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The Malnutrition Frequency Trend in Imam Reza Teaching Hospital: Results from Nutrition Day 2019-2021

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ABSTRACT

Introduction: Malnutrition is a global health issue affecting nearly 40% of the population. Hospital malnutrition is a severe medical problem, which is often overlooked and has negative effects on both patients' health and the economy. In addition, malnutrition increases the risk of clinical complications and mortality. On Nutrition Day (nDay), patients in hospital wards and nursing homes worldwide participate in a cross-sectional survey using a standard questionnaire to assess their nutritional status. This study aimed to investigate the prevalence of malnutrition among patients at Imam Reza Teaching Hospital from 2019 to 2021.

Method: This study analyzed nDay data from Mashhad's Imam Reza Teaching Hospital from 2019 to 2021. The study included demographic and nutritional data from patients in fourteen different wards/units of the hospital. Over the past three years, an overview of malnutrition trends was presented by examining patient-reported responses to questions about malnutrition and its risk factors.

Results: The frequency of malnutrition in Burn units was the highest at 37.5% in the male unit in 2020 (P-value: <0.0001). The lowest BMI was observed in Oncology patients, averaging 18.9±2.4 in 2019. The most significant decrease in nutritional intake occurred in the Gastroenterology department, at 37.5% in 2019. The most significant change in hospital nutrition intake one week before admission was in the General Surgery ward, with a 47.4% decrease in 2019.

Conclusion: The significance of malnutrition, particularly in hospitals, could assist the health system in addressing this issue by using nDay as a standard questionnaire and screening tool. This study indicated that Burn units, Gastroenterology, Oncology, and General Surgery departments are the most susceptible to malnutrition and thus require increased attention.

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Introduction

Malnutrition, a critical global health challenge, has been approached from two distinct angles. Initially, attention was directed toward undernutrition, food security, and micronutrient deficiencies, while the focus later shifted to obesity, overweight issues, and excessive dietary intake (1). This multifaceted problem transcends national boundaries, affecting countries across the development spectrum (2). Prevalence rates of malnutrition vary significantly among communities, ranging from as low as 0.8% to as high as 40% (3). Given the growing exposure of individuals to both forms of malnutrition at different life stages, it is essential to identify risk factors (4). Various determinants contribute to malnutrition, including diminished appetite, eating difficulties, respiratory conditions, and gastrointestinal disorders. Furthermore, socioeconomic status, social isolation, advancing age, and physical limitations can also play a role (5, 6). Investigating hospital malnutrition is crucial, given that hospitalized patients are particularly vulnerable to these risk factors (7).
The pervasive issue of malnutrition within hospital settings is a significant medical concern that is often overlooked, yet it profoundly affects both patient health and the broader economic

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landscape. Malnutrition has been correlated with a surge in clinical complications, mortality rates, hospital admissions, and readmissions, alongside escalated healthcare expenditures (8). A comprehensive approach integrating robust medical treatment with intensive nutritional interventions is imperative to address hospital malnutrition (9) effectively. In certain instances, hospital malnutrition may stem from underlying medical conditions. Additionally, inadequate monitoring, identification, and assessment procedures within hospital environments may contribute to malnutrition occurrences. Furthermore, some healthcare professionals lack sufficient training to identify individuals at risk of malnutrition (9, 10). Over recent decades, several tools have been devised to detect malnutrition. Examples include the Mini Nutritional Assessment (MNA, 2009), the Malnutrition Universal Screening Tool (MUST, 2003), the Subjective Global Assessment (SGA, 1987), the Nutritional Risk Screening (NRS, 2002), and the Malnutrition Screening Tool (MST, 1999), for malnutrition assessment (11). Nonetheless, most screening tools are tailored to specific demographics, such as patients in healthcare settings or particular communities (12). A straightforward screening test for nutritional risk is utilized by participants of the nDay initiative, enabling the evaluation of various hospitals worldwide and their departments over time (10).

Nutrition Day (nDay) is an annual event during which hospital wards and nursing homes undergo cross-sectional audits for a single day. The nDay initiative has collected data from various wards and units supported by ESPEN (European Society for Clinical Nutrition and Metabolism) since its inception in 2006. Local unit staff use a standardized questionnaire to gather and input data into the nDay database. Globally, Nutrition Day aims to enhance awareness and understanding of malnutrition within the healthcare system and improve overall nutrition care quality (10, 13).

Mashhad University of Medical Science joined for the first time in 2010 and continued participating until 2023 as part of the Nutrition Day project. (14). This study aims to evaluate trends in malnutrition prevalence and associated factors observed from 2019 to 2021 at Imam Reza Teaching Hospital.

Materials & Methods

The data for this cross-sectional study was obtained from the nDay database at Imam Reza Teaching Hospital in Mashhad, Iran, from 2019 to 2021. All patients provided consent for their participation in the study. Throughout the study, the standardized protocol was followed, and a specific questionnaire was tailored to nDay (10). Various factors were considered during the data analysis, including 1) frequency of malnutrition, 2) frequency of being at risk for malnutrition, 3) body Mass Index (BMI), 4) weight loss within the past three months, 5) reduced food intake in the week before admission, 6) changes in food intake since admission, and 7) the amount of food consumed by patients on nDay. The data related to nutritional status were utilized to analyze malnutrition frequency trends.

The data were analyzed using SPSS (Version 19, Chicago, IL, USA). The Kolmogorov-Smirnov test showed that all variables had a normal distribution. Descriptive analyses were used to report variable frequencies. PRISM software was used to create charts illustrating trends in malnutrition frequency from 2019 to 2021, providing a comprehensive understanding of the issue.

The project was approved by the Mashhad University of Medical Sciences Ethical Committee (Code: 4020808).

Results

Demographic Findings

A total of 414 adult patients from 14 units within Imam Reza Teaching Hospital in Mashhad participated in the study.

In 2019, 14 wards contributed to the survey, covering Infection, Oncology, General Medicine, Rheumatology, Pulmonary, Gastroenterology, Internal Medicine, Dermatology, Burns male, Burns female, General Surgery, Orthopedic Surgery, Gynecological Surgery, and Cardiac Surgery. However, participation was limited due to the COVID-19 pandemic in 2020, with only five wards involved: Burns male, Burns female, General Surgery, Orthopedic Surgery, and Gynecological Surgery. In 2021, ten wards joined the study, including Infection, Oncology, Rheumatology, Gastroenterology, Internal Medicine, Burns male, General Surgery, Orthopedic Surgery, Gynecological Surgery, and Cardiac Surgery. Table 1 presents the frequency of malnutrition and at-risk cases in different units between 2019 and 2021.

The Burns male hospital unit exhibited the highest proportion of malnourished patients, nearly 40% in 2020. In 2019, the Pulmonary ward closely trailed the Burns male unit 2021, in 2019, the Burns female unit recorded the highest percentage of patients at risk of malnutrition (100%), followed by Gynecological Surgery (53%) and the Burns male unit (50%) in

Table 1. Frequency of malnutrition and at-risk cases for malnutrition

Unit Name	2019 N (%)		2020		2021		P-value	P-value At
	Malnourished	At Risk	Malnourished	At Risk	Malnourished	At Risk	malnutrition	Risk
Infection	-		-		-	-		
Oncology	2 (22.2%)	4(44.4%)			2(8.3%)	7(29.2%)	0.00*	0.02*
General Medicine	-	3(15.8%)			1 (4.5%)	8(36.4%)		0.00*
Rheumatology	1 (10.0%)	3(30.0%)			-	-		
Pulmonary	4 (30.8%)	1 (7.7%)						
Gastroenterology	2 (11.8%)	4(23.5%)			2(13.3%)	3(20.0%)	0.41	0.60
Internal Medicine	2 (16.7%)	1 (8.3%)				9(47.4%)	< 0.0001*	
Dermatology		1(12.5%)						
Surgery								
Burns (Female)		10(100%)	1 (12.5%)	2(25.0%)				< 0.0001*
Burns (Male)	1 (11.1%)	4(44.4%)	3 (37.5%)	4(50.0%)	3 (30.0%)	1 (10.0%)	0.00*	< 0.0001*
General Surgery		1 (5.3%)	-	-	1 (4.2%)	10(41.7%)		< 0.0001*
Orthopedic surgery	2 (5.0%)	1 (2.5%)	1 (10.0%)	1(10.0%)	1 (3.1%)	-	0.09	0.01*
Gynecological Surgery			-	-	1 (6.3%)	-		
Cardiac Surgery		3 (42.9%)			-	-		

rated at 30.8% and 30%, respectively. However, 2020.

Table 2. BMI in different units between 2019-2021

Unit	BMI (kg/m^2)		
	2019	2020	2021
Infection	24.7±6.2		24.9±4.8
Oncology	18.9±2.4		25.6±11.1
General Medicine	23.0±4.9		
Rheumatology	25.3±5.2		23.0±2.4
Pulmonary	25.7±11.3		
Gastroenterology	23.4±5.9		22.9±2.7
Internal Medicine	24.4±5.5		24.0±4.8
Dermatology	29.3±10.4		
Burns (Male)	19.9±2.5	22.8±6.1	25.3±5.2
Burns (Female)	25.6±6.2	23.1±4.8	
General Surgery	24.9±3.9	25.6±6.4	25.7±3.6
Orthopedic surgery	23.7±4.4	22.4±5.2	24.7±4.8
Gynecological Surgery	29.5±7.7	28.9±5.3	30.7±12.2
Cardiac Surgery	26.9±4.1		25.3±4.7

Conversely, the lowest prevalence of malnourished patients was observed in the surgery orthopedic unit in 2021, accounting for only 3%, followed by surgery general in 2021 at 4.2%. Figures 1 and 2, respectively, demonstrate the frequency of malnutrition and the risk for malnutrition in different wards between 2019 and 2021.

As shown in Table 2, the Oncology unit had the lowest BMI in 2019, with a median of 18.9±2. Following closely behind was Burns's male unit in 2019, with a BMI of 19.9±2.5. In contrast, Gynecological Surgery had the highest BMI among all units in 2021, with a BMI of 30.7±12.2.

Weight Loss in the Last Three Months

Table 3 indicates that Gastroenterology patients had the highest rate of unintentional weight loss among all units, at 76.5%. Internal Medicine followed this in 2021 at 68%, and Orthopedic Surgery in 2020 at 60%. Figure 3 illustrates the weight loss trend in the three months following admission.

Food intake a week before hospitalization

According to Table 4, 37.5% of patients admitted to the Gastroenterology unit in 2019 had consumed a quarter or almost none of their food, followed by 36.7% in General Surgery and 33.3% in Oncology. Figure 4 illustrates the trends in food intake before hospitalization from 2019 to 2021.

Food Intake in nDay

According to Table 5, General surgery had the lowest food intake in 2019 at 47.4%, almost none. Conversely, Rheumatology had nearly all their food intake in 2019 at 50%, Burns males in 2020 at 50%, and Rheumatology again in 2021 at 50% (the supplementary tables are at the end of this file). Figure 5 illustrates the trends in food intake during this period.

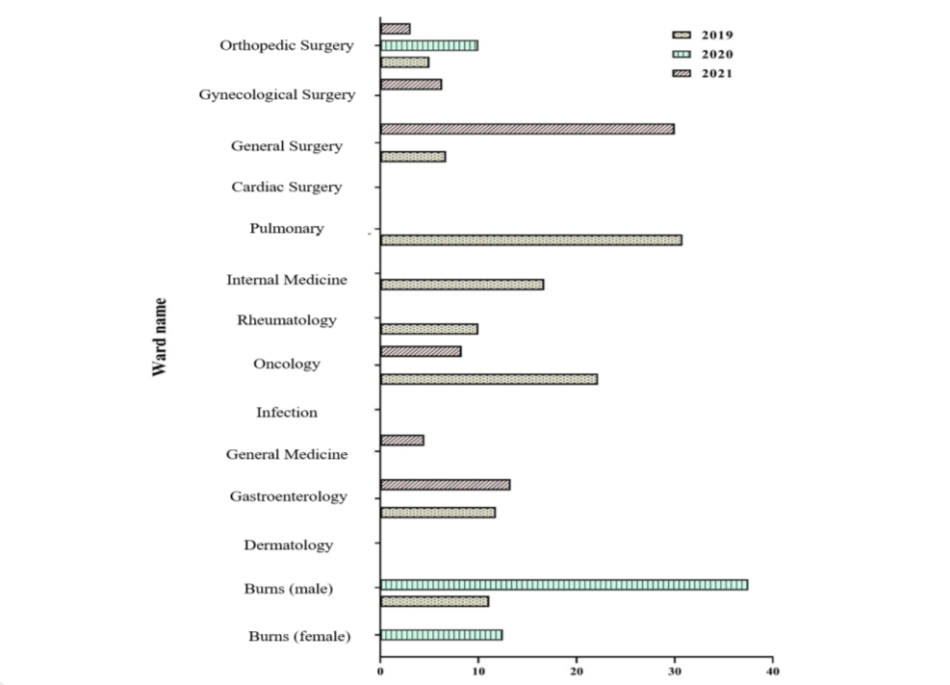

Figure 1. Trend in the frequency of malnutrition

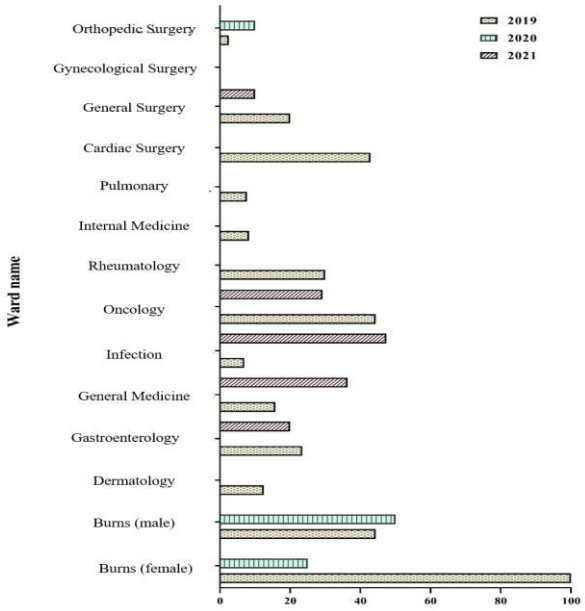

Figure 2. Trend of individuals at risk for malnutrition

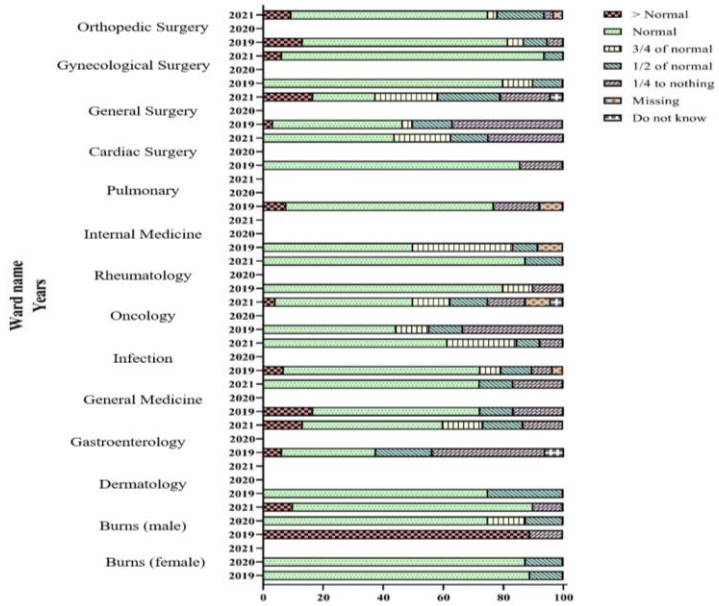

Figure 4. Trend of eating well before admission

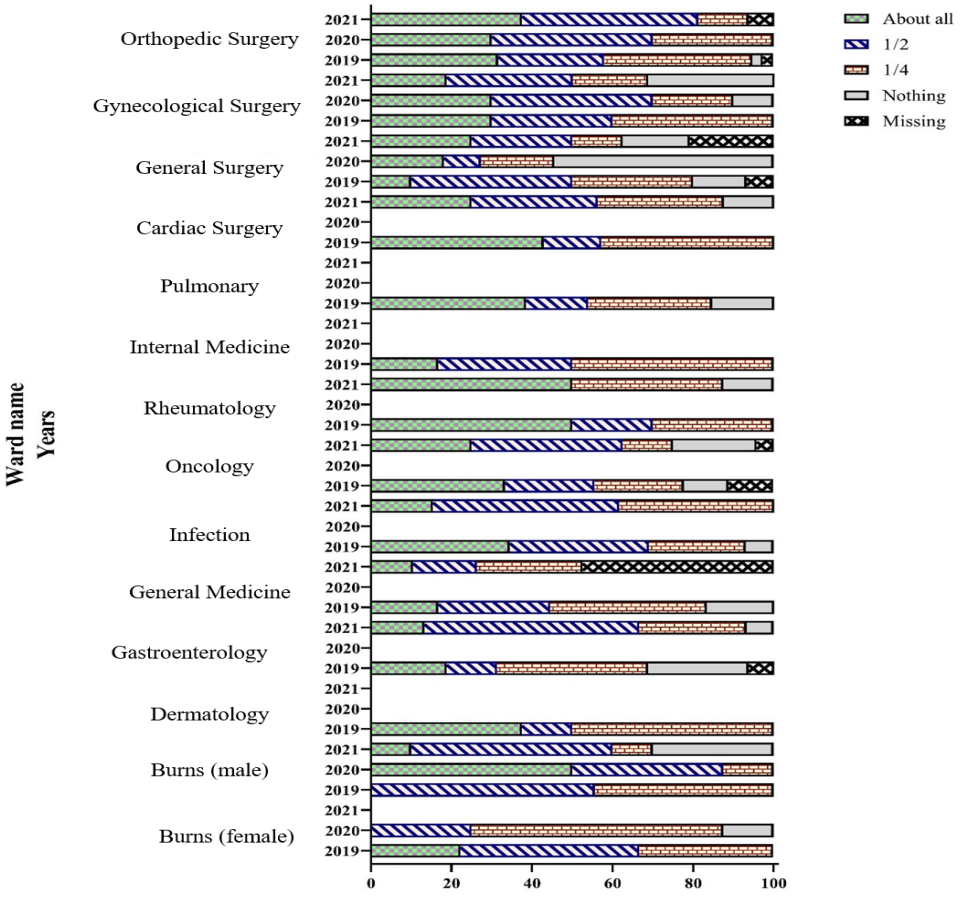

Figure 5. Trend of food intake on nDay

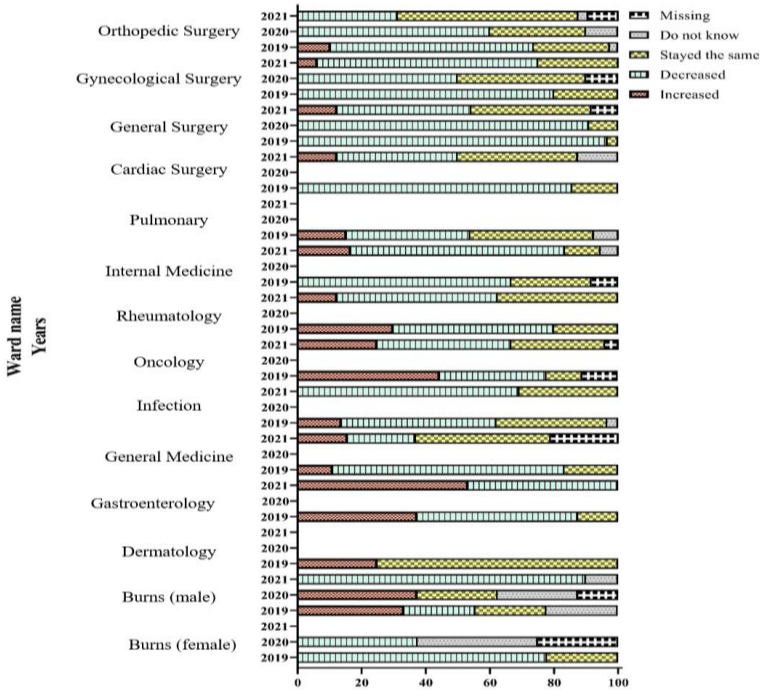

Figure 6. Trend of food intake in the hospital

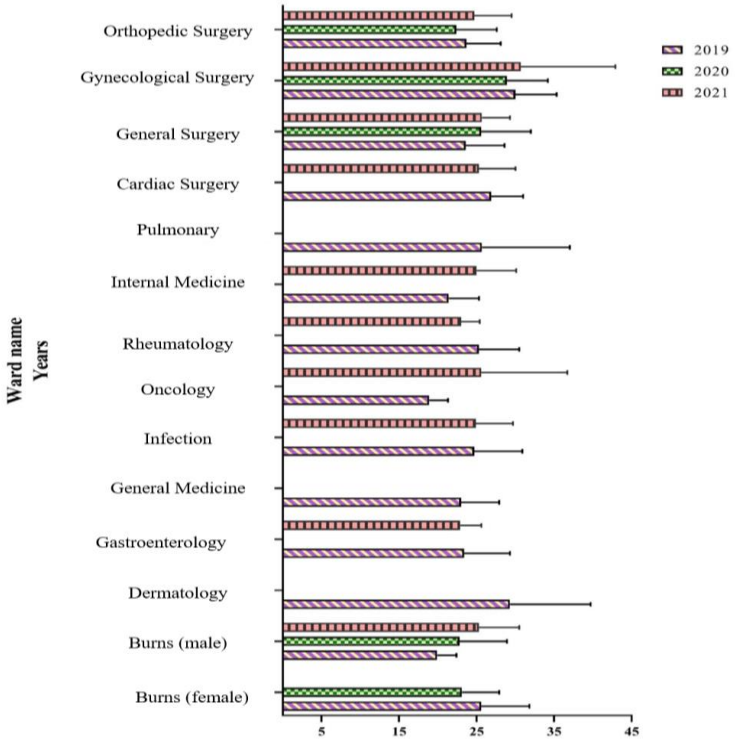

Figure 7. Trend of BMI (Body Mass Index) in various units

Food Intake Changes in the Hospital

As shown in Table 6, patients in the Burns male unit in 2021 experienced a 90% decrease in food intake, while patients in the Cardiac Surgery unit in 2019 had a 55% decrease. Oncology patients in 2019 saw a 44.4% decrease, while those in the Burns male unit in 2020 and Gastroenterology in 2019 had an increase of 37.5% in food intake compared to before hospitalization.

Discussion

A consistent trend was not identified for malnutrition within the Imam Reza Teaching Hospital after analyzing the data from various departments. Frequencies of malnutrition varied across different years within the same department. However, when considering all departments collectively, the Burns department, Pulmonary department, and General Surgery exhibited the highest rates of malnourished patients. Additionally, the Burns and Gynecological Surgery units showed the highest risk of malnutrition.

The lowest Body Mass Index (BMI) was observed among oncology patients. Gastroenterology recorded the highest instances of weight loss in the three months preceding admission and a reduction in nutrition intake before hospitalization. Comparatively, the general surgery unit reported the lowest food intake during nDay and admission.

Malnutrition in the Burn Unit

According to our findings, the Burns unit showed the highest incidence of malnutrition. A survey conducted in 2021 involving 109 patients across various hospitals in Iran also found that a majority of patients in the Burns ward were malnourished (15). The prevalence of malnutrition in Burns units is not surprising, given the critical condition of individuals with burn injuries. These patients were prone to hypermetabolic responses, which could intensify the use of bodily resources and potentially lengthen hospital stays when combined with preexisting malnutrition (16). This study also noted an increase in overall malnutrition and malnutrition risk among Burns ward patients over the years studied.

Burn victims experience a significant increase in metabolism, requiring a higher intake of energy, carbohydrates, protein, fats, vitamins, minerals, and antioxidants. Early nutritional intervention through parenteral or enteral feeding is crucial to reduce infection risks, speed up recovery, and minimize long-term complications (17).

The persistent hypermetabolism and catabolism from burn injuries led to muscle wasting, cachexia, impaired wound healing, organ dysfunction, and increased susceptibility to infection (18).

Despite ongoing research, the causes of hypermetabolism after burns remain complex and are not fully understood. Active investigations can uncover the intricate dysregulation of metabolism, hormonal pathways, and inflammatory processes. Oxygen consumption is linked to increased ATP turnover and cellular-level thermogenesis by the body (19).

Several studies have implicated catecholamines as the primary mediators of hyper metabolism (19, 20). Catabolic hormones such as epinephrine, cortisol, and glucagon inhibit protein synthesis and fat production (21). As a result, an imbalance between protein synthesis and breakdown leads to skeletal muscle cachexia. Dysregulation of muscle kinetics may persist for up to three years following severe burns, resulting in reduced lean body mass (18).

The timing of treatment, including nutrition, significantly impacts patient outcomes post-severe burns. Burn injuries cause severe damage to the intestinal mucosa, heightening bacterial translocation and impairing nutrient absorption. Hence, initiating nutritional support within 24 hours of injury is crucial (22). Given burn patients' hypermetabolic state, meeting their caloric requirements while avoiding overfeeding is essential, with nutritional support being the primary objective (23).

As nitrogen constitutes the fundamental building block of amino acids, ensuring adequate protein provision is another crucial aspect of post-burn nutritional support. Thus, monitoring nitrogen inputs and losses facilitates the study of protein metabolism (18).

Malnutrition and BMI

The study's Oncology ward had the lowest Body Mass Index (BMI). Cachexia, characterized by unintentional weight loss and muscle wasting, affects approximately 30% of all cancer patients. Individuals experiencing cachexia endure severe fatigue and weakness, significantly impacting their quality and length of life. Cachectic patients face a negative energy balance due to increased energy expenditure and decreased energy intake.

Tumor-secreted factors and systemic inflammatory responses may elevate the basal metabolic rate, leading to inefficient energy production pathways and heightened energy demand by both the tumor and the host (24).
Cachexia is defined as a body weight loss exceeding 5%, or >2%, in patients with a BMI <20 kg/m^2 or the presence of sarcopenia. Patients with refractory cachexia often exhibit substantial catabolism. Various factors, including tumor type, cancer stage, food intake, inflammation levels, and response to chemotherapy, can influence the progression of cachexia (25). Identifying and effectively treating cachexia may improve symptoms and treatment outcomes for affected patients (26). Common interventions typically revolve around nutrition and physical therapy, alongside addressing underlying causes of reduced food intake, such as anorexia and nausea (26, 27).
Moreover, inflammatory factors and mediators implicated in cachexia contribute to systemic inflammation. Immune checkpoints modulate adipocyte differentiation and systemic metabolic balance during cachectic development. A comprehensive understanding of cachexia encompasses the immunometabolism axis, immune-gut axis, and immune-nerve axis (28).

Weight Loss before Admission

The findings revealed that patients admitted to the Gastroenterology ward experienced the most significant weight loss three months before their hospitalization.
Various gastrointestinal diseases are characterized by weight loss, often accompanied by clinical manifestations of malassimilation, maldigestion, and malabsorption. Patients with conditions such as celiac disease, lambliasis, small bowel Crohn's disease, common variable immunodeficiency syndrome (CVIDS), and Whipple's disease may exhibit a loss of absorptive surface. Persistent intestinal pseudo-obstruction can lead to weight loss due to postprandial pain and dysmotility. In addition, there may be a primary or secondary association between exocrine pancreatic insufficiency and various protein-losing enteropathies. Surgery-related symptoms, including dumping syndrome, bile acid malabsorption, and short bowel syndrome, contribute to chronic intestinal issues. Intestinal injuries such as radiation-induced enteritis, persistent intestinal ischemia, and intestinal diabetic polyneuropathy also lead to chronic intestinal problems (29).
Similarly, recent weight loss can be indicative of clinical manifestations and a cornerstone in the diagnosis of some gastrointestinal diseases, such as Crohn's disease (30). The underlying physiological disturbances caused by disease can also be considered as the cause of weight loss as a marker of disease activity (31)
Weight loss can be a crucial diagnostic marker for certain gastrointestinal diseases, such as Crohn's disease, and may indicate disease activity. Many gastrointestinal diseases have an inflammatory basis, resulting in a generalized catabolic state. During the acute phase of the disease, resting energy expenditure increases, while proinflammatory cytokines exert anorexic effects. This inflammatory state impacts leptin, adiponectin, and ghrelin levels, potentially affecting satiety. Moreover, deficiencies in both macronutrients and micronutrients occur due to malabsorption in these disease processes (32, 33). Symptoms such as a solid gastrocolic reflex and food-related pain can lead patients to avoid eating, putting them at risk of malnutrition (31). Patients suffering from any of these conditions are at risk of malnutrition.

Conclusion

Malnutrition among hospitalized patients remains under-recognized despite efforts to screen for it systematically over the years. Inadequate nutritional treatment during hospitalization contributes to its persistence (34).
Early screening for malnutrition is crucial for the timely initiation of nutritional therapy. Regular monitoring of nutritional status using a nutrition evaluation score facilitates prompt nutritional intervention as recommended by nutrition guidelines (35, 36).
Targeted nutritional care for patients admitted to wards where malnutrition risk is highest can help reduce the incidence of malnutrition and associated complications.

Strength and Limitation

The significant strength of this study lies in its comprehensive sampling approach, encompassing a wide array of hospitals and specialties within those hospitals. Consistency and comparability were ensured across different settings utilizing a standardized questionnaire as a global tool for assessing malnutrition

frequency. A detailed breakdown of the questions and factors related to malnutrition was provided, enhancing understanding and facilitating targeted interventions. The reporting of trends further enhances our understanding of the prevailing situation, enabling us to deliver improved nutrition care to our patients. Moreover, collaborating with dieticians and nutrition students in compiling the questionnaire adds credibility to the findings.

The study has limitations, however, which need to be acknowledged. The cross-sectional design and reliance on self-reported survey responses introduce inherent limitations, including the potential for recall bias. Moreover, the inability of some wards to participate in the study due to the COVID-19 pandemic in 2020 restricts the generalizability of the findings to some extent. Furthermore, the study's restriction to a single teaching hospital, albeit the largest in northeast Iran, may limit the generalizability of the findings. Despite these limitations, this study provides valuable insights into the prevalence and factors associated with malnutrition, paving the way for future research and interventions in this critical area of healthcare.

Declarations

Conflict of Interest

The authors declare that they have no conflict of interest.

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Ethical Approval

This study was conducted under the guidelines of the Helsinki Declaration. The Research Ethics Committee of Mashhad University of Medical Sciences approved all procedures involving human volunteers (IR.MUMS.MEDICAL.REC.1402.371).

Reference

1. Wells JC, Sawaya AL, Wibaek R, Mwangome M, Poullas MS, Yajnik CS, et al. The double burden of malnutrition: aetiological pathways and consequences for health. The Lancet. 2020;395(10217):75-88.
2. Swinburn BA, Kraak VI, Allender S, Atkins VJ, Baker PI, Bogard JR, et al. The global syndemic of obesity, undernutrition, and climate change: the Lancet Commission report. The lancet. 2019;393(10173):791-846.
3. Crichton M, Craven D, Mackay H, Marx W, De Van Der Schueren M, Marshall S. A systematic review, meta-analysis and meta-regression of the prevalence of protein-energy malnutrition: associations with geographical region and sex. Age and ageing. 2019;48(1):38-48.
4. Fleming TP, Watkins AJ, Velazquez MA, Mathers JC, Prentice AM, Stephenson J, et al. Origins of lifetime health around the time of conception: causes and consequences. The Lancet. 2018;391(10132):1842-52.
5. Kiesswetter E, Colombo MG, Meisinger C, Peters A, Thorand B, Holle R, et al. Malnutrition and related risk factors in older adults from different health-care settings: an enable study. Public Health Nutrition. 2020;23(3):446-56.
6. Besora-Moreno M, Llauradó E, Tarro L, Solà R. Social and economic factors and malnutrition or the risk of malnutrition in the elderly: a systematic review and meta-analysis of observational studies. Nutrients. 2020;12(3):737.
7. Correia MIT, Sulo S, Brunton C, Sulz I, Rodriguez D, Gomez G, et al. Prevalence of malnutrition risk and its association with mortality: nutritionDay Latin America survey results. Clinical Nutrition. 2021;40(9):5114-21.
8. Inciong JFB, Chaudhary A, Hsu H-S, Joshi R, Seo J-M, Trung LV, et al. Hospital malnutrition in northeast and southeast Asia: A systematic literature review. Clinical Nutrition ESPEN. 2020;39:30-45.
9. Trtovac D, Lee J. The use of technology in identifying hospital malnutrition: scoping review. JMIR Medical Informatics. 2018;6(1):e4.
10. Tarantino S, Hiesmayr M, Sulz I. nutritionDay Worldwide Annual Report 2019. Clinical nutrition ESPEN. 2022;49:560-667.
11. Serón-Arbeloa C, Labarta-Monzón L, Puzo-Foncillas J, Mallor-Bonet T, Lafita-López A, Bueno-Vidales N, et al. Malnutrition Screening and Assessment. Nutrients. 2022;14(12).
12. Leij-Halfwerk S, Verwijs MH, van Houdt S, Borkent JW, Guaitoli PR, Pelgrim T, et al. Prevalence of protein-energy malnutrition risk in European older adults in community, residential and hospital settings, according to 22 malnutrition screening tools validated for use in adults ≥65 years: A systematic review and meta-analysis. Maturitas. 2019;126:80-9.
13. Böhne SEJ, Hiesmayr M, Sulz I, Tarantino S, Wirth R, Volkert D. Recent and current low food intake – prevalence and associated factors in hospital patients from different medical specialities. European Journal of Clinical Nutrition. 2022;76(10):1440-8.
14. Tarantino S, Hiesmayr M, Sulz I. nutritionDay Worldwide Annual Report 2019. Clinical Nutrition ESPEN. 2022;49:560-667.
15. Poudineh S, Shayesteh F, Kermanchi J, Haghdoost AA, Torabi P, Pasdar Y, et al. A multi-centre survey on hospital malnutrition: result of PNSI study. Nutr J. 2021;20(1):87.

16. Williams FN, Herndon DN, Jeschke MG. The hypermetabolic response to burn injury and interventions to modify this response. Clin Plast Surg. 2009;36(4):583-96.
17. Chan MM, Chan GM. Nutritional therapy for burns in children and adults. Nutrition. 2009;25(3):261-9.
18. Clark A, Imran J, Madni T, Wolf SE. Nutrition and metabolism in burn patients. Burns & trauma. 2017;5.
19. Yu YM, Tompkins RG, Ryan CM, Young VR. The metabolic basis of the increase in energy expenditure in severely burned patients. Journal of Parenteral and Enteral Nutrition. 1999;23(3):160-8.
20. Williams FN, Herndon DN, Jeschke MG. The hypermetabolic response to burn injury and interventions to modify this response. Clinics in plastic surgery. 2009;36(4):583-96.
21. Demling RH, Seigne P. Metabolic management of patients with severe burns. World Journal of Surgery. 2000;24:673-80.
22. Magnotti LJ, Deitch EA. Burns, bacterial translocation, gut barrier function, and failure. The Journal of Burn Care & Rehabilitation. 2005;26(5):383-91.
23. Graves C, Saffle J, Morris S. Comparison of urine urea nitrogen collection times in critically ill patients. Nutrition in Clinical Practice. 2005;20(2):271-5.
24. Law ML. Cancer cachexia: Pathophysiology and association with cancer-related pain. Frontiers in Pain Research. 2022;3:971295.
25. Fearon K, Strasser F, Anker SD, Bosaeus I, Bruera E, Fainsinger RL, et al. Definition and classification of cancer cachexia: an international consensus. The Lancet Oncology. 2011;12(5):489-95.
26. Del Fabbro E. Combination therapy in cachexia. Ann Palliat Med. 2019;8(1):59-66.
27. Mantovani G, Macciò A, Madeddu C, Serpe R, Massa E, Dessì M, et al. Randomized phase III clinical trial of five different arms of treatment in 332 patients with cancer cachexia. The Oncologist. 2010;15(2):200-11.
28. Wu Q, Liu Z, Li B, Liu Y-e, Wang P. Immunoregulation in cancer-associated cachexia. Journal of Advanced Research. 2023.
29. Fromhold-Treu S, Lamprecht G. [Gastrointestinal causes of weight loss: clinical presentation, diagnostic workup and therapy]. Dtsch Med Wochenschr. 2016;141(4):253-60.
30. Sawczenko A, Sandhu B. Presenting features of inflammatory bowel disease in Great Britain and Ireland. Archives of Disease in Childhood. 2003;88(11):995-1000.
31. Elsherif Y, Alexakis C, Mendall M. Determinants of Weight Loss prior to Diagnosis in Inflammatory Bowel Disease: A Retrospective Observational Study. Gastroenterol Res Pract. 2014;2014:762191.
32. Rigaud D, Cerf M, Sobhani I, Carduner M, Mignon M. Increase of resting energy expenditure during flare-ups in Crohn disease. Gastroenterologie Clinique et Biologique. 1993;17(12):932-7.
33. Karmiris K, Koutroubakis IE, Kouroumalis EA. Leptin, adiponectin, resistin, and ghrelin–implications for inflammatory bowel disease. Molecular Nutrition & Food Research. 2008;52(8):855-66.
34. Konturek PC, Herrmann HJ, Schink K, Neurath MF, Zopf Y. Malnutrition in hospitals: it was, is now, and must not remain a problem! Medical science monitor: International Medical Journal of Experimental and Clinical Research. 2015;21:2969.
35. Stratton RJ, Hackston A, Longmore D, Dixon R, Price S, Stroud M, et al. Malnutrition in hospital outpatients and inpatients: prevalence, concurrent validity and ease of use of the 'malnutrition universal screening tool'('MUST') for adults. British Journal of Nutrition. 2004;92(5):799-808.
36. Vidal A, Iglesias MJ, Pertega S, Ayúcar A, Vidal O. Prevalence of malnutrition in medical and surgical wards of a university hospital. Nutrición Hospitalaria. 2008;23(3):263-7.

Supplementary Tables

Table 3. Weight loss in the last 3 months

Unit	2019						2020						2021						p-value					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Infection	3 (10.3%)	10 (34.5%)	5 (17.2%)	6 (20.7%)	5 (17.2%)																			
Oncology	1 (11.1%)	5 (55.6%)	1 (11.1%)	1 (11.1%)	1 (11.1%)																			
General medicine		8 (42.1%)	10 (52.6%)	1 (5.3%)																				
Rheumatology		5 (50.0%)	4 (40.0%)	1 (10.0%)									1 (6.7%)						< 0.0001*					
Pulmonary	1 (7.7%)	8 (61.5%)	3 (23.1%)	7 (31.8%)	1 (7.7%)																			
Gastroenterology	1 (5.9%)	13 (76.5%)		2 (11.8%)	1 (5.9%)								1 (6.7%)						0.77					
Internal Medicine	2 (12.5%)	2 (12.5%)	3 (18.8%)		5 (31.3%)								1 (6.7%)						0.22					

Unit	2019						2020						2021						p-value					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Dermatology	2 (25.0%)	1 (12.5%)	3 (37.5%)	2 (25.0%)																				
Surgery																								
Burns(male)		1 (11.1%)	4 (44.4%)		1 (11.1%)	3 (33.3%)		3 (37.5%)	1 (12.5%)				1 (10.0%)	2 (20.0%)	2 (20.0%)			5 (50.0%)		< 0.0001*	< 0.0001*			
Burns(female)	1 (11.1%)	4 (44.4%)	3 (33.3%)	1 (11.1%)		3 (37.5%)			2 (25.0%)												0.21			
Surgery General	1 (3.3%)	10 (33.3%)	8 (26.7%)	3 (10.0%)	1 (3.3%)	7 (23.3%)		4 (36.4%)	4 (36.4%)				1 (4.2%)	13 (54.2%)	10 (41.7%)				0.70	0.00*	0.02*			
Orthopedic Surgery	9 (23.1%)	6 (15.4%)	14 (35.9%)	2 (5.1%)	2 (5.1%)	6 (15.4%)		6 (60.0%)	3 (30.0%)				2 (6.3%)	5 (15.6%)	13 (40.6%)	4 (12.5%)	1 (3.1%)	7 (21.9%)	0.0007*	< 0.0001*	0.26	0.07	0.47	0.20
Genecology Surgery	1 (3.2%)	1 (3.2%)	3 (9.7%)	24 (77.4%)																				

Unit	2019						2020						2021						p-value					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Cardiac Surgery	1 (14.3%)	2 (28.6%)	4 (57.1%)											12 (75.0%)	2 (12.5%)			2 (12.5%)		< 0.0001*	< 0.0001			

1- intentionally/ 2- unintentionally/ 3- steady weight/ 4- gained weight/ 5- does not know

Table 4. Food intake one week before hospital admission

Unit	2019							2020							2021							p-value						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Infection	2 (6.9%)	19 (65.5%)	2 (6.9%)	3 (10.3%)	2 (6.9%)	1 (3.4%)									8 (61.5%)	3 (23.1%)	1 (7.7%)	1 (7.7%)					0.55	0.00*	0.62	0.78		
Oncology		4 (44.4%)	1 (11.1%)	1 (11.1%)	3 (33.3%)										1 (4.2%)	11 (45.8%)	3 (12.5%)	3 (12.5%)	3 (12.5%)	2 (8.3%)	1 (4.2%)		1	0.82	0.82	0.0004			
General Medicine	3 (16.7%)	10 (55.6%)		2 (11.1%)	3 (16.7%)										13 (72.2%)		2 (11.1%)	3 (16.7%)					0.01*		1	1		
Rheumatology		8 (80.0%)	1 (10.0%)		1 (10.0%)										7 (87.5%)		1 (12.5%)						0.18					
Pulmonary	1 (7.7%	9 (69.2%)			2 (15.4%)	1 (7.7%)																						
Gastroenterology	1(6.3%)	5(31.3%)		3(18.8%)	6(37.5%)		1(6.3%)								2 (13.3%)	7 (46.7%)	2 (13.3%)	2 (13.3%)	2 (13.3%)				0.09	0.02*		0.24			

Unit	2019							2020							2021							p-value						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Internal medicine		6 (40.0%)			5 (33.3%)		4 (26.7%)									9 (47.4%)	2 (10.5%)	2 (10.5%)	5 (26.3%)		1 (5.3%)		0.31		0.27			< 0.0001*
Dermatology		6 (75.0%)		2 (25.0%)																								
Surgery																												
Burns(male)		8 (88.9%)				1 (11.1%)			6 (75.0%)		1 (12.5%)	1 (12.5%)			1 (10.0%)	8 (80.0%)			1 (10.0%)				0.06					
Burns(female)		8(88.9%)		1 (11.1%)					7 (87.5%)			1 (12.5%)											0.66		0.82		
Surgery GeneraG	5 (26.3%)	7 (36.8%)	3 (15.8%)	2 (10.5%)	2 (10.5%)										1 (9.1%)	4 (36.4%)	3 (27.3%)	2 (18.2%)	1 (9.1%)			0.00*	1	0.0589	0.10			
Orthopedic Surgery	5 (13.2%)	26 (68.4%)	2 (5.3%)	3 (7.9%)	2 (5.3%)										3 (9.4%)	21 (65.6%)	1 (3.1%)	5 (15.6%)	1 (3.1%)	1 (3.1%)		0.36	0.65	0.47	0.08	0.47		
Gynecological Surgeryy		8 (80.0%)	1 (10.0%)	1 (10.0%)											1 (6.3%)	14 (87.5%)		1 (6.3%)				0.18			0.29			
Cardiac Surgeryu		6 (85.7%)			1 (14.3%)											7 (43.8%)	3 (18.8%)	2 (12.5%)	4 (25.0%)			< 0.0001*				0.0502		

1-more than normal/ 2-normal/ 3- about ¾ normal/ 4-about half of normal/ 5- about a quarter nearly nothing/6- I don't know/7-missing

Table 5. Food Intake on Nutrition Day

Unit	2019					2020					2021					pvalue				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Infection	4 (13.8%)	14 (48.3%)	10 (34.5%)	1 (3.4%)								9 (69.2%)	4 (30.8%)				0.00*	0.65		
Oncology	4 (44.4%)	3 (33.3%)	1 (11.1%)		1 (11.1%)						6 (25.0%)	10 (41.7%)	7 (29.2%)		1 (4.2%)	0.00*	0.18	0.54		0.06
General Medicine	2 (11.1%)	13 (72.2%)	3 (16.7%)								3 (15.8%)	4 (21.1%)	8 (42.1%)		4 (21.1%)	0.30	< 0.0001*	0.00*		
Rheumatology	3 (30.0%)	5 (50.0%)	2 (20.0%)								1 (12.5%)	4 (50.0%)	3 (37.5%)			0.00*	1	0.00*		
Pulmonary	2 (15.4%)	5 (38.5%)	5 (38.5%)	1 (7.7%)																
Gastroenterology	6 (37.5%)	8 (50.0%)	2 (12.5%)									8 (53.3%)	7 (46.7%)				0.67	< 0.0001*		
Internal Medicine		8 (66.7%)	3 (25.0%)		1 (8.3%)						3 (16.7%)	12 (66.7%)	2 (11.1%)	1 (5.6%)			1	0.01*		
Dermatology	2 (25.0%)		6 (75.0%)																	
Surgery																				
Burns (male)	3 (33.3%)	2 (22.2%)	2 (22.2%)	2 (22.2%)		3 (37.5%)			2 (25.0%)	2 (25.0%)	1 (12.5%)	9 (90.0%)		1 (10.0%)		0.55	< 0.0001*	0.61	0.01*	

Unit	2019					2020					2021					pvalue				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Burns(female)		7 (77.8%)	2 (22.2%)				3 (37.5%)		3 (37.5%)	2 (25.0%)							< 0.0001*			
Surgery general	1 (5.3%)	7 (36.8%)	8 (42.1%)	2 (10.5%)	1 (5.3%)															
Orthopedic Surgery	4 (10.5%)	24 (63.2%)	9 (23.7%)	1 (2.6%)			6 (60.0%)	3 (30.0%)	1 (10.0%)			10 (31.3%)	18 (56.3%)	1 (3.1%)	3 (9.4%)		< 0.0001*	< 0.0001*	0.03*	
Gynecological Surgery		8 (80.0%)	2 (20.0%)				5 (50.0%)	4 (40.0%)		1 (10.0%)	1 (6.3%)	11 (68.8%)	4 (25.0%)				< 0.0001*	0.00*		
Cardiac Surgery		6 (85.7%)	1 (14.3%)								2 (12.5%)	6 (37.5%)	6 (37.5%)	2 (12.5%)			< 0.0001*	0.00*		

1-about all / 2-1/2/ 3-1/4 / 4-nothing / 5-missing

Table 6. Change in food intake upon admission

unit	2019					2020					2021					P-value				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Infection	10 (34.5%)	10 (34.5%)	7 (24.1%)	2 (6.9%)							2 (15.4%)	6 (46.2%)	5 (38.5%)			0.00*	0.08	0.03*		
Oncology	3 (33.3%)	2 (22.2%)	2 (22.2%)	1 (11.1%)	1 (11.1%)						6 (25.0%)	9 (37.5%)		5 (20.8%)	1 (4.2%)	0.21	0.02*		0.0544	0.0609

Orthopedic Surgery	General Surgery	Burns(female)	Burns (male)	Dermatology	Internal Medicine	Gastroenterology	Pulmonary	Rheumatology	General Medicine
12 (31.6%)	7 (36.8%)	2 (22.2%)		3 (37.5%)	2 (16.7%)	3 (18.8%)	5 (38.5%)	5 (50.0%)	3 (16.7%)
10 (26.3%)	2 (10.5%)	4 (44.4%)	5 (55.6%)	1 (12.5%)	4 (33.3%)	2 (12.5%)	2 (15.4%)	2 (20.0%)	5 (27.8%)
14 (36.8%)	1 (5.3%)	3 (33.3%)	4 (44.4%)	4 (50.0%)	6 (50.0%)	6 (37.5%)	4 (30.8%)	3 (30.0%)	7 (38.9%)
1 (2.6%)	9 (47.4%)					4 (25.0%)	2 (15.4%)		3 (16.7%)
1 (2.6%)						1 (6.3%)			
3 (30.0%)			4 (50.0%)						
4 (40.0%)		2 (25.0%)	3 (37.5%)						
3 (30.0%)		5 (62.5%)	1 (12.5%)						
		1 (12.5%)							
12 (37.5%)			1 (10.0%)			2 (13.3%)		4 (50.0%)	2 (10.5%)
14 (43.8%)			5 (50.0%)			8 (53.3%)			3 (15.8%)
4 (12.5%)			1 (10.0%)			4 (26.7%)		3 (37.5%)	5 (26.3%)
			3 (30.0%)			1 (6.7%)		1 (12.5%)	
2 (6.3%)									9 (47.4%)
0.55			< 0.0001*			0.1491		1	0.14
0.02*		0.00*	0.02*			< 0.0001*			0.03*
0.00*		< 0.0001*	< 0.0001*			0.13		0.29	0.0503
						0.00*			
0.30									

Gynecological Surgery	3 (30.0%)	3 (30.0%)	4 (40.0%)			3 (30.0%)	4 (40.0%)	2 (20.0%)	1 (10.0%)		3 (18.8%)	5 (31.3%)	3 (18.8%)	5 (31.3%)	0.12	0.25	0.00*	0.00*
Cardiac Surgery	3 (42.9%)	1 (14.3%)	3 (42.9%)								4 (25.0%)	5 (31.3%)	5 (31.3%)	2 (12.5%)	0.00*	0.00*	0.07	

1-increased 2-decreased 3-stayed the same 4-does not know 5- missing