

Hygienic-sanitary conditions of open-air fairs and training on good manufacturing practices: a continuous work

Condições higienicossanitárias de feiras livres e capacitação em boas práticas de fabricação: um trabalho contínuo

Amanda Nayara Abreu Silva¹ 

Maysa Nayara Gabrielle Silva¹ 

Lorraine Moreira dos Reis¹ 

Fernanda Cristina Esteves de Oliveira^{II} 

Andréia Marçal da Silva^{I,*} 

ABSTRACT

Introduction: Food offered at open-air markets may be associated with cases of Food and Waterborne Diseases (FWBD), since the local structure is usually inadequate. This fact is reflected on the hygienic-sanitary conditions during the preparation, transport, exposure, and consumption of commercialized foods, which is considered a serious public health problem. Also, the lack of knowledge on the part of food handlers contributes to the dissemination of FWBA. **Objective:** To characterize the hygienic-sanitary conditions of open-air markets in the city of Sete Lagoas - Minas Gerais and to evaluate the impact of offering short training courses on Good Manufacturing Practices. **Method:** An exploratory, descriptive, quantitative, and qualitative study was carried out at open-air markets, based on the following activities: 1) Establishment of partnerships with public agencies; 2) Characterization of the hygienic-sanitary conditions of open-air markets; 3) Training of handlers and assessment of learning. **Results:** The fairs, for the most part, were structurally and organizationally distinct, but with similar problems, such as the absence or scarcity of bathrooms, trash cans with pedals and lids, drinking water and energy points, and the use of inappropriate clothing by the handlers. There was an increase in the percentage of correct answers for most questions after each mini-course, which shows that continued training is of paramount importance for the acquisition and apprehension of knowledge regarding: Good Manufacturing Practices; Fresh Foods and Canned Foods; and Labeling. **Conclusions:** The transfer of the results generated in the development of the Program to the competent bodies will help in the maintenance of marketers, minimizing risks, and offering safer products for consumption.

KEYWORDS: Good Handling Practices; Open-air Markets; Foodborne Diseases; Ready-to-eat Foods

RESUMO

Introdução: Alimentos oferecidos em feiras livres podem estar associados a casos de doenças de transmissão hídrica e alimentar (DTHA), uma vez que a estrutura local normalmente é inadequada; fato refletido sobre as condições higienicossanitárias durante o preparo, transporte, exposição e consumo dos alimentos comercializados, considerado um grave problema de saúde pública. Além disso, a falta de conhecimento por parte dos manipuladores de alimentos contribui de forma significativa para a veiculação das DTHA. **Objetivo:** Caracterizar as condições higienicossanitárias de feiras livres do município de Sete Lagoas - Minas Gerais e avaliar o impacto da oferta de minicursos de capacitações em boas práticas de fabricação. **Método:** Um estudo exploratório, descritivo, quanti-qualitativo, foi realizado nas feiras livres, a partir das seguintes atividades: 1) Estabelecimento de parcerias com órgãos públicos; 2) Caracterização das condições higienicossanitárias das feiras livres; 3) Capacitação dos manipuladores e avaliação do aprendizado. **Resultados:** As feiras, em sua maioria, se mostraram estruturalmente e

^I Universidade Federal de São João del-Rei, Sete Lagoas, MG, Brasil

^{II} Centro Universitário UNA Sete Lagoas, Sete Lagoas, MG, Brasil

* E-mail: amsilva@ufsj.edu.br

Received: Dec 22, 2021

Approved: Mar 13, 2023

How to cite: Silva ANA, Silva MNG, Reis LM, Oliveira FCE, Silva AM. Hygienic-sanitary conditions of open-air fairs and training on good manufacturing practices: a continuous work. *Vigil Sanit Debate*, Rio de Janeiro, 2023, v.11: e02029. <https://doi.org/10.22239/2317-269X.02029>



organizacionalmente distintas, mas com problemas semelhantes, como inexistência ou escassez de banheiros, de lixeiras com pedal e tampa, de pontos de água potável e energia, e uso de indumentária inadequada pelos manipuladores. Observou-se aumento no percentual de acertos para a maioria das perguntas após cada minicurso, o que mostra que capacitações continuadas são de suma importância para a aquisição e apreensão de conhecimentos referentes às boas práticas de fabricação; alimentos *in natura* e conservas e rotulagem. **Conclusões:** A transferência dos resultados gerados no desenvolvimento do Programa para os órgãos competentes poderá auxiliar na manutenção dos feirantes em suas atividades, minimizando riscos, ofertando produtos mais seguros para o consumo.

PALAVRAS-CHAVE: Boas Práticas de Manipulação; Feiras Livres; Doenças de Transmissão Hídrica e Alimentar; Alimentos Prontos para Consumo

INTRODUCTION

The preparation and sale of food on public roads has been growing, consolidating itself as a survival strategy, as well as playing an important socio-economic, cultural and nutritional role in people's lives¹. The open-air market is considered one of the most conventional places for retail food sales², with different meanings for consumers. As far as the municipality is concerned, fairs are places where the local economy is supplied and flows³ as well as being spaces that make up the history of the place, with their own identity, traditions and deep-rooted cultures⁴.

In the municipality of Sete Lagoas, Minas Gerais (MG), there are eight open-air markets, where everything from handicrafts to *fresh* and ready-to-eat food is sold. Due to the fact that they offer a wide variety of products in the same place, associated with more affordable prices and the belief that the food sold is always fresh and of superior quality, they are widely frequented by the population⁵.

In addition to the natural microbiota, food is subject to contamination by different microorganisms (including pathogens) in the various stages of production and preparation, resulting from improper handling, contact with equipment, surfaces and utensils that have not been properly sanitized⁶.

Thus, the food offered at open-air markets can be associated with cases of food and waterborne diseases (FWBD), as it is an environment with intense circulation of products and people, combined with an inadequate and even precarious local structure. Hygienic and sanitary conditions during the preparation, transportation and display of food on the market are a major public health problem. In addition, the purchase of food from dubious sources, packaging and storage in inappropriate conditions and the poor personal hygiene of the handlers are also directly associated with FWBD outbreaks, with negative repercussions on the health conditions of consumers⁷.

In Brazil, between 2009 and 2018, 6,809 outbreaks of FWBD were reported, with 120,584 patients, 16,632 hospitalized and 99 deaths. Priority actions such as public investment to improve the infrastructure of basic sanitation services and good personal and collective hygiene practices, together with the proper handling of food for consumption, are of paramount importance for the prevention, control and reduction of FWBD risks and outbreaks⁸.

The lack of knowledge on the part of food handlers contributes significantly to the spread of FWBD⁹. Therefore, training

programs are of the utmost importance as they raise awareness about the adoption of good manufacturing practices (GMP), so that they carry out preventive measures to guarantee the quality and safety of food from preparation to delivery to the consumer. In addition, specific benefits for market traders can be generated, such as a reduction in complaints from consumers and the creation of cleaner and safer working environments^{10,11}.

Therefore, the detection and rapid correction of flaws related to the hygienic and sanitary conditions of open-air markets, together with the implementation of programs aimed at raising awareness among food handlers, are pertinent in the process of preventing FWBD. It can be seen that most open-air markets face social problems, such as: organizational difficulties and a high turnover of vendors, and infrastructure problems, such as the lack of water points and specific toilets, which can make it difficult to handle food and increase the risk of contamination¹².

It is also worth noting that each individual may be at a different level of understanding and apprehension of training content, often related to their level of education, and various strategies (theoretical and practical) are needed to make them willing to make changes in order to incorporate and apply new desirable attitudes¹³.

The aim of this study was therefore to characterize the hygiene and sanitation conditions of open-air markets in the municipality of Sete Lagoas (MG) and to assess the impact of GMP training courses.

METHOD

The work was characterized as an exploratory, descriptive, quantitative and qualitative study, carried out by students participating in the Extension Program: Feira Legal, between September and November 2019, through observations and evaluations. The following activities were part of the study: 1) establishing partnerships with public bodies in Sete Lagoas; 2) characterizing the hygiene and sanitary conditions of open-air markets (including the hygiene habits and clothing of the handlers), based on *on-site* visits with the application of a *checklist* and questionnaire based on current legislation (Resolution of the National Health Surveillance Agency (Anvisa) No. 216, of September 15, 2004¹⁴; Annex III of the Resolution of the State Health Secretariat (SES)/MG No. 6.362, of August



8, 2018¹⁵ and 3) to train the handlers and evaluate their learning by applying a questionnaire (Chart) before and after the mini-courses were offered.

All the traditional open-air markets in Sete Lagoas were included, as suggested by the municipality's Health Surveillance Agency (Visa), referred to in this paper as: Market 1 (F1), Market 2 (F2), Market 3 (F3), Market 4 (F4), Market 5 (F5), Market 6 (F6), Market 7 (F7) and Market 8 (F8).

The food handlers at all the open-air markets were invited to take part in the research voluntarily, signing an informed consent form (project approved by the Research Ethics Committee of the Federal University of São João del-Rei - Opinion: 3.451.813/CAAE: 15361719.2.0000.5151).

Establishing partnerships

Initially, meetings were held with representatives of Visa of Sete Lagoas and the Secretariats of Culture and Economic

Development and Tourism, where the program's guidelines were explained, with the aim of establishing partnerships to speed up the intended actions.

Characterization of the hygiene and sanitary conditions of open-air markets

Visits were made to the open-air markets in Sete Lagoas (MG) to characterize the markets, through *on-site* observations; identifying and establishing contact with their leaders; observing hygiene and sanitation conditions and explaining the program's objectives to the market vendors. The visits were carried out on Fridays, Saturdays, or Sundays, according to how each market was operating, and were unscheduled, so there was no time for prior changes by the vendors.

After these initial meetings, the visits continued, but with the application of a *checklist* and questionnaire to assess hygiene and health conditions. The questionnaire was administered at

Chart. Questionnaire to assess learning before and after the mini-courses.

Question	Option
1 - The customer was eating a dumpling and found a bone fragment.	A) It's normal because the dumpling was chicken. B) This is a physical hazard and should not be in the food. C) This is a chemical hazard as it may contain poison.
2 - What happens when food is put in the fridge?	A) Microorganisms stop multiplying. B) Microorganisms multiply rapidly. C) Microorganisms multiply slowly.
3 - About the water used to prepare food, it is correct to say:	A) Drinking water should always be used. B) The tank should only be cleaned once a year to prevent it from wearing out. C) Water-related aspects do not affect food quality.
4 - Select the correct option about utensils (such as bowls, boards, and spoons) made of wood in food service.	A) As the cost of wood is high, its use should be avoided. B) Wood is easy to clean and therefore wooden utensils are ideal for food service. C) Wooden utensils are not recommended because they are porous, difficult to clean and can harbor microorganisms.
5 - Select the correct alternative:	A) Use pleasant-smelling sanitizing products. B) Never store cleaning products with food. C) Use hygiene products made at home, as they are more natural.
6 - Regarding the use of personal adornment (earrings, watches, rings) in food service, select the correct option.	A) They can be used as long as they are made of gold or silver. B) They should not be used as they accumulate dirt, make personal hygiene difficult, can fall into food, or cause accidents at work. C) They can be used but they need to be soaked in bleach every day.
7 - What should you look out for when buying raw materials?	A) The appearance of the food. B) The integrity of the packaging, shelf life, changes in color, texture, smell, appearance, and temperature. C) The product brand and the price.
8 - You work at the service counter in a cafeteria. Mark the correct alternative:	A) You are a food handler and must comply with all the rules of good handling practices. B) You don't have to comply with good handling practices because you don't work in the kitchen. C) You are not a food handler, but you must wear an apron and cap.
9 - How should fruit and vegetables be sanitized?	A) After washing with drinking water, disinfection with chlorine should be carried out. B) Only rinsing with drinking water is sufficient. C) After washing with drinking water, disinfection with vinegar should be carried out.
10 - What is the ideal way to defrost food?	A) The food should be taken out of the <i>freezer</i> the night before and left at room temperature so that it is defrosted the next morning. B) The food should be placed in the sun, in a container with water, until it has completely defrosted. C) The food should be defrosted inside the fridge, at the bottom, or in the defrost function of the microwave.

Source: Prepared by the authors, 2022.

Note: The participant would always mark the answer they thought was correct.



the stalls selling ready-to-eat food and contained 40 questions with yes or no answers, covering the entire food preparation chain, made up of five blocks: 1) health of the handlers; 2) training in food handling; 3) work attire; 4) GMP and food handling and 5) enjoyment of working. Although no visits were made to the market traders' homes, several questions in the questionnaire emphasized the conditions in which food is prepared, stored and marketed, from the raw material to the arrival of the food at the fair and its display on the stalls. It is important to mention that there are activities at fairs that can offer a low health risk, giving market traders the possibility of complying with the legislation¹⁵.

Handler training and learning evaluation

At the beginning of October 2019, a 4-hour mini-course was prepared to train market vendors, based on the information obtained during visits to open-air markets, consisting of five blocks of questions: 1) understanding food contamination; 2) handling environment; 3) sanitization; 4) handlers and visitors; 5) stages of food handling. The course was based on the booklet on good practices for food services, according to Resolution No. 216/2004¹⁴ and also covered aspects mentioned in SES/MG Resolution No. 6.362/2018¹⁵.

In mid-October 2019, before and after the two mini-training courses were offered in a room at the Town Hall, the questionnaire (Box) was applied, with questions related to the content presented, in order to assess the degree of understanding and apprehension of the knowledge by the marketers present.

Statistical analysis

Descriptive statistics were analyzed and the results were tabulated in a Microsoft Office Excel® 2010 spreadsheet and expressed in percentages using tables and graphs.

RESULTS AND DISCUSSION

Establishing partnerships

Partnerships with Visa and the Secretariats of Culture and Economic Development and Tourism were essential for obtaining information, such as: which open-air markets existed in the city and what would be the best approach to each representative (leader) of the open-air markets.

An initial contact and call to market vendors by the Food Engineering students taking part in the program did not result in satisfactory participation. It was therefore found that there was a need for greater collaboration from Visa, by making an official call. This participation may be related to the marketers' interest in training, but it may also be due to the fear of punishment from Visa. Devides et al.¹⁶ reported in their study that 36% of the food handlers evaluated took part in the GMP course given to increase their knowledge and 47% because it was required by Visa. In this sense, as well as being

an important supervisory body, VISA is an intermediary for professional qualification.

In addition, Visa, through the city council, provided a fixed venue for the mini-courses, located in the city center, facilitating access and providing all the necessary structure, such as multimedia image transmission equipment and sound equipment for showing exemplary videos, as well as chairs and tables.

Characterization of the hygiene and sanitary conditions of open-air markets

After applying a *checklist* and a questionnaire (Tables 1, 2 and 3), it was possible to characterize the hygienic and sanitary conditions of the open-air markets in Sete Lagoas (MG).

F1, created in 2019, was open from 8am to 4pm on Sundays. The fair's representative was instructed by Visa to contact the Feira Legal Program before starting activities, so that the fairgoers could go through a mini-training course. A visit to the fair revealed that the 12 stalls were selling ready-to-eat food (pastries, barbecues, sandwiches, broths), vegetables, and *fresh* foods. The stalls were not numbered or separated by sector; they were all arranged randomly. The stalls were in poor physical condition and lacked tables and chairs for consumers. The infrastructure was precarious, as there was no access to drinking water, power points or toilets (fixed or chemical). The garbage cans were only on the street itself and had neither a lid nor a pedal. Some irregularities were observed with regard to GMP and food preservation, such as the failure to sanitize hands and the use of ornaments by market traders.

F2 was set up in August 2019 and was open on Sundays from 8am to 2pm. It had eight stalls selling sophisticated food products such as *brownies*, edible ice cream and seafood. The stalls were numbered and always arranged in the same order, with a well-maintained physical structure and tables and chairs for consumers. All the vendors shared a single drinking water and power point, and there were no fixed or chemical toilets. Each stall had a garbage can with a lid and pedal. The handlers wore the appropriate work clothes (light-colored clothing, closed shoes and caps) and no adornments.

F3 was open on Sundays from 8am to 4pm. It had six stalls, all of which were in the food segment, arranged in an organized way, separating ready-to-eat products (broths, barbecues and portions) from fruit and vegetables. The stalls were well maintained and had tables and chairs for consumers. There were no drinking water points, so each vendor had to bring their own gallon of water from home. The only power point available was shared by all the stallholders. All the stalls had waste garbage cans with lids and pedals. The fair representative was responsible for organizing *shows* and a leisure area with toys. The toilets present were chemical and, like the *shows* and toys, were rented by the fairgoers themselves. All the fairgoers wore appropriate clothing.

When we visited F4, which was open on Sundays from 7am to 3pm, we saw 20 stalls selling food products (broths, barbecues,

**Table 1.** Percentages of compliance and correct answers*, in relation to the health of the handler (Block 1) and training in food handling (Block 2), of the study participants obtained after applying the questionnaire used to assess the hygiene and health conditions of the fairs.

	Block 1 - Handler health (%)								Average/ question
	F1	F2	F3	F4	F5	F6	F7	F8	
1. When you started selling the food, did you undergo medical and laboratory tests (parasitology, blood count, cultures)?	100,0	0	33,3	55,6	33,3	61,5	16,7	55,6	44,5
2. Do you have regular medical and laboratory tests?	85,7	100,0	83,3	44,4	50,0	84,6	83,3	11,1	67,8
3. Do you really work with wounds on the body?	92,9	100,0	100,0	77,8	100,0	100,0	83,3	55,6	88,7
4. When you have symptoms of respiratory infections (cough, sore throat), gastrointestinal infections (diarrhea), and eye infections (conjunctivitis, itching, redness), do you go to the doctor?	85,7	66,7	100,0	66,7	100,0	69,2	83,3	0	71,5
Total average per fair	91,1	66,7	79,2	61,1	70,8	78,8	66,7	30,6	-
	Block 2 - Training in food handling (%)								Average/ question
	F1	F2	F3	F4	F5	F6	F7	F8	
5. Have you taken or are you taking any kind of course, internship, or training in the area of food marketing?	14,3	33,3	33,3	44,4	83,3	38,5	50	33,3	41,3
6. Do you take part in any professional training programs related to food handling hygiene?	0	33,3	0	0	0	15,4	0	11,1	7,5
Total average per fair	7,2	33,3	16,7	22,2	41,7	27,0	25,0	22,2	-

Source: Prepared by the authors, 2022.

* Number of questionnaires answered: F1 (n = 14); F2 (n = 3); F3 (n = 6); F4 (n = 9); F5 (n = 6); F6 (n = 13); F7 (n = 6); F8 (n = 9).

sandwiches, cakes), handicrafts, clothes, and articles in general. These were not listed or separated by sector but were arranged randomly. The physical conditions of the stalls were precarious and only five had tables and chairs for consumers. There were only two drinking water points and a single power point. The garbage cans present were uncovered and shared by all. The market traders rented four chemical toilets to serve all the consumers. It was possible to observe that the majority of market traders did not pay attention to wearing light clothing, closed shoes and no adornments.

F5 operated with eight stalls on Thursdays from 6pm to 10pm. The stalls offered food such as broths, snacks, sandwiches, and various portions. Although they weren't numbered, they were set up in a clean place and kept in good condition. The tables and chairs were arranged in areas that were common to all. The traders reported difficulties with power and drinking water points, as there was one point to be shared by everyone. The only chemical toilet was rented by the traders themselves. There were garbage cans at various points in the square, but they had no lids. The food handlers wore their work clothes correctly.

F6 was open on Fridays and Saturdays from 6pm to 10pm. At this fair, the 15 stalls were arranged separately by sector and color. Those selling food (churros, cakes, barbecues, various portions) were the red stalls and were located at the beginning of the fair; the craft stalls were green and white and were located at the end of the fair. All the stalls were in good condition, and the food stalls had tables and chairs for consumers.

There were power points, but no drinking water points near the stalls. There was only one place further away as a support point, with drinking water and fixed toilets. Each stall had its own waste garbage can with a lid and pedal. The vendors wore appropriate clothing.

F7 was open on Sundays between 7am and 2pm, with 20 stalls: a handicrafts area and a bar area at the ends, between which were stalls selling baked goods, *fresh* foods, canned goods and more. The stalls were in good condition and the bar area had tables and chairs for consumers. There was only one common drinking water and power point. Chemical toilets were available (two units), which were paid for by the stallholders. Few of the stalls had pedal garbage cans. The stallholders did not wear their clothes properly (wearing ornaments, open shoes, lack of headdresses).

F8 was approached after a request from Visa, because it was an old place where ready-to-eat food was sold, but the participants had not yet undergone the Feira Legal Program training. This square, unlike the other fairs in the city, had fixed stalls (made of masonry) and was open every day from 6pm to 2am. It offered ready-to-eat products such as pizzas, noodles, sandwiches, and pastries. The structural conditions of the square were very poor, with not enough drinking water and energy points. As the structures were fixed, many raw materials were stored there under inadequate temperature conditions. The garbage cans in the square were shared by everyone and had no lids. There were no physical or chemical toilets.

**Table 2.** Percentages of compliance and correct answers, in relation to the handler's service attire (Block 3), of the study participants obtained after applying the questionnaire used to assess the hygiene and health conditions of the fairs.

	Block 3 - Service attire (%)								Average/ question
	F1	F2	F3	F4	F5	F6	F7	F8	
7. Do you wear uniforms that are clear (or an apron with a front), clean, and without pockets throughout your food marketing activities?	7,1	0	33,3	44,4	33,3	84,6	33,3	22,2	32,3
8. Do you only wear your uniform in the work area?	64,3	33,3	50,0	33,3	100,0	92,3	16,7	44,4	48,7
9. Do you wear clean, closed shoes?	42,9	66,7	100,0	66,7	66,7	76,9	100,0	66,7	73,3
10. Is your hair short or completely tied up?	57,1	100,0	66,7	100,0	100,0	92,3	100,0	77,8	86,7
11. If you wear a beard, moustache, or sideburns, do you keep them neatly trimmed?	100,0	100,0	100,0	100,0	83,3	76,9	100,0	88,9	93,6
12. Do you avoid using strong deodorants and excessive make-up?	71,4	66,7	83,3	66,7	100,0	100,0	100,0	77,8	83,2
13. Do you keep your nails trimmed and polish-free?	42,9	100,0	66,7	55,6	100,0	84,6	83,3	88,9	77,8
14. Do you work without adornment (watches, earrings, bracelets, or rings)?	7,1	66,7	66,7	44,4	66,7	38,5	66,7	55,6	51,6
15. Do you use personal protective equipment (caps, gloves, masks)?	35,7	0	66,7	88,9	100,0	61,5	16,7	55,6	53,1
Total average per fair	47,6	59,3	70,4	66,7	83,3	78,6	68,5	64,2	X

Source: Prepared by the authors, 2022.

Number of questionnaires answered: F1 (n = 14); F2 (n = 3); F3 (n = 6); F4 (n = 9); F5 (n = 6); F6 (n = 13); F7 (n = 6); F8 (n = 9).

In all the fairs visited, marketgoers reported the following difficulties: difficult access to drinking water; lack of a tap for sanitizing hands and objects; lack of a power point, lack of adequate toilets and difficulty in communicating with the town hall to resolve the problems pointed out. This highlights the importance of the municipal government's co-responsibility in providing a minimum of infrastructure and organization and contributing to the safety of the food offered in these places¹⁷.

During the visits, a 40-question questionnaire was given to each person responsible for the stall. Sixty-six questionnaires were answered: F1 (n = 14); F2 (n = 3); F3 (n = 6); F4 (n = 9); F5 (n = 6); F6 (n = 13); F7 (n = 6); F8 (n = 9).

According to Block 1 (Table 1), the F1, F3 and F6 fairs had the highest percentage of compliant and correct answers. On the other hand, the fair with the most non-conformities was F8, followed by F4. The main non-conformities were in relation to having medical and laboratory tests before starting work at the fair, as well as having them carried out periodically, also reporting the difficulty of taking time off work when they have symptoms such as a cold, for example. Another study also found that it was not compulsory for health checks to be carried out in schools¹⁸. However, it is worth noting that, according to the legislation that deals with the technical regulation on hygiene and sanitary conditions and GMP for food producing and industrializing establishments, it is mandatory to carry out periodic health checks in places where food is produced and distributed¹⁹.

As for Block 2, it can be seen that in all the fairs the percentage of compliant and correct answers was below 50.0%, with the lowest figure being found in F1 (7.2%). This is probably due to the fact that this is a recently started fair, where the traders have not yet had the opportunity to take part in training courses. The fair with the highest percentage of compliance was F5 (41.7%). The low percentages observed suggest the need to plan and implement training courses for food handlers at Sete Lagoas' open-air markets on an ongoing basis.

Devides et al.¹⁶ reported that knowledge of GMP is fundamental for planning public policies and health education programs, and for implementing and monitoring control measures. In addition, the same authors showed that the training course offered to food handlers in the city of Araraquara in São Paulo had a positive impact on the acquisition of knowledge, indicating the need for constant improvement, through regular or reinforcement courses for all those involved in food handling, with a view to product quality and food safety¹⁶.

In Table 2 (Block 3), fair F5 had the highest percentage of compliant and correct answers (83.3%), which may be related to the result reported earlier, in which it was observed that it also had a higher percentage of compliant and correct answers in relation to participation in food handling courses. In F1, the percentage of compliant and correct answers was only 47.6%, since there was a low percentage of people wearing clean, light-colored clothes, caps, closed shoes and tied-up hair, wearing uniforms only in the workplace, and most wore ornaments, colorful clothes, large nails and nail polish.



Table 3. Percentages of compliance and correct answers, in relation to good manufacturing and food handling practices (Block 4), of the study participants obtained after applying the questionnaire used to assess the hygiene and health conditions of the fairs.

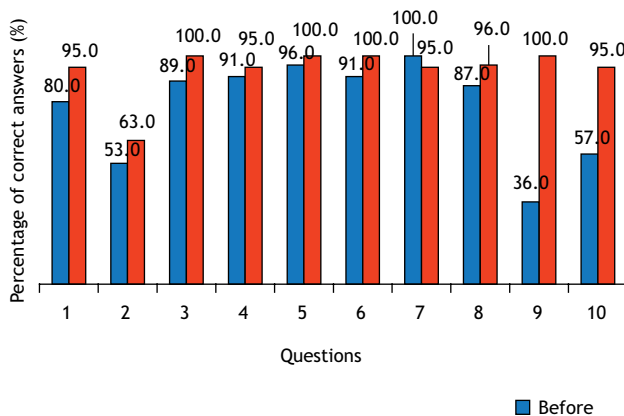
Block 4 - Good manufacturing and food handling practices (%)									
	F1	F2	F3	F4	F5	F6	F7	F8	Average/ question
16 Do you use 70% alcohol before handling food?	35,7	66,7	83,3	33,3	66,7	69,2	83,3	22,2	57,6
17. Do you handle money when you're working?	50,0	66,7	83,3	44,4	83,3	53,8	33,3	88,9	63,0
18 Is the food displayed for consumption at the right temperatures?	85,7	100,0	100,0	77,8	50,0	84,6	100,0	88,9	85,9
19. Do you notice any problems with pests at the fair?	100,0	66,7	66,7	77,8	100,0	84,6	50,0	55,6	75,2
20. Do you choose your suppliers on the recommendation of other traders?	42,9	100,0	33,7	77,8	16,7	15,4	33,3	66,7	48,3
21. Is food always bought from the same supplier?	100,0	66,7	100,0	77,8	100,0	100,0	100,0	88,9	91,7
22. Is the workplace organized at home?	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
23. Are the raw materials stored in a clean, dry, ventilated, and insect\ rodent\free place away from the ground\ walls\ceiling?	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
24. Is the product's expiration date respected?	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
25. Are cleaning products separated from food and disposables?	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
26. Are packages and cans washed with soap under running water before opening?	85,7	100,0	100,0	77,8	100,0	92,3	100,0	88,9	93,1
27. When handling food at home, do you wash your hands frequently, especially after going to the toilet, sneezing, or touching animals?	100,0	100,0	100,0	100,0	66,7	100,0	100,0	88,9	94,5
28. Do you use the same utensils for raw and cooked food?	71,4	100,0	50,0	88,9	50,0	76,9	50,0	22,2	63,7
29. In the case of frozen food, is defrosting done in the fridge or microwave?	62,3	66,7	100,0	100,0	100,0	92,3	100,0	44,4	83,2
30. Is the perishable food kept at refrigeration temperature?	100,0	100,0	100,0	100,0	100,0	100,0	100,0	77,8	97,2
31. Is the food cooked completely, including inside?	92,9	100,0	100,0	100,0	100,0	92,3	100,0	100,0	98,2
32. Is the water used for washing\preparing food and cleaning\disinfecting treated?	100,0	100,0	100,0	100,0	100,0	100,0	100,0	77,8	97,2
33 Is the water tank cleaned regularly (every 6 months)?	100,0	100,0	100,0	55,6	100,0	92,3	100,0	33,3	85,2
34. Are vegetables eaten raw washed and sanitized\disinfected?	100,0	100,0	100,0	100,0	66,7	92,3	100,0	66,7	90,7
35. Is food used in other preparations reused?	35,7	66,7	50,0	77,8	50,0	61,5	50,0	77,8	58,7
36. During transportation, is the food kept in well-sealed containers and under refrigeration?	100,0	100,0	100,0	100,0	100,0	100,0	100,0	22,2	90,3
37. Is the garbage collected every day or whenever it's full?	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
38. At home and at markets: do the garbage cans have pedals?	92,9	66,7	100,0	100,0	83,3	69,2	100,0	22,2	79,3
39. Are the garbage cans and the area where they are located washed and dried daily?	100,0	66,7	100,0	100,0	100,0	100,0	100,0	11,1	84,7
Total average per fair	85,6	88,9	90,3	87,0	84,7	86,5	87,5	68,5	X

Source: Prepared by the authors, 2022.

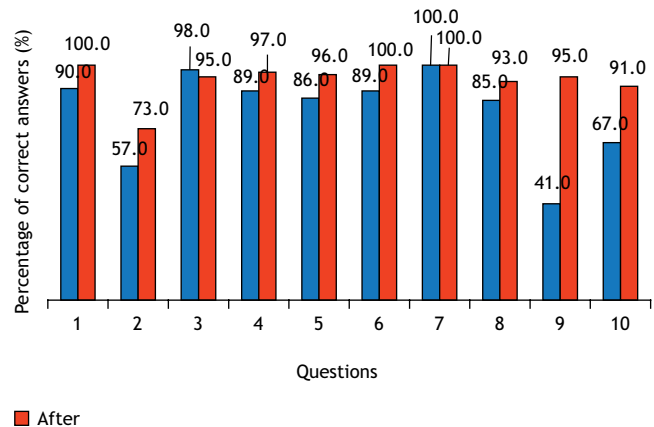
Number of questionnaires answered: F1 (n = 14); F2 (n = 3); F3 (n = 6); F4 (n = 9); F5 (n = 6); F6 (n = 13); F7 (n = 6); F8 (n = 9).



A First training mini-course



B Second training mini-course



Source: Prepared by the authors, 2022.

Figure. Average percentage of correct answers to each question in the questionnaire (Table 1), applied immediately before and after the training mini-courses: A (first mini-course) and B (second mini-course).

A study carried out with beef handlers at open-air markets and public markets in João Pessoa (PB) also found non-compliance in their clothing, such as wearing dirty aprons and not using hair protection².

Table 3 (Block 4) shows that the fair with the lowest percentage of compliance and correct answers was F8 (68.5%). The other fairs obtained a percentage of compliance and correct answers of more than 85.0%, showing that the majority of traders had a basic understanding of this issue.

It is worth noting that choosing suppliers on the recommendation of other market traders was one of the items with a low percentage (48.3%), followed by the use of 70% ethyl alcohol before handling food (57.6%) and the reuse of food in other preparations (58.7%). The low percentage of sharing supplier information among market traders is probably related to fear of competition. However, the low percentage of use of 70% alcohol before handling food is worrying, given that there are no exclusive sinks for sanitizing hands at the fairs, and that these can be vehicles for transporting micro-organisms to the food. Food is reused in other preparations by fairgoers who participate in more than one fair. Therefore, it is important that this food is stored at the right temperature and for the right length of time, avoiding the multiplication of undesirable micro-organisms, including pathogens. Almeida et al.²⁰ found 82% inadequate hand asepsis in a study of street food handlers in a municipality in the Recôncavo Baiano.

According to legislation¹⁴, hand hygiene for food handlers is a critical point for GMP, and an exclusive hand hygiene sink is recommended in the handling area, whenever necessary. In the absence of exclusive sinks, the use of 70% alcohol is of the utmost importance to prevent food-borne illnesses, as it has very low toxicity, a rapid microbicidal effect and is easy to apply.

And finally, with regard to the pleasure of working at the fair (Block 5), 100.0% of the fairgoers at all the fairs responded positively, indicating that they are happy with the job they do.

Handler training and learning assessment

In order to make the two mini-courses offered in 2019 more interactive (22 fairgoers took part in the first and 41 in the second), dynamics were used to address service attire, cross-contamination, hand hygiene and the health of handlers.

Figure (A and B) shows the average percentage of correct answers for each of the questions in the questionnaire (Table 1) applied before and after taking part in the mini-courses.

Figure A shows that there was an increase in the number of correct answers to all the questions after the mini-course, with the exception of question number 7, about what to look out for when buying raw materials. It is believed that the result may have been unsatisfactory due to the difficulty on the part of the market traders in understanding the question. Firstly, it is important to reassess the level of education of these participants and, secondly, to reformulate the question by including the word “only” and the appearance of the food in the letter “A”, so as not to leave the participant in doubt and mislead them. Lack of schooling is an aggravating factor in the search for the informal market, since the best jobs require a high level of schooling²¹. It is worth noting that the biggest increases were seen in questions 9 and 10. It is believed that this increase is due to the fact that, before taking part in the mini-course, the market traders believed that these vegetables could be sanitized using vinegar.

There was an increase in the number of correct answers to all the questions after the mini-course (Figure B), except for question 3, which referred to the care of water used in the food manufacturing and handling area. There was an increase in the number of correct answers to the last two questions, reinforcing the need for a continuous training program, due to the human characteristic of reverting to habits that are often non-compliant. The high turnover of market traders is also a cause for concern, as it has an impact on the lack of training in good food



handling practices. Therefore, a trained individual changes their habits and this action benefits society²⁰.

Andreotti et al.⁹ noted the importance of continuous and planned training to raise awareness and change the behavior of the handlers. The support of supervisory bodies and the municipality is essential to achieve good results in the training program for handlers and the implementation of GMP.

CONCLUSIONS

The fairs proved to be structurally and organizationally different, but with similar infrastructure problems, which suggests

the need for guidance and greater supervision from health control bodies and greater attention from the municipality to try to remedy or reduce structural problems. Ongoing training proved to be important for acquiring and learning about the following topics: 1) GMP; 2) *fresh* foods; and 3) canning and labeling, as they contribute to improving the hygiene and sanitation of open-air markets and perfecting the techniques and processing used.

Transferring the results of the program to the secretariats responsible for the fairs will help with guidance, inspection, and improvements to infrastructure, so that market traders can continue their activities, minimizing risks and guaranteeing the supply of safer products for consumption by the population.

REFERENCES

1. Carneiro ACLL, Cardoso LDM, Souza LT, Santos LV, Viana Filho GP. Elaboração de roteiro para inspeção das boas práticas de manipulação e comercialização de alimentos no setor informal. *Vigil Sanit Debate*. 2017;5(1):127-32. <https://doi.org/10.22239/2317-269X.00866>
2. Lundgren PU, Silva JA, Maciel JF, Fernandes TM. Perfil da qualidade higiênico-sanitária da carne bovina comercializada em feiras livres e mercados públicos de João Pessoa/PB-Brasil. *Alim Nutr*. 2009;20(1):113-9.
3. Silva A. Sustentabilidade em empreendimentos de feiras livres [tese]. Lajeado: Centro Universitário Univates; 2016.
4. Silva A, Haetinger C. Os empreendimentos de feiras livres do município de Santa Maria/RS: caracterização e sustentabilidade. *Estud Debate*. 2017;24(3):7-28. <https://doi.org/10.22410/issn.1983-036X.v24i3a2017.1196>
5. Martins AG, Caroline A, Ferreira S. Caracterização das condições higiênico-sanitária das feiras livres da cidade de Macapá e Santana-AP. *Rev Arq Científicos*. 2018;1(1):28-35. <https://doi.org/10.5935/2595-4407/rac.immes.v1n1p28-35>.
6. Faustino JS, Passos EC, Mello ARP, Araújo ALM, Souza CV, Jorge LIF et al. Análises microbiológicas de alimentos processados na baixada santista, envolvidos em doenças transmitidas por alimentos, no período de 2000-2006. *Rev Inst Adolfo Lutz*. 2007;66(1):26-30. <https://doi.org/10.53393/rial.2007.v66.32844>.
7. Oliveira AGM, Carmo CN, Leite SGF, Miguel MAL, Colares LGT. Elaboração, validação de conteúdo e da confiabilidade do instrumento para avaliação higiênico-sanitária de serviços de alimentação. *Vigil Sanit Debate*. 2014;2(3):86-93. <https://doi.org/10.3395/vd.v2i3.222>
8. Ministério da Saúde (BR). Boletim epidemiológico. Brasília: Ministério da Saúde; 2019[acesso 25 out 2021]. Disponível em: http://bvsm.sau.gov.br/bvs/publicacoes/manual_integrado_vigilancia_doencas_alimentos.pdf
9. Andreotti A, Baleroni FH, Paroschi VHB, Geres S, Panza A. A importância do treinamento para manipuladores de alimentos em relação à higiene pessoal. *Iniciac Cient Cesumar*. 2003;5(1):29-33.
10. Stefanello CL, Linn DS, Mesquita MO. Percepção sobre boas práticas por cozinheiras e auxiliares de cozinha de uma UAN do noroeste do Rio Grande do Sul. *Vivências*. 2009;5(8):93-8.
11. Coutinho EP, Nóbrega HC, Neves HCN, Silva EMG. Feiras livres do brejo paraibano: crise e perspectivas. In: Anais do 44º Congresso da Sober “Questões Agrárias, Educação no Campo e Desenvolvimento; Fortaleza, Ceará. Fortaleza: Sociedade Brasileira de Economia e Sociologia Rural; 2006[acesso 25 out 2021]. p. 1-33. Disponível: <http://ageconsearch.umn.edu>.
12. Matos JC, Benvindo LRS, Silva TO, Carvalho LMF. Condições higiênico-sanitárias de feiras livres: uma revisão integrativa. *Rev Eletr Gestão Saúde*. 2015;6(3):2884-93.
13. Norcross JC, Krebs PM, Prochaska JO. Stages of change. *J Clin Psychol*. 2011;67(2):143-54. <https://doi.org/10.1002/jclp.20758>
14. Agência Nacional de Vigilância Sanitária - Anvisa. Resolução RDC Nº 216, de 15 de setembro de 2004. Dispõe sobre regulamento técnico de boas práticas para serviços de alimentação. *Diário Oficial União*. 16 set 2004.
15. Secretaria de Estado de Saúde do Estado de Minas Gerais - SES-MG. Resolução Nº 6.362, de 8 de agosto de 2018. Estabelece procedimentos para o licenciamento sanitário do microempreendedor individual, do empreendimento familiar rural e do empreendimento econômico solidário, que exercem atividades de baixo risco sanitário na área de Alimentos. *Diário Oficial do Estado*. 9 ago 2018.
16. Devides GGG, Maffei DF, Catanozi MPLM. Perfil socioeconômico e profissional de manipuladores de alimentos e o impacto positivo de um curso de capacitação em Boas Práticas de Fabricação. *Braz J Food Technol*. 2014;17(2):166-76. <https://doi.org/10.1590/bjft.2014.014>
17. Prefeitura Municipal de Sete Lagoas. Decreto Nº 3.416, de 8 de fevereiro de 2007. Institui o regulamento disciplinar e de funcionamento das feiras livres realizadas no município de Sete Lagoas. *Diário Oficial do Município*. 9 fev 2007.



18. Rosa G, Messa V, Sereno APPG, Netto AP, Bezerra K, Sala PL et al. Estudo da prevalência de enteroparasitoses em manipuladores de alimentos de escolas do município de Umuarama, Paraná, Brasil. *Braz J Develop.* 2020;6(7):44321-30. <https://doi.org/10.1590/S1413-81232010000300033>
19. Ministério da Saúde (BR). Portaria Nº 326, de 30 de julho de 1997. Dispõe sobre o regulamento técnico sobre as condições higiênico-sanitárias e de boas práticas de fabricação para estabelecimentos produtores/industrializadores de alimentos. *Diário Oficial União.* 31 jul 1997.
20. Almeida MR, Santos PS, Lisboa CS, Conceição SS. Boas práticas de manipulação de comida de rua: estratégias de intervenção com manipuladores de um município do Recôncavo Baiano. *Rev Bras Saúde Func.* 2019;7(1):17-26. <https://doi.org/10.25194/rebrasf.v7i1.1188>
21. Stülp J. Efeitos dos setores econômicos e da escolaridade sobre o rendimento do trabalho no Rio Grande do Sul. *Rev Econ Sociol Rural.* 2006;44(1):99-118. <https://doi.org/10.1590/S0103-20032006000100005>

Authors' Contribution

Silva AM, Oliveira FCE - Conception, planning (study design), acquisition, analysis, data interpretation, and writing of the work. Silva ANA, Silva MNG, Reis LM - Acquisition, analysis, data interpretation, and writing of the work. All the authors approved the final version of the work.

Conflict of Interest

The authors inform that there is no potential conflict of interest with peers and institutions, political or financial, in this study.



CC BY license. With this license, the articles are open access, which allows unrestricted use, distribution and reproduction in any medium as long as the original article is properly cited.