

Hospital Food Service Satisfaction Level and Associated Factors among Inpatients in a Teaching Hospital

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ABSTRACT

Background: Hospital food services play a significant role in aiding with the process of recovery and the well-being of the patients apart from the treatment received and the medication as such. Monitoring and assessing the level of satisfaction with hospital food services among patients is important to provide them with first-rate service that can meet their dietary requirements and needs. Thus, the objective of this study was to assess the level of satisfaction with hospital food service and associated factors among inpatients in a teaching hospital. **Methods:** This survey was conducted among 34 patients aged 18 – 65 years old who admitted at a teaching hospital in Kuantan, Pahang. Those who consumed at least three hospital main meals including breakfast, lunch, and dinner were asked to complete a questionnaire which had 3 sections: a) socio-demographic background, b) general characteristics, and c) food service satisfaction questionnaire (Patients' Satisfaction toward Hospital Food Service Questionnaire). **Results:** Majority of the patients were satisfied with the food service provided (n = 9, 26.5%), followed by highly satisfied (n = 8, 23.5%), moderate (n = 8, 23.5%), dissatisfied (n = 6, 17.6%), and highly dissatisfied (n = 3, 8.8%). In addition, the results identified a significant correlation between food attributes, staff issues, meal distribution time, physical and social factors and overall satisfaction (p < 0.01). **Conclusion:** This study provides valuable insight into patient satisfaction with hospital food services and the factors associated with it. These findings underscore the need for continuous monitoring and improvement in hospital food services to better meet patient expectations and enhance their overall hospital experience.

Keywords:

Hospital food service; satisfaction level; inpatients

INTRODUCTION

Background

Hospital food services play a significant role in aiding with the process of recovery and the well-being of the patients apart from the treatment received and the medication as such. It is because, in the process of getting better, patients need a healthy and well-balanced diet that suits their needs in addition to the medical treatment. Monitoring and assessing the level of satisfaction with food services among patients is important to provide them with first-rate service that can meet their dietary requirements and needs (Azeman et al., 2018). However, many people have a negative perception of hospital food, believing that it is bland, unappetizing, flavourless, cold, improperly displayed, and poorly served. Also, malnutrition may occur among hospitalised patients due to inadequate consumption of food among them (Ibrahim et al., 2017; Mangunsong & Junadi, 2018). Undernutrition is a common malnutrition issue in hospital settings and can arise among patients due to dissatisfaction with food service. This is because, according to Theron & O'Halloran (2022), majority of hospitalised patients had low dietary intake and poor absorption.

Other than that, patients also fail to reach their energy needs for various reasons including loss of appetite, prescribed fasting, and nausea (Rinninella et al., 2023). It also found that the level of satisfaction with hospital food services is distinct in every country that has been studied. In Saudi Arabia and Pakistan, the overall satisfaction with the quality of food services was 78.8% and 91% respectively (Abdelhafez et al., 2012; Sadaf et al., 2018). In contrast, research conducted in Malaysia revealed that only 53.3% of patients evaluate hospital food services as 'okay', and 32% of them rated hospital food services as either 'very good' or 'good' (Aminuddin et al., 2018). Identifying the factors that contribute to the dissatisfaction is important to make a better strategy to improve food services. When the root of the problem has been identified, then the healthcare organization can improve the quality of care that meets the patient's expectations and generate the presence of a patient-centered approach. Vijayakumaran et al. (2016) found that patients admitted to hospitals that use an in-house food service system had a better overall experience than hospitals using outsourced food service. The existing literature reviews lack of study that investigate the satisfaction of patients at a teaching hospital that used an outsourced centralized food service system. The study outcome will be useful in gaining insight into other similar

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healthcare settings that practice an outsourced food service model. This study is aimed to assess the hospital food service satisfaction level and associated factors among inpatients in a teaching hospital in Kuantan, Pahang.

MATERIALS AND METHODS

Study design and setting

A cross-sectional study design was used in this study. The study was conducted in a teaching hospital in Kuantan, Pahang.

Study population

The subjects were selected among inpatients in all wards excluding ICU and paediatrics wards in a teaching hospital located in Kuantan, Pahang. Eligible to participate in this study were adult patients aged 18 – 65 years old, who consumed at least a breakfast, lunch, and dinner from the hospital meals regardless of the length of stay in the hospital, received a normal and/or therapeutic diet, and were able to communicate.

Sampling method and sample size

Stratified sampling was used in this study. The patients were grouped based on designated wards; medical, surgery, orthopaedics, obstetrics and gynaecology (O&G) wards. Within each ward, patients were randomly selected for inclusion based on predefined inclusion and exclusion criteria. This approach ensured that the sample included patients from all designated wards, providing a comprehensive representation of the patient population across the hospital. The sample size for this study was 34 subjects .

Ethical Consideration

Ethical approval was obtained from the Kulliyah Postgraduate and Research Committee (KPGRC) (KAHS30/24) and from the International Islamic University Malaysia Research Ethical Committee (IREC) and Sultan Ahmad Shah Medical Centre (SASMEC) (IIR24-43).

Research Instruments

The satisfaction of patients toward hospital food service and associated factors was measured using the Patients' Satisfaction Towards Hospital Food Services Questionnaire adapted from Boughoula et al. (2020). The questionnaire was primarily self-administered by the patients. However, the researcher assisted when needed to ensure clarity and

completeness. Before distribution, the researcher explained the study's objectives and provided detailed instructions on how to complete the questionnaire. The questionnaires were distributed during mealtimes for convenience, and the completed forms were collected by the researcher once the patients had finished. The questionnaire comprised three different sections: A) socio-demographic, B) general characteristics, and C) food service satisfaction questionnaire.

Section A: Socio-demographic

This part included questions such as age, gender, education level, occupational sector, household income, marital status, and races.

Section B: General characteristics

This section included questions about types of wards, medical condition, length of hospital stay, type of diet, intake of food during hospital stay , and dependency on hospital food.

Section C: Food service satisfaction

Patients Satisfaction with Hospital Food Service questionnaire was used (Boughoula et al. 2020). It was translated back-to-back from English to Malay. The questionnaire was reviewed by to experts specializing in Teaching English as a Second Language (TESL) and four lecturers who have backgrounds in food service and dietetics to provide feedback on the content and clarification of terms before the actual data collection commenced. The questionnaire comprised four underlying dimensions of patients' satisfaction with hospital food service including dimension food attributes, staff issues, meal distribution time and physical and social dimensions. There were 12 questions on food quality attributes in the dimension of food attributes; 4 questions dealt with staff issues; 5 questions in the dimension of mealtimes, and 3 questions related to environment in the physical and social dimension sector. Patients were asked to show their level of satisfaction by selecting a response on a 5-point Likert scale with the maximum point was 5, and the minimum point was 1. The highest scale was 5 for highly satisfied, 4 for satisfied, 3 for moderate, 2 for dissatisfied, and the lowest scale was 1 for highly dissatisfied. A mean score of ≤ 2.50 was considered as dissatisfied, with a score of ≥ 2.50 but < 3.50 was moderate, and a score of 3.50 was satisfactory.

Statistical analysis

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 17.0. Descriptive statistics were used to summarize the subjects' socio-demographic, general characteristics data and satisfaction levels. The association between overall satisfaction and associated factors influencing patients' satisfaction with

hospital food service was examined using Spearman's rank correlation analysis with a significant value p , 0.05.

RESULTS

Socio-demographic background

A total of 34 inpatients from a teaching hospital aged between 20 to 65 years old were recruited in this study with the majority of the subjects aged between 51 and 65 years old ($n = 22$, 64.7%). Overall, more females ($n = 18$, 52.9%) than males ($n = 16$, 47.1%) participated in this study. In addition, it was found that most subjects had completed secondary education ($n = 11$, 32.4%). Besides, the highest number of subjects were either retired or not working ($n = 13$, 38.2%). The majority of the patients had a household income range of less than RM 5250 ($n = 28$, 82.4%). In terms of marital status, most of the patients were married ($n = 30$, 88.2%). Last but not least, the majority of subjects recruited were Malay ($n = 33$, 97.1%). (Table 1).

Table 1: Socio-demographic characteristics of inpatients in teaching hospital ($n=34$)

Characteristics	Variables	Frequency (n)	Percentage (%)
Age	1	0	0
	≤20	3	8.8
	21 – 30	5	14.7
	31 – 40	4	11.8
	41 – 50	22	64.7
Gender	Male	16	47.1
	Female	18	52.9
Educational Level	No education/ primary	9	26.5
	Secondary	11	32.4
	Diploma	5	14.7
	Bachelor/ Master/PhD	9	26.5
	Occupational Sector	Private	7
Occupational Sector	Government	10	29.4
	Self	4	11.8
	Not working/ retired	13	38.2
	Household Income (RM)	≤RM 5250	28
RM 5250 – RM 11819		6	17.6
≥RM 11 819		0	0
Marital Status		Single	3
	Married	30	88.2
	Widow	1	2.9
Race	Malay	33	97.1
	Chinese	0	0
	Indian	1	2.9
	Others	0	0

General characteristics of inpatients in a teaching hospital

About 18 patients (52.9%) came from internal medicine wards. Next, the most common medical problems among participants were diabetes ($n = 7$, 20.6%) and hypertension ($n = 7$, 20.6%). The majority of participants stayed less than a week in the hospital ($n = 25$, 73.5%). Aside from that, the highest number of

participants in this study received the therapeutic diet ($n = 20$, 58.8%). Besides, the majority of the participants responded that their intake did not change during their hospital stay ($n = 18$, 52.9%). Lastly, most of the participants did not depend solely on the hospital food ($n = 22$, 64.7%). (Table 2)

Table 2: General characteristics of inpatients in a teaching hospital ($n=34$)

Characteristics	Variables	Frequency (n)	Percentage (%)
Type of wards	Internal Medicine	18	52.9
	Surgery	9	26.5
	Orthopaedics	4	11.8
	O&G	3	8.8
	Medical status	None	5
Medical status	Diabetes	7	20.6
	Kidney disease	2	5.9
	Stroke	6	17.6
	Hypertension	7	20.6
	Others	7	20.6
	Length of hospital stay	≤1 week	25
1 – 2 weeks		8	23.5
2 – 4 weeks		1	2.9
Type of diet	Normal	11	32.4
	Therapeutic	20	58.8
	Not sure	3	8.8
Intake of food during hospitalisation	Decreased	16	47.1
	Not changed	18	52.9
	Increased	0	0
Dependence on hospital food	Yes	12	35.3
	No	22	64.7

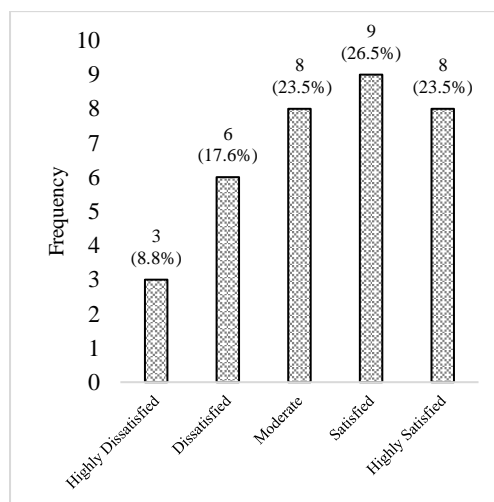


Figure 1: Overall food service satisfaction levels among teaching hospital patients ($n=34$)

Table 3: The mean satisfaction score according to the food service dimensions ($n=34$)

Food service dimension	Mean score ± SD
Food attributes	
The meal tastes nice	3.38±1.28
I like the way vegetables are cooked	3.41±1.23
The meat quality (chicken and fish) served to me is the best	3.74±1.05
The texture of meals is good and suitable for my condition	3.91±1.24
Portion size of my meals are suitable and enough for me	4.35±0.95

The drinks served are just at the right temperature	4.09±1.00
The hot foods are just at the right temperature	4.00±1.16
The cold foods are just at the right temperature	4.00±1.23
I can choose healthy food in the hospital	3.91±1.06
The colour of my meals is attractive	3.65±1.13
The smell of my meals is nice and good	3.59±1.19
The fruit served is fresh	4.53±0.71
Staff issues	
The staffs who deliver and collect my meals are neat and cleans	4.74±0.62
The staffs (nurse or foodservice personnel) are willing to help patient with eating difficulties	4.12±0.91
The staffs have explained to me about my diet	3.18±1.11
The staffs who deliver and collect my meal are friendly and polite	4.35±0.77
Meal distribution time	
The mealtime for breakfast is suitable	4.65±0.65
The mealtime for lunch is suitable	4.65±0.65
The mealtime for tea is suitable	4.65±0.65
The mealtime for dinner is suitable	4.65±0.65
The meal served punctually according to schedule	4.68±0.59
Physical and social	
The hospital or ward scent stops me from enjoying my meals	4.53±0.75
The noise at hospital or ward disturbs me from enjoying my meals	4.50±0.75
The duration given to finish the meal is enough	4.62±0.60
Overall satisfaction	
Overall, I am satisfied with the food service in this hospital	3.82±1.26

Patients' satisfaction towards hospital food service

Overall satisfaction of hospital food service

The mean score for overall satisfaction with the food service in the present study reported a satisfactory level among patients. The frequency and percentage of overall satisfaction with hospital food services are presented in Figure 1. Majority of the patients were satisfied with the food service provided in the teaching hospital (n = 9, 26.5%), followed by highly satisfied (n = 8, 23.5%), moderate (n = 8, 23.5%), dissatisfied (n = 6, 17.6%), and highly dissatisfied (n = 3, 8.8%).

In Table 3, statements from patients' satisfaction with the hospital food service questionnaire and the mean score of each statement were presented. Among the four dimensions studied, participants were most satisfied with the dimension of meal distribution time (4.65±0.63), followed by physical and social (4.55±0.60), staff issues (4.10±0.58), and food attributes (3.88±0.87). The most positively rated statement was "The staff who deliver and collect my meals are neat and clean" (4.74±0.62).

Meanwhile, the statements "The staff has explained to me about my diet," "The meal tastes nice," and "I like the way vegetables are cooked" were the lowest on the list with the scores of 3.18±1.11, 3.38±1.28, and 3.41±1.23, respectively. Thus, it can be concluded that the participants were satisfied with the food service provided by this hospital. *Relationship between the associated factors and overall satisfaction*

Table 2 presents the relationship between the associated factors and overall satisfaction level. The correlations between overall patient satisfaction and various factors influencing hospital food services, "food attributes," "staff issues," "meal distribution time," and "physical and social" were evaluated. The results showed a significant correlation between all the factors and overall satisfaction.

Table 2: Relationship between associated factors and overall satisfaction

Variables	1	2	3	4	5
1 Food Attributes	1				
2 Staff Issues	0.335*	1			
3 Meal Distribution Time	0.569*	0.625*	1		
4 Physical and Social	0.385*	0.491*	0.772*	1	
5 Overall Satisfaction	0.827*	0.590*	0.563*	0.371*	1

*All the correlations are significant at the 0.01 level (2-tailed)

DISCUSSION

The most important findings were that, overall, patients were satisfied with the food service provided in this hospital and each of the food service dimensions. Other than that, the highest satisfaction was with meal distribution time, and the lowest was with food attributes. Firstly, the result indicated the patients were satisfied with overall food services in the teaching hospital. This level of satisfaction was higher compared to the other studies in countries like Iran (Safarian et al., 2018) and Egypt (Al-Torky et al., 2016). A possible justification for the variation in satisfaction includes the distinct menus provided by each hospital, differences in the target populations, the influence of various methodologies, and the diverse individual values of patients (Abdelhafez et al., 2012).

In addition, mealtime distribution received the highest score of all the factors. This finding is consistent with the study by Saus & Sucheran (2021) and Safarian et al., (2018), which found high satisfaction with meal distribution time. Patients were most likely satisfied with all mealtimes: breakfast, lunch, evening tea, and dinner, agreeing that the meal was distributed on time. When meals are served

on time, patients are less likely to be overly hungry or have reduced appetite, which can negatively impact their food intake. A study by Teka et al. (2022) discovered that delays in meal service had a negative impact on patients' perception of meal taste and temperature, resulting in lower satisfaction levels.

Another interesting finding is that physical and social aspects received the second-highest score. The majority of the patients were satisfied with the hospital's environment, including the smell and noise, stating that it did not disturb them from enjoying their meals. From the researcher's perspective, the physical and social aspects received a high score in this study because of several factors. First, there were no unpleasant smells in the wards, such as medication smells or bodily fluids, which could reduce patients' appetite. In addition, the patients stated that there was no loud noise, such as sound from medical equipment or staff conversation, that could disrupt mealtimes.

Besides, it is observed in this study that patients were satisfied with the staff issues. The findings revealed that the majority of patients were pleased with the neatness and cleanliness of the food delivery staff. This implies that the staff likely maintained high standards of hygiene and appearance, which is vital in a healthcare setting. Regardless, it should also be noted that one of the statements in the staff issue dimension, which is "The staff have explained to me about my diet", had the lowest score among individual statements. Patients claimed that the staff just put the food on the table and did not explain whether it was a normal or therapeutic diet. As the teaching hospital was an outsourced food service system, the staff distributing the meal may lack necessary nutritional skills or not received adequate training on dietary requirements to explain the meal to the patients. Patients might be confused about why certain foods are included or excluded from their meals without proper explanation. As a result, staff should take the time to explain each meal, making patients feel informed and valued. Healthcare food service personnel play a crucial role as they are responsible for preparing and serving a substantial number of meals daily. In addition, their work is vital not only for maintaining patient health through proper nutrition but also for enhancing the overall patient experience during their stay in healthcare facilities (Osman et al., 2022).

Another finding is that dimension food attributes had the lowest score of the four dimensions studied. This study is consistent with the findings of Mangunsong & Junadi (2018), Miyoba & Ogada (2019), and Rapo et al. (2021).

Some subjects expressed concern about food characteristics such as taste, smell, color, and texture of the food. In this context, they complained that the food was sometimes unappetizing and bland and that fish dishes often had a fishy smell, causing patients' appetites to decrease. They also claimed that the color of their meals was unappealing and the texture of their meal was not suitable for their health condition. However, this output may be less relevant for patients on therapeutic diets, where dietary restrictions frequently limit the use of salt, sugar, and any other flavour enhancers in order to meet specific dietary requirements. According to Safarian et al. (2018), patient dissatisfaction with the taste and appearance of hospital foods could be due to the unfamiliarity of the food, changes in the daily diet, medical conditions, or the effects of medication.

While this study provides valuable insights into patient satisfaction with hospital food services, several limitations should be acknowledged. First, the study was conducted in a single teaching hospital. In addition, this study focuses on a single point in time to assess patient satisfaction. Patient satisfaction with hospital food services may fluctuate throughout the course of hospitalization due to various factors, such as changes in health status, meal delivery experiences, or alterations in the hospital environment. To capture these variations, future studies should collect satisfaction data at multiple time points, such as admission, mid-stay, and discharge, for a better understanding of how satisfaction evolves and is influenced by recovery or changes in the hospital environment.

CONCLUSION

This study provides valuable insight into patient satisfaction with hospital food services and the factors associated with it. Overall, the patients express satisfaction with the food service provided at the teaching hospital, highlighting the importance of timely meal distribution and the physical and social aspects of the hospital environment. However, it is important to take note of additional factors, such as food attributes and staff issues, which received lower satisfaction scores need to be noted as well. These findings underscore the need for continuous monitoring and improvement in hospital food services to better meet patient expectations and enhance their overall hospital experience.

ACKNOWLEDGEMENT

Special thanks to the Department of Nutrition Sciences, Kulliyah of Allied Health Sciences, Sultan Ahmad Shah

Medical Centre (SASMEC), and International Islamic University Malaysia. This research was not funded by any grant.

REFERENCES

- Rozalina Azeman, A., Adenan, H., & Ripin, A. (2018). Patient'S Satisfaction Towards Private Hospital'S Food Service In Melaka. In *Journal of Hospitality and Networks Jurnal Hospitaliti dan Jaringan* (Vol. 1).
- Ibrahim, E., El-Sherbiny, N., El-Sherbiny, N. A., Ibrahim, E. H., Hewedi, M. M., Author, C., & of Public Health, P. (2017). Patients' Satisfaction with Delivered Food Services in Fayoum Hospitals. In *EC Nutrition* (Vol. 9). https://www.researchgate.net/publication/332538266_Patients'_satisfaction_with_delivered_food_services_in_Fayoum_hospitals
- Osman, N. S., Nor, N. M., Sharif, M. S. M., Rahamat, S., & Hamid, S. B. A. (2022). Barriers and Challenges of an Outsource Hospital Foodservice Operation: A Narrative Thematic Analysis. *Malaysian Journal of Medicine and Health Sciences*, 18. <https://doi.org/10.47836/mjmhs18.s15.14>
- Mangunsong, E. R., & Junadi, P. (2018). In Patient Satisfaction Contributing Factors on Hospital Food Service: A Systematic Review Patient Satisfaction Contributing Factors on Hospital Food Service: A Systematic Review. In *International Journal of Management and Applied Science* (Issue 1).
- Theron, M., & O'Halloran, S. (2022). Patients in public hospitals received insufficient food to meet daily protein and energy requirements: Cape Town Metropole, South Africa. *South African Journal of Clinical Nutrition*, 35(4). <https://doi.org/10.1080/16070658.2021.1997267>
- Rinninella, E., Raoul, P., Maccauro, V., Cintoni, M., Cambieri, A., Fiore, A., Zega, M., Gasbarrini, A., & Mele, M. C. (2023). Hospital Services to Improve Nutritional Intake and Reduce Food Waste: A Systematic Review. In *Nutrients* (Vol. 15, Issue 2). <https://doi.org/10.3390/nu15020310>
- M. Abdelhafez, A., Al Qurashi, L., Al Ziyadi, R., Kuwair, A., Shobki, M., & Mograbi, H. (2012). Analysis of Factors Affecting the Satisfaction Levels of Patients Toward Food Services at General Hospitals in Makkah, Saudi Arabia. *American Journal of Medicine and Medical Sciences*, 2(6). <https://doi.org/10.5923/j.ajmms.20120206.03>
- Sadaf, S., Malik, A. A., Bilal, A., & Saeed, A. (2018). Patient satisfaction regarding food and nutrition care in hospitals of Lahore, Pakistan. *Progress in Nutrition*, 20. <https://doi.org/10.23751/pn.v20i2-S.5855>
- Aminuddin, N. F., Kumari Vijayakumaran, R., & Abdul Razak, S. (2018). Patient Satisfaction with Hospital Food service and its Impact on Plate Waste in Public Hospitals in East Malaysia. *Hospital Practices and Research*, 3(3). <https://doi.org/10.15171/hpr.2018.20>
- Vijayakumaran, R. K., Kumari Vijayakumaran, R., Eves, A., & Lumbers, M. (2016). Patients Emotions during Meal Experience: Understanding through Critical Incident Technique. *International Journal of Hospital Research*, 5(4).
- Boughoula, M., Jamaluddin, R., Abd Manan, N. A., Saad, H. A., & Ab Karim, M. S. (2020). Development of a tool to measure patients' satisfaction of hospital foodservice in a government hospital. *Malaysian Journal of Nutrition*, 26(2). <https://doi.org/10.31246/MJN-2019-0047>
- Safarian, M., Alinezhad-Nameghi, M., Vafisani, F., Asadi, Z., & Sh, S. (2018). Patient satisfaction with hospital food in the hospitals affiliated to Mashhad University of Medical Sciences. *Iran. J Nutrition Fasting Health*, 6(4).
- Al-Torky, M. A., Mohamed, E. A., Yousef, M. A., & Ali, N. A. (2016). Mohamed A. Al-Torky, et al Inpatients' satisfaction with food services in Sohag Inpatients' satisfaction with food services in Sohag University Hospital. In *The Egyptian Journal of Community Medicine* (Vol. 34, Issue 2).
- Saus, C., & Sucheran, R. (2021). Patient satisfaction with foodservice in private hospitals in South Africa. *Journal of Critical Reviews*, 8(02).
- Teka, M., Dhar, G., Dana, T., Asnake, G., Wakgari, N., Bongor, Z., & Daga, W. B. (2022). Erratum: Satisfaction with regular hospital foodservices and associated factors among adult patients in Wolaita zone, Ethiopia: A facility-based cross-sectional study (PLoS ONE (2022) 17: 3 (e0264163) DOI: 10.1371/journal.pone.0264163). In *PLoS ONE* (Vol. 17, Issue 8 August). <https://doi.org/10.1371/journal.pone.0273275>

Miyoba, N., & Ogada, I. (2019). Diet satisfaction and associated factors among adult surgical orthopaedic inpatients at a teaching hospital in Lusaka province, Zambia; A hospital-based cross-sectional study. *BMC Nutrition*, 5(1). <https://doi.org/10.1186/s40795-019-0288-5>

Rapo, S., Mattson Sydner, Y., Kautto, E., & Hörnell, A. (2021). Exploring patient satisfaction with hospital foodservice: A Swedish study using the Acute Care Hospital Foodservice Patient Satisfaction Questionnaire. *Nutrition and Dietetics*, 78(5). <https://doi.org/10.1111/1747-0080.12665>