

Evaluation of The Implementation of Storage Practices for Dry Foodstuffs in Relation to The Quality and Safety of Dry Foodstuffs

Jane Hasvita Sari¹, *AASP. Chandradewi², Luh Suranadi³, and Reni Sofiyatin⁴

¹⁻⁴ Nutrition Department, Mataram Health Polytechnic

Jl. Praburankasari Dasan Cermen, Sandubaya, Mataram-West Nusa Tenggara, Indonesia

²*Corresponding : chandradewi568@yahoo.com

Article Info

Article history:

Received January 4th, 2026

Revised February 26th, 2026

Accepted March 28th, 2026

Keywords:

Dry foodstuffs; Nutrition facilities; Safety; Storage racks, Quality,;

ABSTRACT

Background: The storage of dry foodstuffs that does not comply with standards can reduce quality and increase the risk of contamination, which impacts food safety. The appropriate arrangement of storage shelves is a key measure in maintaining the quality and safety of foodstuffs in nutrition service facilities.

Research Purposes: To evaluate the implementation of appropriate storage shelving in relation to the quality and safety of dry foodstuffs at the Belanting Community Health Centre Nutrition Unit.

Research Methods: This study is a descriptive observational study with a cross-sectional design. Data collection was conducted through direct observation of 10 types of dry foodstuffs before and after the implementation of appropriate storage racks. The aspects assessed included quality (colour, texture, aroma) and safety (biological, physical, and chemical contamination).

Research Result: The results showed an improvement in food quality from 40% to 80%, and an improvement in safety from 20% to 90%. These positive changes occurred following the implementation of storage racks that met standard criteria, such as the use of appropriate materials, a closed design, cleanliness of the racks, non-stacked placement of items, and separation of items from sources of contamination.

Conclusion: The implementation of appropriate storage racks plays a crucial role in improving the quality and safety of dry foodstuffs. This demonstrates that a good storage system needs to be consistently applied to ensure food quality and safety in nutrition facilities.

BACKGROUND

Community health centres (puskesmas) bear a significant responsibility for maintaining the quality of healthcare services, including the provision of safe and nutritious food through their nutrition units. One crucial aspect of this process is the management of dry food storage. Storage practices that do not meet standards can lead to a decline in food quality, increase the risk of contamination, and ultimately jeopardise food safety.

Among the various factors affecting food quality, the storage system plays a significant role. Previous research indicates that storage systems contribute significantly to food quality, particularly regarding physical stability and the prevention of contamination. One of the main components of a storage system is shelving, which must meet certain criteria such as being made of durable materials, being easy to clean, and being arranged neatly with a safe distance from the floor and walls.

At the Belanting Community Health Centre's Nutrition Unit, a standard operating procedure (SOP) for the storage of dry foodstuffs has been in place since August 2024. However, its implementation has not been optimal. Food items are still found unlabelled, stored haphazardly, and not following the first-in, first-out (FIFO) principle. One of the main reasons for the failure to implement this SOP is the lack of comprehensive SOP awareness-raising sessions for the staff responsible at the nutrition unit. The failure to conduct such

sessions is due to several factors. Firstly, management has not scheduled regular training or guidance sessions regarding the implementation of the SOP. Secondly, time and resource constraints mean that conducting the awareness-raising campaign is not a priority. Thirdly, the SOP is not openly available and easily accessible to staff at the Belanting Community Health Centre's Nutrition Unit.

The low effectiveness of the storage system, reflected in an efficiency rate of just 14.28%, has led to a decline in the quality of foodstuffs, such as changes in colour, aroma and texture, and even the growth of mould on some items. This indicates a gap between established policies and practices on the ground, which has the potential to disrupt food provision in healthcare facilities.

Given the importance of implementing an appropriate storage system and the actual conditions on the ground, this study aims to evaluate the extent to which the suitability of storage racks for dry foodstuffs influences the quality and safety of foodstuffs at the Nutrition Unit of the Belanting Community Health Centre.

MATERIAL AND METHODS

This study employed a descriptive observational design with a cross-sectional approach. The study was conducted at the Nutrition Unit of the Belanting Community Health Centre, Sembelia Sub-district, East Lombok Regency. The selection of this location was based on the results of preliminary observations conducted from December 2024 to January 2025, which indicated that the dry food storage racks at the facility did not fully comply with the applicable standard operating procedures (SOPs). This study was conducted from February to March 2025.

The subjects of this study were the nutrition officers responsible for managing foodstuffs at the nutrition unit. The research objectives covered the compliance of the dry food storage racks as well as the quality and safety conditions of the stored foodstuffs. The independent variable in this study was the implementation of storage rack compliance, comprising five aspects: rack material, rack design, rack cleanliness, rack placement, and food storage patterns. Meanwhile, the dependent variables encompass the quality and safety of dry foodstuffs. Quality assessment is based on the colour, texture, and aroma of the foodstuffs, whilst safety assessment covers the potential for biological, physical, and chemical contamination.

Data collection was carried out through direct observation using a checklist drawn up on the basis of the indicators in the SOP for the storage of dry foodstuffs. Observations were made on ten types of dry foodstuffs commonly used in nutrition facilities, namely rice, rice flour, wheat flour, spice mix, granulated sugar, palm sugar, salt, ground pepper, groundnuts and mung beans. The observation process was carried out in two periods: the first period from December 2024 to January 2025 as the pre-implementation phase of the SOP, and the second period from February to March 2025 as the post-implementation phase of the SOP. Indicators of shelf compliance included shelf structure and materials, shelf height from the floor, shelf ventilation or air circulation systems, as well as storage patterns based on the FIFO (First In First Out) principle and the completeness of food labelling.

RESULTS

The results of the observations indicate a significant improvement in the compliance of storage racks, the quality, and the safety of dry foodstuffs following the implementation of the Dry Food Storage Rack Compliance Programme at the Belanting Community Health Centre's Nutrition Unit. This improvement was assessed across five aspects of rack evaluation, as well as physical and safety indicators for the foodstuffs.

Shelf Suitability

Of the five assessment aspects (material, design, cleanliness, placement, and storage pattern), prior to implementation only 2 out of 10 food items (20%) were stored on fully compliant shelves. Following implementation, this figure rose to 9 out of 10 items (90%).

Prior to implementation, it was found that the racks were made of rust-resistant material but were not strong enough to support heavy loads. The rack design also did not meet standard requirements—there was insufficient clearance from the walls and they were still integrated with the plate racks, making cleaning difficult and increasing the risk of cross-contamination. The placement of the racks too close to the walls,

combined with a lack of adequate ventilation, hindered air circulation and led to dampness. The storage system also did not optimally apply the FIFO/FEFO principle, meaning older ingredients were not used first.

Following the implementation of the SOP, the storage racks were replaced with sturdy materials such as rust-resistant stainless steel that is easy to clean. The new design provides ideal spacing from the floor and between shelves, and is positioned with airflow and lighting in mind. Cleaning has become easier, and stock management is carried out using the FIFO and FEFO systems, accompanied by labelling and stock cards. This has created a more organised and efficient storage system.

Quality of Dry Foodstuffs

Prior to implementation, only 4 out of 10 food items (40%) were deemed to be of good quality, characterised by unchanged colour, a texture that remained dry and intact, and an appropriate aroma. Following implementation, the proportion of good-quality items increased to 8 out of 10 items (80%). The colour of the items tended to be more stable, the texture was neither clumpy nor powdery, and the aroma remained fresh. Items that still showed a decline in quality after the implementation of the dry food storage rack system, such as peanuts and green beans, were suspected to be influenced by shelf life and the condition of the items upon entry into the storage room, rather than the rack system itself.

Safety of Dry Foodstuffs

Food safety aspects also showed a clear improvement. Prior to implementation, only 20% of ingredients were deemed safe from three types of contamination (biological, physical, and chemical), whilst the remaining 80% were exposed to risk. Following the implementation of the SOP, 90% of the materials were categorised as safe. A significant reduction was observed particularly in physical and chemical contamination, where, following the intervention, no debris or chemical residues were found around the foodstuffs. Biological contamination also decreased, although some materials such as peanuts and green beans were still found to contain pests, likely stemming from the initial quality of the materials.

DISCUSSION

The implementation of appropriate storage racks for dry foodstuffs at the Belanting Community Health Centre's Nutrition Unit has had a tangible impact on improving the quality and safety of foodstuffs. These findings indicate that storage racks designed in accordance with standard operating procedures (SOPs) are capable of minimising the risk of contamination and improving overall storage conditions.

Compliance of Dry Food Storage Shelves

Prior to the intervention, the materials used for the racks did not meet requirements for durability and stability. This non-compliance resulted in racks that were unstable, difficult to clean, and prone to becoming sources of both physical and biological contamination. Following replacement with sturdier, corrosion-resistant materials such as stainless steel, the cleaning process became more effective and the risk of shelf damage decreased, as also recommended in food sanitation standards (Indonesian Ministry of Health, 2004).

From a design perspective, improvements such as ensuring adequate spacing between the racks and the floor, walls, and between rack levels, allow for better air circulation and facilitate the cleaning process. This is in line with Ministry of Health Regulation No. 1096/Menkes/Per/VI/2011, which highlights the importance of rack design in supporting food cleanliness and hygiene. The previous placement of shelves, which were too close to the walls and lacked adequate ventilation, contributed to dampness and hindered control of the storage environment. Following the reorganisation, ventilation became more optimal, and the potential for cross-contamination was reduced.

Shelf cleanliness has also improved following the implementation of the SOP. The new design separates food shelves from equipment shelves, allowing for routine and more systematic cleaning. This reinforces the findings of previous research which emphasised the importance of separating storage areas to prevent cross-contamination (Marsita, 2019; Antisa, 2023).

Significant changes were also observed in storage patterns. Before the SOP was implemented, there was no structured stock rotation system. Consequently, older food items tended not to be used first, increasing the risk of quality deterioration and wastage. Following the implementation of the FIFO (First In First Out) and FEFO (First Expired First Out) principles, storage became more organised and monitored. The addition of labels and stock cards supported the efficiency and safety of food logistics.

Quality of Dry Food Ingredients

The assessment of dry food ingredient quality in this study covered three main indicators: colour, texture, and aroma. Before the SOP was implemented, only 40% of ingredients were rated as good. Colour changes (becoming dull, yellowish, or dark) occurred due to oxidation, exposure to high temperatures, and humidity, particularly in ingredients such as flour, sugar, and nuts. The texture of ingredients such as flour and sugar became clumpy, whilst nuts showed damage in the form of fine powder. The aroma of the ingredients also turned rancid or musty in most cases, due to the degradation of constituent compounds caused by suboptimal storage.

Following the implementation of a suitable shelving system, the quality of the ingredients improved significantly. The ingredients were stored under more controlled conditions, with adequate ventilation and good air circulation. The improvement in quality was evident in the colours remaining bright, the textures remaining free of clumping, and the aromas remaining normal in 80% of the ingredients. Some ingredients, such as peanuts and green beans, still experienced a decline in quality, which was likely influenced by the initial quality of the ingredients or their long shelf life. However, overall, the change in the storage system proved to support an improvement in food quality. This supports Fellows' (2009) assertion that proper storage can extend the shelf life of food ingredients and prevent a decline in quality. This research is also consistent with the findings of Zakharia (2020), who stated that storage systems play a role of up to 92% in maintaining the quality of food ingredients in food service establishments.

Safety of Dry Foodstuffs

In addition to playing a role in maintaining food quality, a storage racking system that complies with standard operating procedures (SOPs) also makes a significant contribution to improving food safety, particularly in healthcare settings such as community health centres and hospitals. Food safety is crucial as it is directly linked to efforts to prevent biological, physical, and chemical contamination that could pose a risk to consumer health.

When storage systems do not meet standards, unhygienic shelving, shelving combined with tableware storage, and placement too close to walls can potentially trigger cross-contamination. Under such conditions, foodstuffs become more susceptible to the entry of pathogenic microorganisms, insects, or other environmental contaminants that can cause health problems. Another risk arises from shelving placed near chemical substances such as washing-up liquid, which can lead to the contamination of foodstuffs with hazardous substances.

With the implementation of an SOP-based storage system, including the use of sturdy and easy-to-clean shelves, the separation of ingredients in sealed containers, and stock management using the FIFO and FEFO systems, the hygiene standards of the storage area improve significantly. Shelf designs that are no longer integrated with tableware also facilitate the cleaning process and reduce the risk of cross-contamination.

Widyastuti (2019) states that food safety begins with a proper storage system. If storage takes place in a damp environment with insufficient ventilation, microorganisms such as mould or bacteria can easily proliferate. This is further reinforced by the Ministry of Health guidelines (2013), which emphasise that food storage warehouses must meet basic sanitation requirements, such as good air circulation, stable temperature, pest-free conditions, and dryness, to prevent foodborne illnesses.

Fauziah (2023), in her study at Bangil General Hospital, also demonstrated that substandard storage practices—such as placing food directly on the floor or against walls—increase the risk of biological and physical contamination. Furthermore, the absence of a monitoring and evaluation system contributes to weak quality control in storage.

CONCLUSIONS

Based on the results of the research conducted, it can be concluded that the implementation of appropriate storage racks has a positive impact on improving the quality and safety of dry foodstuffs at the Nutrition Unit of the Belanting Community Health Centre. Following the implementation of appropriate shelving in accordance with standards covering aspects of material, design, cleanliness, placement, and storage patterns, there was a significant improvement in food quality from 40% to 80%, and in food safety from 20% to 90%. The implementation of standard-compliant storage racks has proven capable of maintaining the

stability of the colour, texture, and aroma of dry foodstuffs, as well as preventing the risk of biological, physical, and chemical contamination. Thus, the compliance of storage racks plays a vital role in supporting the provision of safe and high-quality food at the Nutrition Unit of the Belanting Community Health Centre.

RECOMMENDATION

It is recommended that the health centre management conduct regular awareness-raising sessions on the SOP, provide training for nutrition staff, and carry out periodic monitoring of the implementation of the food storage SOP.

REFERENCES

- Bakri, B., Intiyati, A., & Widartika. 2018. Nutrition Teaching Materials: Institutional Food Service Systems. Centre for Health Human Resources Education, Ministry of Health of the Republic of Indonesia.
- Fauziah (2023) 'Qualitative Study: Food Safety Practices in the Receipt and Storage of Foodstuffs at Bangil District General Hospital', *University of Brawijaya* [Preprint]. Available at: <https://repository.ub.ac.id/id/eprint/184357/6/FAUZIAH.pdf>
- Fellows, P.J. (2009) *Food Processing Technology: Principles and Practice*. 3rd edn. Cambridge: Woodhead Publishing.
- Fennema, O.R. (1996) *Food Chemistry*. 3rd edn. New York: Marcel Dekker.
- Ministry of Health of the Republic of Indonesia. 2013. Guidelines for Hospital Nutrition Services. Jakarta: Directorate General of Nutrition and Maternal and Child Health
- Marsita, V., Putri, S. A., & Erpidawati. (2023). An overview of the principles of dry food storage in the nutrition department at Ibnu Sina Islamic Hospital, Padang Panjang. *Journal of Multidisciplinary Research*, 2(1), 327–332. <https://doi.org/10.60126/maras.v2i1.172>
- Regulation of the Minister of Health of the Republic of Indonesia. 2003. Hygiene and Sanitation Requirements for Catering Services. Minister of Health of the Republic of Indonesia. Jakarta.
- Susi (2013) 'The Effect of Palm Sugar Variety on the Quality of Crystal Palm Sugar Produced by Small Agroindustry', *Ziraa'ah*, 36(1), pp. 1–11
- Widyastuti, N. and Almira, V.G. (2019) *Hygiene and Sanitation in Food Service*, *K-Media*.
- Widyastuti, N., Nissa, C. and Panunggal, B. (2018) 'Food Service Management', *K-Media Yogyakarta*, pp. 1–83.
- Winarno, F.G., 2004. *Food chemistry and nutrition*. Jakarta: Gramedia Pustaka Utama.
- Zakharia, F. (2020) 'The Effect of Food Storage on Food Quality at the Neo Kupang Hotel', *Tourism Journal*, 3(01), pp. 52–61.
- Zakharia, F., Adiputra, F. and Meko, P. (2023) 'The Role of Food Storage Methods in Improving Food Quality at the Bintang Hotel in Labuhan Bajo, Flores', *Global Education Scientific Journal*, 4(4), pp. 2153–2162. Available at: <https://doi.org/10.55681/jige.v4i4.1468>.