International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print) 2222-5234 (Online)
http://www.innspub.net
Vol. 25, No. 1, p. 127-137, 2024

INNSPUB
RESEARCH PAPER OPEN ACCESS

Determinants of food intake and nutritional status among inpatients in northern hospitals in Tanzania

Asia Ijumaa*, Clara Justine Mollay, Haikael David Martin

Department of Food Biotechnology and Nutrition Sciences, The Nelson Mandela African Institution of Science and Technology (NM-AIST), Arusha, Tanzania

Key words: Hospital meal provision, Anthropometric measurement, Inpatients,

Insufficient nutritional awareness, Meet minimum dietary diversity

http://dx.doi.org/10.12692/ijb/25.1.127-137 Article published on July 05, 2024

Abstract

Adequate nutrition is a key among hospitalized patients. It is crucial and most significant aspect of improving quality of life of inpatients. However, hospitals in developing nations challenged with adequate meal provisions. In Tanzania, meal provision isn't part of inpatients service. This impacted quality of life, causing an increased number of days in hospital stay. Furthermore, research has demonstrated the significance of food consumption to promote recovery. Cross-sectional study design was used in this study. Data were analyzed for descriptive statistical inferences by using R statistical software. Results showed; determinants of food intake were; distance to hospital, 76% inpatients used more than 60 minutes to arrive at hospital and 31% stayed hospital for 15 days and above. Moreover, dietary study was conducted; results showed 70% of inpatients didn't meet minimum dietary diversity. Insufficient nutrition awareness was another determinant where, 70% of inpatients didn't understand balanced diet. Findings revealed that, 86% of inpatients consumed monotonous diet high in starch, 12% of adult inpatients were underweight (BMI <18.5) while 7% were obese with BMI > 30. Twenty nine percent of children aged 6 to 59 months were severely stunted (SD < -3). In this study, association between dietary intake and distance from home indicated, some patients lacking food services because of leaving far from hospital. It was concluded that, higher proportion of inpatients didn't meet minimum dietary diversity due to monotonous diet they consumed. To meet SDGs challenges of zero hunger, good health and well-being, hospital meal provision is essential.

* **Corresponding Author:** Asia Ijumaa ✉ hijirambaga@gmail.com

Introduction

Studies have shown that a healthy diet is fundamental among inpatients; it helps maximize benefit of medications and enhance quality of life (Gamaletsou *et al.*, 2012; Merriweather *et al.*, 2016; Reber *et al.*, 2019). Research done by Schuetz *et al.*, demonstrated that timely, adequate and appropriate nutrition interventions can improve patients clinical outcomes, enhances quality of life, reduce healthcare costs, lower the frequency of disease episodes, shorten hospital stays, fewer complications, and increases survival rates (Schuetz *et al.*, 2021). On the other hand, inadequate diet, for instance, is responsible for one out of every five deaths from chronic diseases worldwide (Downer *et al.*, 2020). According to Canadian Malnutrition Task Force (2017), the significance of healthy eating and nutrition for inpatients in African countries cannot be overemphasized, particularly when it comes to recovering from illness. According to Allard *et al.*, inadequate intake of food among inpatients leads to 2-3 additional days in hospitals and such patient have a high chance of re-admission within 30 days compared to patients who receive adequate nutrition (Allard *et al.*, 2016).

Inadequacies food intake among inpatients have been noted to delay recovery and increase susceptibility of worsening their condition (Naithani *et al.*, 2009). Ensuring adequate nutrition to hospitalized patients is crucial and can positively impact patient recovery and treatment success (Arief *et al.*, 2023). A study conducted by Teka *et al.* indicates that undernutrition and nutritional risks for inpatients, are due to failure of health facilities to provide food to inpatients (Teka *et al.*, 2022). Lack of hospital food provision to inpatients is characterized by insufficient caloric and micro nutrients consumption which results into delays in recovery (Berger *et al.*, 2019). In low - income nations, notably in sub-Sahara Africa, socioeconomic and demographic factors like residence and monthly household income are linked to undernutrition among inpatients (Miyoba and Ogada, 2019). Moreover, other study revealed that nutritional intake among inpatients is frequently insufficient, which may cause nutritional status to worsen during admission (Hamilton and Finley, 2019). Furthermore, a study conducted by Kiprono in sub-Saharan Africa, shows that, inadequate food intake among inpatients may cause medication not to work as intended, leading to poor immunity, recovery rates, and prolonged hospital stays. All these may result to nosocomial infections (Kiprono, 2021). Apart from being crucial to health and quality of life, food is also a basic human right because it is necessary for survival (Frost, 2021). It should be well known that hospital food provision is important in healthcare provision (Dall'Oglio *et al.*, 2015). Tanzania experiences the similar problem of inadequate dietary intake among inpatients which impacts nutritional status and early recovery among inpatients. Study conducted by (Ndyai, 2023), on determinants of inadequate caloric intake among hospitalized patients at Muhimbili National Hospital in Tanzania, found that 15% of inpatients had inadequate dietary intake and this was linked to older age, male and distance from home to the hospital. The study further recommended more studies to explore how factors such as income and living far from the hospital may influence dietary intake, health and nutritional status among hospitalized patients. The current study therefore aimed at assessing the determinants of dietary intake, and nutritional status among inpatients in selected hospitals. This would facilitate the establishment of inpatient nutrition-specific interventions, such as tailored nutrition plans and enhanced nutritional guidelines, in Tanzania.

Materials and methods

Study design

A cross-sectional study design was employed, where a survey was done among inpatients to collect demographic information, determinants of dietary intake and nutritional status among inpatients.

Setting

This was a hospital-based study that was undertaken at four tertiary referral hospitals namely; Mt. Meru Regional Hospital, Arusha Lutheran Medical Center (ALMC) in Arusha region and Mawenzi Regional

Hospital and Kilimanjaro Christian Medical Center (KCMC) in Kilimanjaro region. The studied sites were selected due to the number of inpatients they serve and their status as referral hospitals. The survey was conducted from May to August, 2023.

Participant's inclusion and exclusion criteria

Participants for this study were inpatients children aged (6-59 months), "school children and adolescents aged (6-18 years) and adults (19 years and above) in medical, surgical, pediatric, private, burn, dermatology, oncology, and gynecology wards.

Inclusion

The inclusion criteria are patients able to express themselves and consented to participate in the study.

Exclusion

All patients in intensive care units (ICU), labor ward and those with medical complications were excluded from the study.

Sample size calculation

The sample size for this study was calculated using the following formula (Gomes *et al.*, 2019).

$$n = \frac{Z^2 Pq}{e^2}$$

Where n denotes the sample size, Z is the standard normal deviation, (a constant set at 1.96 using the 95% Confidence interval for estimation). P denotes the largest population variability at 50% (0.5), e- denotes the margin of error at 5%, and q denotes 1-p = 0.5.

The sample size was $n = (1.96)^2 \times 0.5\ (1-0.5)/0.05^2$

n = 384.

Sample size per hospital was calculated proportion to size where: Mt. Meru regional referral hospital has 111, ALMC hospital 28, Mawenzi regional hospital 73 and KCMC Northern zonal referral hospital 174 patients.

Sampling procedure

A purposive sampling technique was used to select study areas and proportion to size sampling was applied within the selected hospitals. Participants were selected based on their ability and willingness to participate. For children, a caregiver was required to consent and respond to the survey questions. Sampling was done in medical, surgical, pediatric, private, burn, dermatology, oncology, and gynecology wards. Eligible participants were randomly selected from the ward register.

Ethical approval and consent processes

Ethical approval was sought from the National Institute for Medical Research (NIMR) ethics committee. A clearance with reference number NIMR/HQ/R.8a/Vol. IX/4291 was granted for this study. Permission was also sought from the Regional administrative secretary's office and respective hospital administration. Participants were well informed of the study and a written informed consent was filled by all who were willing to participate. For children, caregivers consented on their behalf and older children assented to participate. All issues concerning ethics such as confidentiality, privacy, anonymity and voluntary participation were explained to the participants who adhered to participate in this study. All participants were assured that they were free to decline participation in the study without facing any consequences. After obtaining the informed consent, data collection was done in a way that ensured little or no disruption of the ongoing clinical care.

Data collection

A semi-structured questionnaire was used to collect data on demographic and socio-economic information, determinants of inpatients dietary intake, and anthropometric data among inpatients. Kobo collect software was used for data collection from respondents where the questionnaire was installed on it. The interview took approximately twenty minutes for each respondent.

Anthropometric measurement

To examine the overall nutritional status of each research participant, anthropometric measurements of weight and height were taken. A SECA weighing scale machine and length board was used to measure the

respondents' body weight in kilograms (kg) to the nearest value of 0.1 kg and height in centimeters (cm) to the nearest value of 0.1 cm respectively. Patients were requested to reduce clothes in order to take the measurement of weight as precise as possible. Measurements obtained were used to compute the indices of nutrition status for both adults and children.

Dietary intake

A twenty-four-hour dietary recall was used to collect information on the food consumed by inpatients in the past 24 hours. These were then used to determine the Dietary diversity score (DDS) of inpatient. A nine food groups scale was used, which were; starchy staples, dark green leafy vegetables, vitamin A-rich fruits and vegetables, other fruits and vegetables, organ meats, eggs, meat and fish, legumes, nuts and seeds, and milk and milk products (Kennedy *et al.*, 2010).

Data management and statistical analysis

Data were managed using Microsoft Excel, cleaned, coded and transferred to R program for analysis. The analysis of data was done by using R program software for descriptive statistics in terms of frequencies, percentages and association (R Core Team 2023). The anthropometric data for children aged 6 to 59 months was analyzed using ENA for smart survey software. Anthropometric data for school-age children and adolescents were managed using anthroplus to obtain BMI for age Z score. Adult anthropometric data were analyzed directly in R statistical software program.

Results

Social-economic and demographic information of the respondents

The social economic and demographic information of the respondents in the studied health facilities are summarized in Table 1. A total of 386 inpatients were interviewed in the four selected health facilities. The demographic classification shows that (54%, n = 209) of the respondents were males and 46% (177) were females. Most of the inpatients had primary education (49%, n=189%), and (6%, n=22) had not attended any formal education. The interviewed participants had various sources of income, the major one was agriculture (58%, n= 222). In the assessment of nutritional awareness, only (30%, n=116) of the interviewed inpatients were aware of nutrition specifically in defining what a balanced diet is.

Table 1. Social demographic information of the study participants (n = 386)

Variables	Health facilities				
	Mt. Meru	ALMC	Mawenzi	KCMC	Total [n (%)]
Gender					
Male	68	11	34	96	209 (54)
Female	43	17	39	78	177 (46)
Education level					
Children - NA (their education level not recorded)	31	5	18	34	88 (23)
Primary	53	11	35	90	189 (49)
Secondary	17	6	10	24	57 (15)
College	4	5	3	16	28 (7)
Not gone to school	6	1	7	10	22 (6)
Source of income					
Agriculture	63	11	42	106	222 (58)
Business	26	4	11	24	65 (17)
Casual Labour	2	0	1	5	8 (2)
Employed	2	5	5	13	25 (6)
Others	14	8	14	26	65 (17)
Estimated income per month in TZS					
30,000-150,000	86	18	57	134	295 (76.42)
151,000-300,000	15	2	12	19	48 (12.43)
301,000-600,000	8	5	1	10	24 (6.21)
601,000 and more	2	3	3	11	19 (4.92)

ALMC, Arusha Lutheran Medical Center; KCMC, Kilimanjaro Christian Medical Center; n, Number; TZS, Tanzanian shillings and %, Percentage

Table 2. Nutritional status of study participants

Children 6-59 months (n = 82)	WAZ n (%)	HAZ n (%)	WHZ n (%)
Normal nutrition status	47 (57)	43 (53)	56 (68)
Moderate nutrition status	14 (17)	15 (18)	09 (11)
Severe nutrition status	21 (26)	24 (29)	17 (21)
Nutrition status of school children and adolescents	BMI for age		
Normal nutritional status	35 (70)		
Overweight	5 (10)		
Moderately underweight	6 (12)		
Severe underweight	4 (8)		
Nutritional status of adult inpatients	BMI		
Normal nutrition status	158 (62)		
Obesity	17 (7)		
Overweight	47 (19)		
Underweight	32 (12)		

BMI, Body Mass Index; HAZ, Height for Age Z score; WAZ, Weight for Age Z score; and WHZ, Weight for Height Z score.

Table 3. Inpatients Food intake as indicated by individual dietary diversity

Food groups	Facility n (%)			
	Mt. MERU (n = 111)	ALMC (n = 28)	MAWENZI(n =73)	KCMC (n = 174)
Starchy staples	101(91%)	7 (25%)	68 (93%)	155 (89%)
Dark green leafy veg. & fruits	37 (33%)	18 (64%)	25 (34%)	64 (37%)
Vitamin A-rich plant foods	36 (32%)	15 (54)	27 (37%)	52 (30%)
Other fruits or vegetables	81 (73%)	21 (75%)	43 (59)	115 (66%)
Meat, poultry, fish, seafood	43 (39%)	16 (57%)	35 (48%)	104 (60%)
Organ meat	2 (2%)	0 (0%)	2 (2%)	0 (0%)
Eggs	5 (5%)	25 (89%)	3 (4%)	22 (13%)
Pulses/legumes/nuts	34 (31%)	24 (86%)	13 (18%)	65 (37%)
Milk and milk products	45 (41%)	14 (50%)	28 (38%)	71 (41%)
Minimum Dietary Diversity				
MDD not reached	100 (90%)	6 (21%)	57 (78%)	109(63%)
MDD reached	11 (10%)	22 (79%)	16 (22)	65 (37%)
Total count	111 (100%)	28 (100%)	73 (100%)	174 (100%)

ALMC, Arusha Lutheran Medical Center; KCMC, Kilimanjaro Christian Medical Center; MDD, Minimum Dietary Diversity; n, number and %, percentage

Nutritional status

Nutrition status of children aged between 6-59 months

A total of 82 children aged between 6 months to 5 years were assessed as showed in Table 2 below.

Nutrition status of school-age children and adolescents

Body Mass Index (BMI) for age Z scores were calculated and categorized according to WHO cutoff points for normal nutrition status, moderately underweight, overweight and severely underweight. Results showed about 70% (35) of "school-age children and adolescents" had normal nutrition status while 8% (4) were severely underweight, 12% were moderately underweight and 10% were overweight as shown in Table 2 below.

Nutrition status of adult inpatients

To determine the nutrition status of adult inpatients, Body Mass Index (BMI) was used. Measurements of weight and height were taken by following the procedure outlined in the World Health Organization guideline of 2021 for anthropometric measurement.

Weight and height data obtained were used to calculate the BMI and classification of nutrition status was done according to WHO guidelines on nutrition status assessment under four categories; Obese (≥ 30), Overweight (25-29.9), Normal (18.5-24.9), and underweight (< 18.5), (WHO and UNICEF, 2021) as shown in Table 2.

Inpatient's Food intake as indicated by individual dietary diversity score

The result of food intake as indicated by individual dietary diversity score (IDDS) (Table 3) has shown that, 70% of inpatients didn't meet individual dietary diversity (IDD).

Table 4. Determinants of dietary intake among inpatients in selected hospitals in the northern zone of Tanzani

Variable	Individual dietary diversity			
	No, N = 271[1]	Yes, N = 115[1]	Overall, N = 386	p-value[3]
Duration of hospital stay				0.007
1-5 days	125 (76%)	39 (24%)	n=164	
6-8 days	52 (73%)	19 (27%)	n=71	
9-11 days	15 (88%)	2 (12%)	n=17	
12-14 days	9 (64%)	5 (36%)	n=14	
15 days and above	70 (58%)	50 (42%)	n=120	
Time taken from home to hospital				<0.001
5-15 minutes	2 (100%)	0 (0%)	n=2	
16-30 minutes	10 (77%)	3 (23%)	n=13	
31-60 minutes	68 (87%)	10 (13%)	n=78	
60 minutes and above	191 (65%)	102 (35%)	n=293	
Estimated income per month				0.11
30,000-150,000	201 (68%)	94 (32%)	n=295	
151,000-300,000	33 (69%)	15 (31%)	n=48	
301,000-600,000	20 (83%)	4 (17%)	n=24	
601,000 and more	17 (89%)	2 (11%)	n=19	
Nutrition awareness				>0.9
No	191 (70%)	81 (30%)	n=272	
Yes	80 (70%)	34 (30%)	n=114	
Body Mass Index for adults				0.8
Normal weight	111 (70%)	47 (30%)	n=158	
Underweight	21 (68%)	11 (32%)	n=32	
Overweight	31 (67%)	16 (33%)	n=47	
Obese	14 (79%)	3 (21%)	n=17	

[1]n (%)
[2]n=n
[3]Pearson's Chi-squared test; Fisher's exact test

Additionally in the individual dietary diversity score, starchy staples were the most widely consumed food group among inpatients accounting for 86% of their dietary intake while the least (1%) consumed food group is organ meat. A food was considered to be a part of the food group if it was consumed once or more in the previous twenty-four hours. Any food taken within the last 24 hours was categorized into one of the nine food groups which were assessed in individual dietary diversity. The minimum dietary diversity for IDD is considered to have been met by inpatients who consumed five or more food groups, but those who consumed four groups or less did not meet the requirement.

Determinants of food intake among inpatients

Determinants of inpatient's dietary intake were; duration of hospital stay, distance from hospital, estimated income, nutritional awareness and body mass index among inpatients (Table 4). The results showed that, distance to hospital and duration of hospital stay were significantly associated with dietary intake among inpatients at ($p< 0.001$) and $p <0.007$ respectively. The majority of inpatients who stayed in the hospital for 15 days and above had inadequate dietary intake. Furthermore, neither those with nutrition awareness (30%) nor those without nutrition awareness (70%) met the minimum dietary diversity.

Discussion

This research aimed to investigate the determinants that influence dietary intake and nutritional status among inpatients at Mt. Meru Regional Referral Hospital, ALMC in Arusha region, Mawenzi Regional Referral Hospital and KCMC in Kilimanjaro region. A total of 386 inpatients participated.

Findings show 209 (54%) of the study participants were males while females were 177 (46%). These findings concur with a study done by Ashrafun and Uddin in Bangladesh and Bwire in Swaziland. These studies reported the participation of more males (65.2%) compared to females (34.8%) in their studies

which were done in hospital settings. A combination of factors, such as sex hormones and men's higher expression of disease receptors, as well as lifestyle choices may contribute to the fact that women are more resistant to diseases than men (Ashrafun and Uddin, 2011; Bwire, 2020). Moreover, studies also show that women easily seek medical attention early compared to men who do that when things are really bad (Dauvellier *et al.*, 2016).

The prevalence of underweight and obesity among adults was 12% and 7% respectively. Some of the factors that may directly influence adult nutrition status may be inadequate dietary intake and in the cases of obesity, one may have come to the hospital already obese or get obese while admitted due to poor movement/physical activity (Fusco *et al.*, 2017). Among adolescents 8% were severely underweight and for children aged 6-59 months, 26% were underweight, 29 % were stunted and 21% were wasted. Again, several factors may be responsible for this nutrition status, the very first may be a lack of adequate nutrition to fight the disease/condition, and others may be poor appetite and lack of proper care for the patient. This study found out that most patients had a very monotonous diet of mainly cereal grains. This was reflected in individual dietary diversity scores. This concurred with some studies that showed that most inpatients in the developing world have diets that are primarily composed of starchy staples, and inadequate nutritional diversification which leads to inadequate intake (Kinabo *et al.*, 2016; Rathnayake *et al.*, 2012). The individual dietary diversity score showed that, 89% of the respondents consumed cereals while food groups like dark green leafy vegetables, “fish and meat”, organ meat, “milk and milk products” and eggs were rarely consumed (< 29%), In this study BMI was not significantly associated with individual dietary diversity. Nevertheless, a study conducted in China reported that, prolonged hospital stay might be the factor that contributes to both low and high BMI of inpatients. The study revealed that, poor nutrition status of inpatients can increase the number of days of hospital stay and other medical complications such as anemia, osteoporosis, general body weakness and nosocomial infections (Zhu *et al.*, 2023). One of the determinants of food intake among inpatients is the duration of hospital stay. This was significantly associated with individual dietary diversity. The current study found that 31% of the respondents who were admitted for more than 15 days had a dietary intake that was below the minimum. Research shows that, poor dietary intake may lead to longer hospital stays, poor recovery and increased disease severity. All these combined lead to increased hospital expenses and impair family progress (Egg *et al.*, 2020; Schuetz *et al.*, 2021). The results of this study concur with the study conducted by the Agency for Health Care Research and Quality (AHCRQ) in Rockville, which reported that, an increase in nosocomial infections and the development of illnesses beyond what the patient had when first admitted are associated with prolonged hospital stays (Kronick, 2016). Another study also showed that, poor nutrition is strongly linked to extended hospital stays and may raise mortality as well as unnecessary use of hospital beds and other resources (Tipton *et al.*, 2021). Inadequate diverse food for inpatients may further contribute to weight loss due to depletion of fat and muscle mass hence the vicious cycle of infections and malnutrition (Ahmed *et al.*, 2014). Eating diversified food provides inpatients with various benefits including energy and other nutrients needed for cell repair, helping patients to stay strong and healthy. The assessment of dietary intake in this study showed that, consumption of fish, legumes, vegetables and fruits was low compared to the intake of cereals. This corresponds to the study conducted by Zhao *et al.*, on dietary intake among inpatients in China which showed that, the consumption of grains was the highest (97.7%), whereas that of fish, beans, and organ meats was low at 57.2% (Zhao *et al.*, 2020). Similarly, a study done in Iran reported that, low dietary diversity among inpatients has implications on their recovery rate, as a result, patients stay longer in the hospital (Nachvak *et al.*, 2017).

Another determinant of inpatient dietary intake is the distance from the inpatient home to the hospital. This

was significantly associated with individual dietary diversity. The majority (76%) of the study participants use more than 60 minutes to arrive to the hospital. With this in mind, it is harder for caregivers to visit them and provide meals on time. On the other hand, from the observation made in this study, for those living far from the hospital, caregivers were able to come to see them only once per day as a result patients tend to eat leftovers. It is worth noting that no health facility had a refrigerator or a microwave to allow patients to store and warm their food when needed. This may impact the safety of the food because if the food is not well stored it could be a breeding ground for microorganisms. This may also increase the patient's susceptibility to bacterial stomach infections. These findings were in line with the study done in Bangladesh which found that distance to the hospital increases the likelihood of not getting fresh and diversified food (Ashrafun and Uddin, 2011). Hospitalized patients should be given special consideration such as getting meals at the hospital because they are likely to be more vulnerable to foodborne illnesses (Ashrafun and Uddin, 2011). Therefore living far from the hospital affects dietary intake and minimizes the possibility of receiving food support from family members and friends.

Moreover, other determinants of dietary intake among inpatients include estimated income per month, nutritional awareness and Body Mass Index. In this study, the estimated income per month of the interviewed inpatients, was not significantly associated with individual dietary intake. This result is different from the study conducted by Bonaccio et al which reported that, high income is greatly associated with patient dietary intake and individual dietary diversity (Bonaccio *et al.*, 2012). This study went on to explain that people with higher income had a higher probability of adhering to consuming a diverse diet compared to those in the lowest income bracket. The socioeconomic position and food security of the household where the patient came from, are linked to the increase in dietary diversity provided to inpatients. Our study findings showed no significant difference between those who earn low, medium, or high income per month; all did not meet the minimum dietary diversity. This shows that other factors such as nutrition education among patients and their caregivers may play a role.

Nutrition awareness of interviewed inpatients was not significantly associated with their dietary intake. However, a study conducted in Australia reported that, lack of nutrition awareness affects eating practices and is a predominant barrier to meeting nutritional requirements among inpatients (Cass and Charlton, 2022). Another study reported that, consumption of nutritious foods like fruits, vegetables, and healthy starchy foods was higher when nutrition awareness was high (Egg *et al.*, 2020). Furthermore, another study reported that, nutrition awareness is essential to manage opportunistic infections, maintain the immune system, optimize response to medical treatment and reduce the number of days in the hospital. Providing diverse food to inpatients has positive effects on recovery rate and optimizes the benefit of drugs to inpatients (Mengie *et al.*, 2018).

This was a cross-sectional study, our findings could only be indicative of a potential dietary pattern. In this study, we did not quantify the dietary intake, the use of the dietary recall method and diversity score to assess the dietary intake is subjective and can only be indicative. Moreover, in the determination of inpatient's nutritional status, we could not correlate status at admission and at the time we were collecting data. Follow-up studies preferably cohort studies are warranted.

Conclusion

This study revealed a higher proportion of inpatients in the selected hospitals did not meet their minimum dietary diversity. Most consume a monotonous diet high in starch with little or no protein source and micronutrient sources such as vegetables and fruits. We found an association between dietary intake and distance from home indicating that some patients may be lacking food services because of living far from the hospital. This is a call for more attention in

service provision among patients. A consideration of meal provision as part of services given by the health facility is important.

Recommendation(s)

1. Hospitals in collaboration with the Ministry of Health should have a common program for the provision of food as hospital services to all hospitalized patients.
2. Provision of well-balanced meals among hospitalized patients especially in referral hospitals is key because in most cases people come from far and it may be difficult for their family members to visit and bring food daily.
3. It is important to give nutrition education to patients, relatives/caregivers and health care providers.
4. There should be guidelines, policies and protocols for food provision among hospitalized patients.

Acknowledgments

The African Center of Excellence in Research, Agricultural Advancement, Teaching Excellence, and Sustainability in Food and Nutrition Security (CREATES-FNS), housed at the Nelson Mandela African Institution of Science and Technology (NM-AIST), is acknowledged by the authors for its financial assistance.

References

Allard JP, Keller H, Jeejeebhoy KN, Laporte M, Duerksen DR, Gramlich L, Payette H, Bernier P, Davidson B, Teterina A, Lou W. 2016. Decline in nutritional status is associated with prolonged length of stay in hospitalized patients admitted for 7 days or more: A prospective cohort study. Clinical Nutrition **35(1),** 144-152. DOI: https://doi.org/10.1016/j.clnu.2015.01.009

Arief RQ, Widayanti LP, Hidayati LS, Oktorina S, Arief MJ, Alam S. 2023. Hospital Food Service Assessment Improving Nutritional Intake Inpatients: a Literature Review. Hospital Management Studies Journal (Homes Journal) **4(2).** https://doi.org/10.24252/hmsj.v4i2.36819

Ashrafun L, Uddin MJ. 2011. Factors determining inpatient satisfaction with hospital care in Bangladesh. Asian Social Science **7(6),** 15-24. https://doi.org/10.5539/ass.v7n6p15

Berger MM, Pantet O, Schneider A, Ben-Hamouda N. 2019. Micronutrient deficiencies in medical and surgical inpatients. Journal of Clinical Medicine **8(7),** 931. https://doi.org/10.3390/jcm8070931

Bonaccio M, Bonanni AE, Castelnuovo AD, De Lucia F, Donati MB, De Gaetano G, Iacoviello L. 2012. Low income is associated with poor adherence to a Mediterranean diet and a higher prevalence of obesity: Cross-sectional results from the Moli-sani study. BMJ Open **2(6),** e001685. https://doi.org/10.1136/bmjopen-2012-001685

Bwire GM. 2020. Coronavirus: Why Men are More Vulnerable to Covid-19 Than Women? SN Comprehensive Clinical Medicine **2(7),** 874-876. https://doi.org/10.1007/s42399-020-00341-w

Cass AR, Charlton KE. 2022. Prevalence of hospital-acquired malnutrition and modifiable determinants of nutritional deterioration during inpatient admissions: A systematic review of the evidence. Journal of Human Nutrition and Dietetics March, 1043-1058. https://doi.org/10.1111/jhn.13009

Dall'Oglio I, Nicolò R, Di Ciommo V, Bianchi N, Ciliento G, Gawronski O, Pomponi M, Roberti M, Tiozzo E, Raponi M. 2015. A Systematic Review of Hospital Foodservice Patient Satisfaction Studies. Journal of the Academy of Nutrition and Dietetics **115(4),** 567-584. https://doi.org/10.1016/j.jand.2014.11.013

Dauvellier M, Dennehy J, Duda A, Ferguson L, Ferrari E, Forest M, Frangoudes K, Frey R, Irving P, Lodovici MS, Loi D, Mcdevitt-pugh L, Mantouvalou K, Mergaert L, Green SOB, Orlando N, Osch TVan, Pesce F, Pimminger I, Zambelli MS. 2016. Gender in entrepreneurship. European Institute for Gender Equality, 22.

Downer S, Berkowitz SA, Berkowitz SA, Harlan TS, Olstad DL, Mozaffarian D. 2020. Food is medicine: Actions to integrate food and nutrition into healthcare. The BMJ **369(table 1).** https://doi.org/10.1136/bmj.m2482

Egg S, Wakolbinger M, Reisser A, Schätzer M, Wild B, Rust P. 2020. Relationship between nutrition knowledge, education and other determinants of food intake and lifestyle habits among adolescents from urban and rural secondary schools in Tyrol, Western Austria. Public Health Nutrition **23(17),** 3136-3147. https://doi.org/10.1017/S1368980020000488

Frost N. 2021. Out with the "Old", in with the "New": Challenging dominant regulatory approaches in the field of human rights. European Journal of International Law **32(2),** 507-536. https://doi.org/10.1093/ejil/chab012

Fusco KL, Robertson HC, Galindo H, Hakendorf PH. 2017. Clinical outcomes for the obese hospital inpatient: An observational study. https://doi.org/10.1177/2050312117700065

Gamaletsou MN, Poulia KA, Karageorgou D, Yannakoulia M, Ziakas PD, Zampelas A, Sipsas NV. 2012. Nutritional risk as predictor for healthcare-associated infection among hospitalized elderly patients in the acute care setting. Journal of Hospital Infection **80(2),** 168-172. https://doi.org/10.1016/j.jhin.2011.08.020

Gomes F, Baumgartner A, Bounoure L, Bally M, Deutz NE, Greenwald JL, Stanga Z, Mueller B, Schuetz P. 2019. Association of Nutritional Support with Clinical Outcomes among Medical Inpatients Who Are Malnourished or at Nutritional Risk: An Updated Systematic Review and Meta-analysis. JAMA Network Open **2(11),** e1915138. https://doi.org/10.1001/jamanetworkopen.2019.15138

Hamilton AB, Finley EP. 2019. Qualitative methods in implementation research: An introduction. Psychiatry Research **280,** 112516. https://doi.org/10.1016/j.psychres.2019.112516

Kennedy G, Ballard T, Dop MC. 2010. Guidelines for measuring household and individual dietary diversity. In Fao. www.foodsec.org

Kinabo J, Mamiro P, Dawkins N, Bundala N, Mwanri A, Majili Z, Jumbe T, Kulwa K, Mamiro D, Amuri N, Ngowi M, Msuya J. 2016. Food intake and dietary diversity of farming households in Morogoro region, Tanzania. African Journal of Food, Agriculture, Nutrition and Development **16(4),** 11295-11309. https://doi.org/10.18697/ajfand.76.16045

Kiprono SJ. 2021. Assessment of Nutrition Care, Food Service Quality, and Nutrition Status of Hospitalized Patients at Nakuru Level Five Hospital, Kenya. Doctoral Dissertation, University of Nairobi.

Mengie GM, Worku T, Nana A. 2018. Nutritional knowledge, dietary practice and associated factors among adults on antiretroviral therapy in Felege Hiwot referral hospital, Northwest Ethiopia. BMC Nutrition **4(1),** 1-8. https://doi.org/10.1186/s40795-018-0256-5

Merriweather JL, Salisbury LG, Walsh TS, Smith P. 2016. Nutritional care after critical illness: A qualitative study of patients' experiences. Journal of Human Nutrition and Dietetics **29(2),** 127-136. https://doi.org/10.1111/jhn.12287

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),** 1-7. https://doi.org/10.1186/s40795-019-0288-5

Nachvak SM, Abdollahzad H, Mostafai R, Moradi S, Pasdar Y, Rezaei M, Esksndari S. 2017. Dietary Diversity Score and Its Related Factors among Employees of Kermanshah University of Medical Sciences. Clinical Nutrition Research **6(4),** 247. https://doi.org/10.7762/cnr.2017.6.4.247

Naithani S, Thomas JE, Whelan K, Morgan M, Gulliford MC. 2009. Experiences of food access in hospital. A new questionnaire measure. Clinical Nutrition **28(6),** 625-630. https://doi.org/10.1016/j.clnu.2009.04.020

Ndyai JE. 2023. Determinants of Inadequate Calories Intake among Hospitalized Patients at Muhimbili National Hospital: A Cross-sectional Study in Dar es Salaam, Tanzania. 1-17.

Rathnayake KM, Madushani P, Silva K. 2012. Use of dietary diversity score as a proxy indicator of nutrient adequacy of rural elderly people in Sri Lanka. BMC Research Notes **5,** 469. https://doi.org/10.1186/1756-0500-5-469

Reber E, Gomes F, Bally L, Schuetz P, Stanga Z. 2019. Nutritional management of medical inpatients. Journal of Clinical Medicine **8(8),** 1130. https://doi.org/10.3390/jcm8081130

Richard Kronick. 2016. Role in improving quality, safety, and Health system – Public Health Reports.

R Core Team. 2023. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/

Schuetz P, Sulo S, Walzer S, Vollmer L, Brunton C, Kaegi-Braun N, Stanga Z, Mueller B, Gomes F. 2021. Cost savings associated with nutritional support in medical inpatients: An economic model based on data from a systematic review of randomised trials. BMJ Open **11(7),** e046402. https://doi.org/10.1136/bmjopen-2020-046402

Teka M, Dihar G, Dana T, Asnake G, Wakgari N, Bonger Z, Daga WB. 2022. Satisfaction with regular hospital foodservices and associated factors among adult patients in Wolaita zone, Ethiopia: A facility-based cross-sectional study. PLOS ONE **17(3 March),** e0264163. https://doi.org/10.1371/journal.pone.0264163

Tipton K, Leas B, Mull NK, Siddique S, Greysen S, Lane-Fall M, Tsou A. 2021. Interventions to decrease hospital length of stay. Rockville (MD): Agency for Healthcare Research and Quality (US); 2021 Sep. Report No.: 21-EHC015., 40, 1-147. www.ahrq.gov

World Health Organization and the United Nations Children's Fund (UNICEF). 2021. Indicators for assessing infant and young child feeding practices. In World Health Organization and the United Nations Children's Fund (UNICEF): Vol. WHA55 A55/.

Zhao A, Li Z, Ke Y, Huo S, Ma Y, Zhang Y, Zhang J, Ren Z. 2020. Dietary diversity among Chinese residents during the COVID-19 outbreak and its associated factors. Nutrients **12(6),** 1699. https://doi.org/10.3390/nu12061699

Zhu B, Ou Y, Guo X, Liu W. 2023. Poor nutritional status is associated with incomplete functional recovery in elderly patients with mild traumatic brain injury.