

Waste management analysis at Pujale Wisdom Park UGM cafeteria

Nelly Herawaty Nababan^{1*}, Naura Rahma Ashila¹, Hana Kristina¹, Gayatri Rahma Dewi¹, Muhammad Fadhli¹, Muhammad Yusuf¹ and Ari Prayogo Pribadi¹

¹OSH Sciences, Department of Health Behaviour, Environment, and Social Medicine, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

Abstract. This study to describe consumer perspectives on waste management and analyze interventions for waste issues at Pujale Canteen UGM, which is crucial for enhancing public health and sanitation standards. A preliminary study of eight UGM cafeterias revealed that Pujale Canteen UGM achieved a score of 16 out of a total of 36 points on the UGM healthy cafeteria criteria. One hundred and sixty respondents who had visited Pujale Canteen UGM completed a consumer perspective questionnaire. Furthermore, four respondents were interviewed in depth to gain detailed insights. A fishbone analysis was employed to ascertain the priority issues, while the MEER method was utilised to identify potential solutions. The findings were unequivocal: 43.2% of respondents perceived Pujale Canteen UGM as unclean, 44.4% experienced discomfort, and 59.4% reported dissatisfaction. The interviews revealed an urgent need for improvements in sanitation, the provision of a cleaner environment, more effective waste disposal facilities, and the installation of handwashing stations. The fishbone analysis identified "Unclean Pujale Canteen UGM" as the core issue, and interventions were selected using the MEER method, including the provision of waste bins and cleanliness equipment. The primary issue at Pujale Canteen UGM is cleanliness. It is recommended that facilities and cleanliness equipment be provided to improve waste management and overall satisfaction at Pujale Canteen UGM.

1 Introduction

The importance of hygiene and environmental sanitation has become more apparent to the public. As a result of the COVID-19 pandemic, attention to the cleanliness of food, venues, and food vendors has increased significantly [1]. Collaboration among various university components is essential to cultivate a campus environment that promotes healthy and sustainable nutrition [2]. Gadjah Mada University (UGM) has established a Health Promoting University (HPU) program aimed at fostering an academic setting that enhances the health and well-being of its community [3]. In maintaining the standards of canteens at UGM, HPU has launched the "Pola Makan Sehat" program, which aims to ensure that all UGM canteens meet

*Corresponding author: nelly.herawaty.nababan@mail.ugm.ac.id

these standards. The HPU has also published a “Practical Guide to Healthy Canteens to Healthy Canteens at UGM”, which will serve as a reference for all the canteens at UGM [4].

A preliminary study was conducted by observing eight faculty canteens at UGM to assess the implementation of the HPU program using a checklist comprising 36 criteria based on the UGM healthy canteen guidelines. The results revealed that Pujale Canteen UGM scored only 16 out of 36 due to failing to meet several criteria, such as lacking designated areas for dirty plates/trays and covered bins for kitchen waste (organic waste) and non-combustible waste. In contrast, other faculty canteens scored above 30, with the Faculty of Psychology Canteen achieving a score of 34 out of 36, the Faculty of Law Canteen scoring 35 out of 36, and the FKMKM Canteen scoring 33 out of 36.

The unclean and littered Pujale Canteen UGM has resulted from indiscriminate littering. Such actions violate *UU Nomor 18 Tahun 2008 tentang Pengelolaan Sampah Pasal 29 Ayat 1(e)*, which prohibits individuals from disposing of waste in undesignated areas. Littering can pollute the environment and attract disease vectors. A dirty environment increases the risk of food contamination. Although there were no immediate health problems, preventive action is needed to reduce potential health risks [5]. Regulating students’ waste disposal behavior will support waste management initiatives at the university [6]. Alternatively, providing adequate infrastructure and improving the university’s waste management system are viable solutions [7]. Universities should implement a waste management program and work collectively with university staff and students to address waste issues [8].

Information provided by Pujale vendors through interviews indicates that the availability of hygiene equipment and sanitation personnel requires evaluation by UGM as their collaborative partner. In 2012, training sessions, seminars, and module distribution were conducted for Pujale Canteen UGM vendors, but only on a single occasion. Canteen vendors need to receive periodic training on canteen and food management to uphold university canteen standards [9]. The term “healthy canteen” encompasses a multitude of factors that contribute to the well-being of the individuals utilizing them, including the availability of nutritionally dense options, a hygienic and comfortable atmosphere, and environmentally sustainable practices. Waste management in these establishments encompasses several strategies aimed at reducing the environmental impact of the food served. These strategies may include separating organic and non-organic waste, using products that minimize environmental impact, and implementing policies that encourage the use of less plastic. By implementing these practices in healthy canteens, carbon reduction, and a healthier environment can be achieved [10].

The evaluation of canteens may involve various stakeholders, including canteen vendors, consumers, healthcare personnel, and relevant institutional officials. Consumer perspectives may offer valuable insight into the evaluation process, enabling Pujale Canteen UGM to compete with faculty canteens at UGM. Therefore, the authors intend to analyze consumer perspectives on waste management at Pujale Canteen UGM.

Many studies have addressed waste management and hygiene in food service environments in general, but often fall short in examining the unique challenges and practices in academic institutions, particularly in the context of university canteens. This research makes a unique contribution by addressing the effectiveness of existing waste management strategies, evaluating consumer perceptions, and proposing customized solutions to improve the cleanliness and sustainability of university canteens. In contrast to previous studies that focus more on broader institutional practices or general food service settings, this research offers an in-depth examination of the specific challenges and opportunities for operational improvement in university canteens. With this novel approach, this study aims to fill a gap in the existing literature and provide useful insights for other academic institutions seeking to improve their waste management and hygiene standards.

2 Materials and Methods

2.1 Participants

A total of 160 participants who visited the Pujale Canteen UGM completed the online questionnaire. Four respondents were randomly selected from 160 participants for in-depth interviews, to obtain a range of perspectives and experiences related to the research topic. The inclusion and exclusion criteria are designed to concentrate on individuals who are actively involved with Pujale Canteen UGM, allowing for relevant and up-to-date feedback. By targeting current patrons, including faculty, staff, and students at UGM, the study aims to gather specific insights into the effectiveness and impact of the canteen's waste management practices. This targeted approach ensures that the data collected is actionable and can contribute to enhancing waste management and overall standards in the canteen.

2.2 Research Model Teaching

The research model employed in this study is based on quantitative research methods, which were used to gather data on consumers' perspectives regarding cleanliness, comfort, and satisfaction with the Pujale Canteen UGM. The study employs the fishbone method to root causes of problems related to cleanliness, comfort, and satisfaction, facilitating a structured approach to identify critical issues. Besides that, the study used the Methodology, Effectiveness, Efficiency, and Relevance (MEER) method to ensure that the solutions proposed are practical, effective, efficient, and relevant to the specific challenges faced by the canteen. Together, these methods provide a thorough and systematic approach to improving the canteen's operations based on consumer feedback.

2.3 Data collection tools

The data were gathered via an online questionnaire on Google Forms, which concentrated on consumers' perceptions of the cleanliness, comfort, and satisfaction with the Pujale Canteen UGM. To gain a deeper understanding of the findings yielded by the questionnaire, four selected respondents participated in in-depth interviews.

2.4 Data evaluation and statistical analysis

The data obtained from the questionnaire were subjected to a series of processing stages, including editing, coding, data processing, and cleaning. The fishbone method was employed to ascertain the priority of the issues identified, while the MEER method was utilised to identify and evaluate the efficacy of potential solutions.

3 Results and Discussion

3.1 Results

Data were collected via an online questionnaire from October 16 to October 22, 2023, to assess the cleanliness, comfort, and customer satisfaction at the Pujale Wisdom Park Canteen. This evaluation is contextualized by comparing it to the high standards observed in other UGM canteens. For instance, the Faculty of Psychology Canteen, with a score of 34/36, is noted for its clearly labelled waste bins, regular cleaning schedules, well-equipped handwashing stations,

and efficient ventilation. The Faculty of Law Canteen, scoring 35/36, excels in waste sorting, adheres to strict sanitation practices, and offers comfortable seating, while the FKMK Canteen, with a score of 33/36, stands out for its strong hygiene practices, modern waste management infrastructure, and positive customer feedback. These examples set a high benchmark for waste management and hygiene, highlighting areas where the Pujale Canteen can improve to meet similar standards. The majority of participants were aged 15-20 years (66.8%), male (58.13%), and participants (97.5%) were members of the UGM academic community.

Table 1. Demographic information of participants

Characteristics	n (%)
Age	
15-20	107 (66.87)
21-25	49 (30.62)
26-30	44 (2.6)
Gender	
Female	67 (41.88)
Male	93 (58.13)
Status	
UGM Academic Community	156 (97.5)
Non-UGM Academic Community	4 (2.5)

Table 2 presents the results of the consumer perspective questionnaire scores. The distribution of consumer perspectives regarding the comfort of Pujale Canteen UGM in the bad category (very bad and bad) is 43.2%, while the total percentage of the good category is 56.8%. The total percentage of the uncomfortable category (very uncomfortable and uncomfortable) is 44.4%. Meanwhile, the total comfortable category (comfortable and very comfortable) is 55.6%. The total percentage of consumer satisfaction with Pujale Canteen UGM, as indicated by the dissatisfied category (very dissatisfied and dissatisfied), is 59.4%, and the total satisfied category (satisfied and very satisfied) is 40.7%. Since the percentage between the bad and good categories has a slight difference, further assessment is needed by conducting in-depth interviews.

In-depth interviews represent the next step in obtaining a more comprehensive understanding of the questionnaire results. During these interviews, informants consistently highlighted key points related to cleanliness, the availability of trash bins, and facilities such as sinks for handwashing. Several distinctions were noted between the Pujale Canteen and faculty canteens at UGM. Faculty canteens at UGM demonstrate better waste management, with trash bins classified according to organic, inorganic, and paper waste, strategically placed for easy access. Faculty canteens also maintain higher cleanliness standards by employing dedicated cleaning services, whereas the Pujale Canteen lacks such provisions. Additionally, faculty canteens offer adequate handwashing facilities, which are absent at the Pujale Canteen.

Informants suggested several improvements for the Pujale Canteen, including repairing the leaking roof, enhancing cleanliness, providing better trash bins, and encouraging management initiatives to maintain customer comfort and cleanliness. Student awareness and responsibility were also emphasized as critical factors in maintaining the canteen's cleanliness. Consequently, the desired changes require collaboration between management and visitors to create a clean, comfortable, and healthy canteen environment.

Table 2. Consumer Perspectives Questionnaire Scores

Variable	N (%)
Cleanliness	
Very bad	26 (16.3)
Bad	43 (26.9)
Good	82 (51.2)
Very good	9 (5.6)
Comfort	
Very uncomfortable	38 (23.8)
Uncomfortable	33 (20.6)
Comfortable	73 (45.6)
Very comfortable	16 (10.0)
Satisfaction	
Very dissatisfied	41 (25.6)
Dissatisfied	54 (33.8)
Satisfied	58 (36.3)
Very satisfied	7 (4.4)

Table 3. Problem Solution Analysis using MEER

	Alternative Solutions	Values				Total	Ranking
		M	E	E	R		
1.	Provide closed and sorted trash bins	5	4	5	5	19	I
2.	Provide cleaning equipment	5	4	4	5	18	II
3.	Create a Self-service Program	3	3	5	5	16	III
4.	Create a canteen cleanliness monitoring program	2	3	2	4	11	IV

The main problems derived from each variable and interview results fill the fishbone diagram. The fish head represents the priority issue. The problem identification for Pujale Canteen UGM using the fishbone tool is illustrated in **Figure 1**. Based on the fishbone analysis of cleanliness, comfort, and satisfaction, three main problems were identified for each variable. In the cleanliness variable, the most significant issue is waste that has not been managed properly, with scattered trash and messy, untidy stalls in the interior of Pujale Canteen UGM. In the comfort variable, the primary concern is the uncomfortable condition and atmosphere of the canteen due to foul odors, high temperatures causing discomfort for customers, and inadequate lighting in the Pujale Canteen UGM Area. Lastly, in the satisfaction variable, the main problems are the limited parking space, dirty toilet facilities, and the absence of a suggestion box in Pujale Canteen UGM.

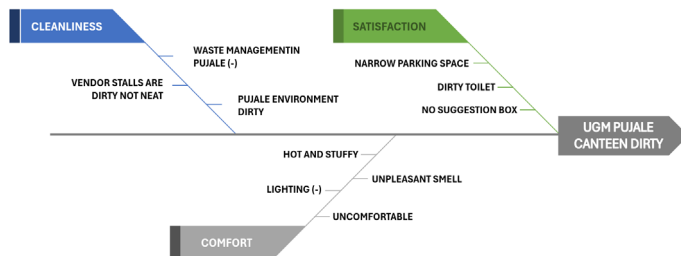


Fig. 1. Problem Identification using The Fishbone Method

3.2 Discussion

This research not only evaluates cleanliness, comfort, and satisfaction at Pujale Canteen UGM but also reveals important social implications. Improved sanitation and waste management enhance public health by lowering disease risks and creating a cleaner environment. Additionally, the study promotes environmental awareness among students and staff, potentially influencing their everyday practices and reinforcing the university's dedication to sustainability. Economically, better operational standards can increase the profitability and stability of on-campus vendors. Culturally, raising hygiene standards fosters a more positive campus environment, boosting overall community engagement and satisfaction. In essence, the findings highlight how addressing these factors can contribute to a healthier, more sustainable, and unified campus community. The issue of waste is not only a concern for the government but also at the institutional level, namely higher education institutions. In 2014, Ahmad Dahlan University (UAD) Yogyakarta stated that the average type of daily waste at UAD is inorganic waste from food consumption in canteens [13]. Furthermore, the Bogor Agricultural Institute (IPB), one of the largest academic institutions in Indonesia with a "Green Campus" program aiming for a good and comfortable environment, is still involved in waste problems. IPB has not yet implemented waste sorting [14].

The main problem in the Pujale Canteen UGM at UGM is the dirty environment caused by suboptimal waste management. The findings of a dirty canteen have two human factors: consumers and producers. Both have a role in waste management, to maintain environmental friendliness and cleanliness [15].

It is important to ensure that canteen sanitation standards are met, including proper lighting, ventilation, clean water supply, wastewater disposal, handwashing facilities, and waste disposal conditions. Therefore, the university/management is required to provide facilities that meet the standards. Steps to ensure continuous improvement in personal hygiene, sanitation, and food safety practices in university cafeterias are: 1) Routine inspections and assessments should be conducted to identify areas where the canteen does not meet sanitation standards, 2) adequate training programs should be implemented to educate food workers about personal hygiene, sanitation, and food safety practices, 3) proper handwashing facilities should be provided and maintained to ensure compliance with hand hygiene standards, 4) the canteen should establish protocols for proper waste and wastewater disposal to meet required standards, 5) continuous monitoring and evaluation of food safety practices should be conducted to identify areas for improvement and take corrective actions, 6) collaboration with relevant authorities and experts in the field can provide guidance and support in implementing best practices for personal hygiene, sanitation, and food safety in university cafeterias [16].

Waste management at the university level can be done by providing facilities that support the "Green Campus" concept, such as trash bins based on waste types, recruiting sanitation workers and waste management officers, providing waste shredders and waste sorting rooms

that are protected from insects, rats, and birds, as well as waste disposal transportation. The availability of adequate facilities will support waste management. Universities can establish policies to prohibit waste disposal within the campus environment, promote waste recycling, and provide training on waste types and sorting into three categories (wet, dry, and hazardous) to students and academic staff. This training can raise awareness among campus residents to better understand waste management and its impact on health, as well as maintaining the campus's greenery [17].

The practice of independent waste sorting by consumers, as done in fast food restaurants, is also thought to be effective in reducing waste in the canteen environment. Self-service mechanisms are useful for adding education and consumer awareness regarding waste sorting. This practice is already being implemented in faculty canteens. Of course, the introduction of informative designs or symbols related to waste sorting is needed to increase the effectiveness of the sorting program [18]. For example, information about biodegradability or recycling can be included in food packaging, which can encourage the sustainability of sorting behaviour and motivate consumers to buy environmentally friendly products [19].

According to the guidelines for healthy campus health management by the Indonesian Ministry of Health in 2019, there are several indicators of steps taken in the healthy campus program. To implement healthy canteens, it is necessary to monitor the implementation of healthy canteens within the campus environment. Monitoring is an effort carried out routinely to identify program implementation and progress towards program goals, conducted periodically every quarter. If monitoring is carried out, it will ensure that program activities are implemented following the guidelines and planning of healthy canteens [20].

Limitations of this research include the lack of similar studies related to the environmental evaluation of Pujale Canteen. The availability of previous research could have provided a deeper understanding of the issues examined in this study. This research is intended to serve as a preliminary study for future investigations. Additionally, the study did not involve the university's perspective, which could have enriched the information gathered and provided a more comprehensive evaluation.

4 Conclusion

Based on the research results, visitors are dissatisfied with dining inside the Pujale Canteen UGM, where 43.2% of consumers state that the Pujale Canteen UGM is not clean, 44.4% of consumers state that they are not comfortable eating in the Pujale Canteen UGM, and 59.4% of consumers state that they are not satisfied with the facilities and cleanliness of the Pujale Canteen UGM. The main problem with the Pujale Canteen UGM is the dirty environment, so the solution to the Pujale Canteen UGM problem is to provide trash bins, implement a self-service program, and conduct regular monitoring at the Pujale Canteen UGM. The steps taken are not only reactive to the problems currently faced by the Pujale Canteen UGM but are also proactive in improving service quality and the environment to increase the comfort and satisfaction of Pujale Canteen UGM consumers.

References

1. D. Widyanigrum, A. A. Muhammad, Customer preference in food vendor during the Covid-19 pandemic: a case study of university student. IOP Publishing. **1168**, 1-5 (2023). <https://doi.org.10.1088/1755-1315/1168/1/012042>.
2. C. Franchini, B. Biasini, A. Rosi, F. Scazzina, Best practices for making the university campus a supportive environment for healthy and sustainable diets. Current opinion in

- Environmental Science. **32**(100436), 1-7 (2023).
<https://doi.org/10.1016/j.coesh.2022.100436>.
3. Humas UGM, UGM Luncurkan Health Promoting University dalam Pembukaan Lustrum XIV (2023).
<https://ugm.ac.id/id/berita/18126-ugm-luncurkan-health-promoting-university-dalam-pembukaan-lustrum-xiv/>.
 4. Ugmsehat. Buku pedoman Praktis Kantin Sehat UGM (Health Promoting University Universitas Gadjah Mada, 2022).
<https://hpu.ugm.ac.id/2022/10/24/buku-pedoman-praktis-kantin-sehat-ugm>
 5. R. O. Sunarya, R. Yudhastuti, An overview of Food Hygiene and Sanitation in Campus Canteens Universitas Airlangga Surabaya, *Jurnal Kesehatan Lingkungan*. **11**(2), 158-165 (2019). <https://doi.org/10.20473/jkl.v11i2.2019.158-164>
 6. H. Wang, B. Ma, D. Cudjoe, M. Farrukh, R. Bai, What influences students' food waste behavior in campus canteens? *British Food Journal*. **125**(2), 381-395 (2022).
<https://doi.org/10.1108/bfj-10-2021-1103>
 7. M.A. Budiharjo, N.G. Humaira, S.A. Putri, B.S. Ramadan, S. Syafrudin, E. Yohana, Sustainable Solid Waste Management Strategies for Higher Education Institutions: Diponegoro University, Indonesia Case Study. *Sustainability*. **13**, 1-15 (2021).
<https://doi.org/10.3390/su132313242>.
 8. Mary Rose Maharlika P. Cruz, Trastalk: PUP San Pedro Campus Takes on the City's Solid Waste Management Problem. 167-181 (2023). <https://doi.org/10.1108/978-1-80071-845-620231010>
 9. A. A. M. Sabuj, F. Z. Haque, I. Younous, A. Pongit, N. Barua, G. Hossain, A. Islam, S. Saha, Microbial risk assessment of ready-to-eat-fast foods from different street-venden restaurants. *International Journal of One Health*. **6**(1), 41-48(2020).
<http://doi.org/10.14202/IJOH.2020.41-48>.
 10. Q. Long, L. Feng, C. Baoming, W. Ling-en, J. Shaosheng, Determinants of food waste generation in Chinese university canteens: Evidence from 9192 university students. *Resources Conservation and Recycling*. **167**, 105410 (2021).
<https://doi.org/10.1016/J.RESCONREC.2021.105410>.
 11. B. Cabrera-Ledesma, V. Abril-Ulloa, V. Pinos-Velez, V. Carpio-Arias, A Descriptive Qualitative Study of the Perceptions of Regulatory Authorities, Patents, and School Canteen Owners in South of Ecuador about the Challenges and Facilities related to Compliance with The National Regulation for School Canteens. *International Journal of Environmental Research and Public Health*. **20**, 1-14 (2023).
<https://doi.org/10.3390/ijerph20075313>
 12. A. Ibrahim, A. Pratiwi, D.I. Meytri, Madri, M.A. Kurniawan, N. Yuniarti, Measuring Customer Satisfaction Using CRM Scorecard in Canteen Fasilkom Unsri. *International Conference on Electrical Engineering and Computer Science*. **10**, 403-408 (2018).
[10.1109/ICECOS.2018.8605253](https://doi.org/10.1109/ICECOS.2018.8605253)
 13. S. A. Mulasari, A. Rustiawan, Domestic Waste Management Feasibility Study at Ahmad Dahlan University. *Journal of Education and Learning (EduLearn)*. **12**(4), 663-668 (2018).
<https://doi.org/10.11591/edulearn.v12i4.9232>
 14. J. Rugatiri, Z. Abidin, A. Ismail, Assessing Solid Waste Management Strategy In Higher Education Institutions Of Indonesia: A Case Study Of Ipb University. *IOP Conference Series: Earth and Environmental Science*. **771**, 1-10 (2021).
<https://doi.org/10.1088/1755-1315/771/1/012023>
 15. C. A. G. Castillo, Waste Management Practices of Canteen Workers: Basis for Policy Making in School. *Advanced Science Letters*, **24**(11), 8536-8539 (2018).
<https://doi.org/10.1166/asl.2018.12607>

16. A. Rahman, R.Tosepu, S. R. Karimuna, S. Yusran, A. Zainuddin, J. Junaid, Personal hygiene, sanitation and food safety knowledge of food workers at the university canteen in Indonesia. *Public Health of Indonesia*. **4**(4),154-161 (2018). <https://doi.org/10.36685/PHI.V4I4.219>
17. J. Jayaprakash, H. Jagadeesan, Sustainable Waste Management in Higher Education Institutions—A Case Study in AC Tech, Anna University, Chennai, India. *Green Engineering for Campus Sustainability*. 163-172 (2020). https://doi.org/10.1007/978-981-13-7260-5_12
18. Y. Hsieh, Y. Chen, W. Tsai, Making Packaging Waste Sorting More Intuitive in Fast Food Restaurant. *International Conference on Human-Computer Interaction*. **11584**, 16-31 (2019). https://doi.org/10.1007/978-3-030-23541-3_2
19. A. Bojanowska, A.Sulimierska, Consumer Awareness of Biodegradability of Food Packaging. *Sustainability*. **15**(13980), 1-16 (2023). <https://doi.org/10.3390/su151813980>
20. Kementerian Kesehatan, Pedoman Manajemen Kampus Sehat (2019). <https://simpan.ugm.ac.id/s/8zvpLZn1SSmpHNS#pdfviewer>