good Practices and Standard Operating Procedures (SOPs) available to the employees involved and to the health authority.			
12.2. The SOPs shall contain sequential instructions for operations, frequency of implementation, and corrective actions, specifying the position and/or function of those responsible for the activities and approved, dated, and initiated by the head of the establishment.			
12.3. Records kept for a minimum period of 30 days from the date of food preparation.			
a) Cleaning of facilities, equipment, and furniture.			
b) Integrated Control of Vectors and Urban Folds.			
c) Reservoir hygiene.	3) Purchases	Short	500.00
d) Hygiene and Health of Handlers			
2.16. Luminaires located in the preparation area, storage, and inside the equipment that may contaminate food, appropriate and protected against explosion and accidental falls.			
2.26. Garbage collectors, in the sanitary facilities, equipped with a lid activated without manual contact and sanitized whenever necessary and at least daily.			
2.32. Existence of measuring instruments or equipment critical to food safety, such as thermometers, clocks, among others.	4) Reforms	Mean and long	--
2.8. Doors to the preparation and storage area equipped with automatic closure and adequate barriers to prevent the entry of vectors and other animals.			
2.24. Sanitary facilities and changing rooms kept organized in an adequate state of conservation and external doors equipped with automatic closing.			

Chart 1. Action plans to adapt the facilities to the sanitary legislation of a food service in a project. (Continues)

Item oflaw	Actionplan	Deadline	Cost (R\$)
3.16. Employees responsible for the activity of sanitizing sanitary facilities and sanitizing cloths with appropriate uniforms that are different from those used in food handling.	4) Reforms	Meanandlong	--
7.5. Light-colored, clean, properly maintained, complete uniform (hair protection covering the strands completely, uniform with short or long sleeves covering all personal clothing and without pockets above the waistline, without buttons or with protected buttons, trousers with short or long sleeves covering the long sleeves, closed shoes), exclusive to the food preparation area and changed at least daily.			
9.26. Keeping samples (100g/100mL) of all prepared foods, including beverages (100mL), in appropriate packaging for food, of first use, identified with at least the name andpreparation date, stored for 72 hours under refrigeration, at a temperature below 5° C, in industrial kitchens, hotels, schools, long-term social assistance institutions for the elderly and early childhood education establishments and other establishments at the discretion of the health authority.			
2.7. Ceiling with a smooth, waterproof finish, light color, easy to clean and in an adequate state of conservation.	5) Budgets	Meanandlong	--
2.9. Windows with a smooth surface, easy to clean, adjusted to the jambs with removable millimeter screens for cleaning and adequate state of conservation.			
2.11. Grease traps and sewage traps compatible with the volume of waste and located outside the food preparation and storage area.			
2.21. The food preparation area is equipped with a kitchen range hood with an internal exhaust system with filter elements or an electrostatic hood system.			
2.30. Existence of scheduled and periodic maintenance of equipment and utensils.			
2.34. Records of scheduled and periodic maintenance of equipment and utensils critical to food safety, such as at least refrigerators, freezers, and hot and cold storage and distribution equipment.			
3.8. Use of sanitizing products regulated by the Ministry of Health.			
2.5. Floor made of easy-to-clean material (smooth, waterproof, and washable) and in an adequate state of conservation. (Textured flooring)	5) Budgets and 1) Trainings	Mean and short	--

Second stage – Do

During the four months that followed the diagnosis, action plans were implemented in the food service. Initially, theoretical training with the institution's team was carried out in an expository and dialogued way, addressing all the needs of adapting the food service to the legislation, such as the requirements for handlers, the proper handling and hygiene of food in all stages of the production process, as well as the organization of the physical space. Then, *onthejob*¹¹ training was carried out with the cook for specific functions, such as food handling, temperature controls at receiving, storage, preparation and distribution, filling out worksheets, storing leftovers, and defrosting food.

Materials, equipment, and utensils such as sponges, thermal mats to support the pans in the food distribution, lamps, cleaning cloths, and scales were purchased. Regarding the reforms, a list of needs was drawn up according to the term – short-term (up to 2 months), medium-term (from 2 to 6 months), and long-term (over 6 months). Short-term actions were implemented, such as repairing the self-closing door. Medium and long-term items, such as replacing the kitchen floor, replacing the grease trap outside the food production area, and purchasing a kitchen rangehood were only budgeted, due to the institution's financial unavailability.

Third stage – Check

After implementing the action plans, the checklist was applied for the second time. The percentage of compliance was 56.67%, with an 18.34% increase compared to the first application. The highest growth was seen in the categories "Prepared Food Exposure to Consumption", with a 50% increase in compliance, "Food Preparation", with 29.41%, and "Raw Material, Ingredients, and Packaging", with a 25% increase in adequacy.

Fourth stage – Act

In this phase, the corrected processes were standardized, such as handler hygiene, food handling, hygiene, and organization of the physical space. However, some points that had already been implemented in the first action plan remained non-compliant, either due to lack of effectiveness in the intervention or due to attitudinal issues of the handlers. For this reason, non-conforming items were included in a new PDCA cycle.

PDCA Cycle 2

First stage – Plan

In the fifth month of work, the second PDCA cycle was initiated to adjust the remaining non-conformities. Based on the results of the second evaluation, the *brainstorming* technique was used during a meeting with the employees and the project's nutritionist in order to develop a second version of the action plan.

Second stage – Do

The action plan was implemented. Several spreadsheets related to food production – receiving, cooking temperature, post-cooking, cold storage – were developed, as well as records of cleaning operations – air conditioning and installations and equipment that are not routinely carried out. A *handler checklist* was also elaborated. Those responsible for handling the molding were trained on temperature control and filling out the worksheets, and a thermometer for food was purchased. Posters with hand hygiene guidelines were also made and fixed on the walls.

Third stage – Check

Seven months after starting the activities, the food service underwent its third evaluation through the checklist. A compliance rate of 70.83% was seen, classified as good,²¹ an increase of 32.5% in relation to the first evaluation. The categories with the highest growth were “Cleaning of Equipment, Furniture and Utensils”, which obtained a 37.5% increase in compliances, and “Handlers”, with a 30.77% increase in their adaptations. Table 1 shows the values of evaluations 1, 2, and 3.

There were significant differences in compliance between evaluations 1 and 3, 1 and 2, and 2 and 3 ($p < 0.001$). From the first evaluation to the second, adjustments increased by 18.34%. From the second to the third, there was a 14.16% increase. The “Handlers” category had the highest percentage of improvements, followed by “Prepared Food Exposure to Consumption”, and “Food Preparation”, as shown in Table 1. In the final evaluation, the categories with the highest evaluation rates were precisely those that required attitudinal corrections by food handlers.

Fourth stage – Act

At this stage, the appropriate items were standardized, and data collection was finished.

DISCUSSION

Except for the categories that started with 100% adequacy, all other categories improved in the evaluation of hygienic-sanitary requirements during the study, compared to the initial result. In the first evaluation, the compliance with the legislation was 38.33% (poor), and in the last one, it was 70.83% (good).²¹

A similar study, carried out in industrial kitchens, made a first evaluation, followed by training on the application of a quality tool to correct errors and saw that compliance increased from 59.4% to 76.2% after the intervention.²² This showed that studies that carry out interventions to adapt non-conformities to the legislation are effective in improving the hygienic-sanitary quality of food services.

In UAN, most studies present punctual evaluations without using interventions. A study conducted in public school kitchens found a 68% compliance.²³ In another study that evaluated several restaurants, the highest compliance rate found was 66.7%, and the others below 45% compliance.⁸ Although these studies are important to signal the need for improvements, they are not effective in improving the hygiene conditions of the establishments.

The studies show different percentages of compliance with good practice regulations. A survey conducted with 30 restaurants in Joinville (Santa Catarina) found that the compliance of 90% of the evaluated food services was 50% or less.⁸ In Porto Alegre (RS), in a sample of 15 food services, the average adequacy was 60.5%.⁹ A study with different establishments in Itaquí-RS found an average of 38.23% of compliance.¹⁰

In general, difficulties are perceived in the process of implementing the requirements for good hygienic-sanitary quality. Besides, this research did not find studies that evaluated food services in social assistance projects, for comparison purposes.

The best results in hygiene adjustments are obtained through simple systems, with processes of few steps.²⁴ After the diagnosis, this study developed action plans by using the 5W2H tool, which allowed for greater clarity on the items that needed improvement.

One of the action plans consisted of training, which was responsible for several adjustments to the legislation. Resolution No. 600/2018 indicates that it is the role of the nutritionist to collaborate with the

updating and improvement of the multidisciplinary team.¹ Besides, SES Ordinance No. 799/2023 requires that the person responsible for food handling – the technical manager or owner of the establishment or designated employee – be trained in good practices and train their staff.¹⁴

A study carried out in a university restaurant in Lajeado-RS evaluated the adequacy of good practices before and after training and saw a 61.11% adequacy before and 72.22%²⁵ after training, showing it had a positive impact on the adequacy of food service to hygienic-sanitary conditions. Carrying out training is essential for the proper functioning of food services, especially with regard to hygiene processes and handler conduct.

Another action plan was related to the elaboration of spreadsheets to assist in temperature control, cleaning the kitchen, and the handler. Regarding preparation temperatures, SES Ordinance No. 799/2023 defines that a heat treatment must be guaranteed in which at least 70°C is reached in all parts of the food and that, after preparation, the food is kept at a temperature above 60°C for up to 6 hours.¹⁴ However, there was no hot storage equipment at the site, such as a thermal counter or *passthrough*, and it was not possible to maintain the post-preparation temperature above 60°C and follow the state legislation. However, to reduce the risks of microbial multiplication, a temperature control spreadsheet was prepared according to CVS No. 5/2013, of the state of São Paulo, which defines that hot foods can remain below 60°C for a maximum of one hour.²⁶ In the food service, the distribution system took place immediately after preparation.

The application of the PDCA in this work proved to be efficient both for the identification of the non-conformities and its correction, considering that the growth in the conformity percentage was higher than 38%. Other works used PDCA as a tool for improvements in different processes, such as the study of a food industry located in the Triângulo Mineiro, Minas Gerais, that decreased the consumption of oil by 17% by using the PDCA cycle to find the problem and solve it.²⁷ Thus, the PDCA cycle is an efficient tool used in problem solving.

The study's limitations were related to the time of execution. PDCA is a cycle of continuous improvement that should always be in motion; thus, guidelines were carried out so that the service continues to improve and PDCA continues to be implemented.

CONCLUSION

No presente trabalho, o ciclo PDCA mostrou-se uma ferramenta eficaz para melhorar a qualidade higiênico-sanitária de um serviço de alimentação em uma instituição assistencial. A implementação dos planos de ação, especialmente aqueles que requeriam mudanças atitudinais, impactaram positivamente na qualidade higiênico-sanitária do serviço de alimentação.

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Flain NBP participated in the conception and design of the work, data collection and interpretation, writing of the text, review and approval of the final version; Rodrigues LP, Pereira MC, Dal Osto NB and Silveira JT participated in the

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