

PREVALENCE OF MALNUTRITION AND ITS RELATED FACTORS IN PATIENTS WITH CANCER IN AL-NASIRIYAH CITY, IRAQ 2024

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Article Received date: 12 May 2025

Article Revised date: 01 June 2025

Article Accepted date: 22 June 2025



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ABSTRACT

Background: Cancer remains one of the leading causes of death, Its incidence is on the rise due to various factors. Malnutrition is widespread among cancer patients and plays a significant role in morbidity and mortality by reducing treatment effectiveness, prolonging hospital stays, and others. **Objectives:** To investigate the prevalence of malnutrition and the associated factors that affect the nutritional status of cancer patients at Thiqr Oncology Center/ Iraq 2024. **Patients and methods:** A cross-sectional study targeting cancer patients who attend Thiqr Oncology Center from 1st of March to 31st August 2024. The data were collected by direct interviews with patients and by answering questions regarding sociodemographic characteristics, and clinical characteristics, and using a nutritional assessment tool called (patient-generated subjective global assessment). Data were analyzed using the statistical package for the social science program version 27. A statistically significant level was determined at $P \leq 0.05$. **Results:** Of the 295 patients, sixty-eight percent (201 patients) were diagnosed with malnutrition (thirty-nine percent moderate and twenty-nine percent severe malnutrition). In comparison, thirty-two percent (94 patients) were well nourished. Malnutrition was associated with an increase in age and this association was significant. Also, the duration of the disease, advanced stage of cancer, low BMI of the patients, and special types of neoplasm were associated significantly with malnutrition (P value < 0.05). While other demographic factors (residency, sex, occupation, education) and type of treatment show an insignificant association. **Conclusions:** Malnutrition is prevalent among cancer patients in Thiqr governorate, so special attention to malnutrition screening must be a priority for healthcare providers to improve overall survival and quality of life for patients with cancer.

KEYWORDS: Cancer, Malnutrition, Patient generated subjective global assessment, Thiqr.

INTRODUCTION

Cancer is a broad term for a wide range of diseases that can affect any part of the human body. The human body is composed of trillions of cells that typically grow and divide throughout a lifetime. When cells become abnormal or aged, they usually die. In cancer, cells continue to divide, preventing the old or abnormal cells from dying as they should. This leads to abnormal growth, impairs the function of the affected area, and can have serious consequences.^[1]

One distinguishing feature of cancer is the ability of abnormal cells to invade nearby structures, and spread to

other organs, a process known as distant metastasis. Tumors can also be benign, meaning they cannot metastasize but can still cause issues by compressing neighboring tissues, leading to nerve damage, reduced blood flow, tissue death, or organ damage. Benign tumors typically do not regrow once removed, whereas cancerous tumors may recur.^[2]

There are over 100 types of cancer, often named after the organs or tissues where they originate. The main groups of cancer are (carcinoma, sarcoma, leukemia, lymphoma, myeloma, and brain, Spinal cord cancers).^[3]

In statistical terms, cancer ranks as the second leading cause of death worldwide. It was estimated that there were 20 million new cancer cases diagnosed in 2022, with 9.7 million deaths attributed to the disease globally. By 2050, the annual number of cancer cases is projected to potentially reach 35 million. This anticipated increase in cancer cases by 2050 is primarily due to the aging population and overall population growth. Developing countries face difficult challenges when we talk about cancer because political and economic instability exacerbates this condition. These factors are likely to exacerbate the future burden of cancer.^[4,6]

In Iraq, cancer follows heart and cerebrovascular diseases as the second leading cause of death. The overall cancer incidence rate in 2019 was 91.66 per 100,000 population (78.14 for males and 105.46 for females). This incidence rate for all cancers has significantly increased from 43.95 per 100,000 in 1999. The mortality rate for cancer according to current statistics reached 28 per 100,000 population in 2019 (28.45 for males and 27.55 for females). The most prevalent cancers in terms of incidence rate were breast, lung, colorectal, brain/CNS, and leukemia.^[7]

Given these statistical facts, cancer represents a major public health challenge, placing a significant financial and logistical burden on both the global and Iraqi healthcare systems. However, the quality of care provided to patients varies considerably across different regions. Therefore, healthcare authorities must take decisive action to address this leading cause of death.^[8,14]

Malnutrition is increasingly recognized as a critical healthcare issue. It refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients, leading to abnormalities in the patient's physiological, psychological, and social well-being.

Nevertheless, research shows that the effectiveness of nutritional treatments is closely tied to the timing of the intervention, with the most favorable outcomes seen when support is provided early on.^[9,10]

The most prevalent type of malnutrition as a consequence of cancer is undernutrition. Malnutrition is a serious issue among cancer patients, leading to significant morbidity. It is primarily caused by tumor-induced metabolic abnormalities and treatment-related side effects.^[11] The primary treatment modalities for cancer include surgery, chemotherapy, and radiotherapy. Approximately 20% of cancer-related deaths are attributed to malnutrition and its complications.^[12] Malignant tumors, especially those originating from the gastrointestinal tract, can impede nutrient intake and absorption, contributing to malnutrition.

Nutrition assessment aims to identify nutrition status-related problems and their underlying causes, including malnutrition. This process involves collecting and

analyzing relevant clinical, physical, and nutritional data, encompassing dietary habits, medical and surgical history, medications, and psychosocial factors to pinpoint the issue. One of the earliest recognized approaches to nutrition assessment in adults was outlined by Blackburn *et al* in their publication "Nutritional and Metabolic Assessment in Hospitalized Patients," highlighting assessment as the initial step in addressing malnutrition.^[16]

Various objective measures, such as anthropometric and laboratory assessments (e.g., weight changes, arm muscle circumference, triceptal skinfold thickness, serum albumin, transferrin, and nitrogen balance), can be utilized to evaluate a patient's nutritional status. However, factors like hydration status and underlying medical conditions can impact the interpretation of certain measures, such as serum albumin, making the evaluation complex.^[17] Moreover, some indicators, like serum albumin, have prolonged half-lives, posing challenges in assessing short-term changes in nutritional status accurately.

Traditional assessment methods based on objective measures are often time-consuming and require specialized training. To address these limitations, a user-friendly, cost-effective, and non-invasive clinical tools were introduced to enhance the nutritional assessment process. Several malnutrition diagnostic tools are currently employed in adult populations, with the Subjective Global Assessment (SGA) being one of the most commonly utilized methods.^[18] So the aim of the study is:

- 1-To determine the prevalence of malnutrition among adult cancer patients at Thiqr Oncology Center in Iraq.
- 2-To evaluate the factors that increase the risk of malnutrition in patients.
- 3-To provide valuable insights into the intricate relationship between cancer and malnutrition to enhance comprehensive cancer care.

PATIENTS AND METHOD

A cross-sectional study was conducted on 295 patients who attended the oncology center in Thiqr / Iraq either for receiving chemotherapy or for admission or follow-up. The sample size will be calculated according to Fischer's equation.^[19] The data were collected by using a convenient sampling technique on the patients who attend oncology centers and by using a questionnaire that contain sociodemographic information such as (age, sex, marital state, residency, smoking status, and educational level). We use also a nutritional assessment tool called patient-generated subjective global assessment. The (PG-SGA) is composed of 7 sections that include questions about:

- 1- Current and previous (6 or 1 month) weight, last 2 weeks weight changes, height.
- 2- Food intake whether increased, decreased, or unchanged over the last month.

- 3- Presence or absence of symptoms that impair nutrient intake during the last 2 weeks.
- 4- Activities and functions over the last month.
- 5- Presence of disease and its relation to nutritional requirements such as cancer, CKD, AIDS, trauma, age more than 65 years old.
- 6- Metabolic demand such as fever and steroid intake.
- 7- Physical examination such as muscle status, fat storage, and fluid status.

Any adult patient above 18 years old with cancer who gave consent for participation after giving him/her clear explanation about the aim of the study was included, while patients with mental disabilities who cannot give accurate information and patients who cannot recall their previous weight in the previous 6 or 1 month, or he cannot recall any important information's related to the score questions were excluded.

Data were collected by directly interviewing the patients, during which the weight and height were calculated and the other questions were answered by the patients regarding the sociodemographic status and (PG-SGA) score, specific diagnosis taken from the patient medical records, and some physical examinations were done

(subjective evaluation of 3 aspects of body composition include muscle status, fat stores, and fluid status).

Data entry and analysis were done using SPSS (statistical package for social sciences) version 27 with a p-value of ≤ 0.05 was considered statistically significant.

ETHICAL APPROVAL

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki. The study was carried out with patients' verbal and analytical approval before the sample was taken.

RESULTS

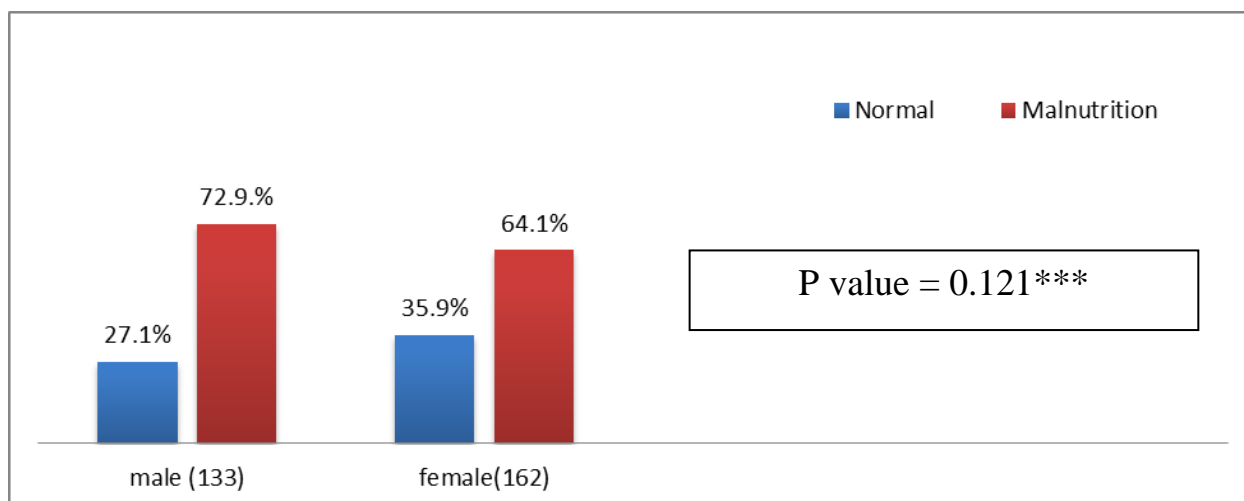
From a total of 295 cancer patients included in the study, the mean age of patients was 53.94 years ($SD \pm 15.3$), ranging from 18 to 98 years. About 36% were above or equal to 60 years old. The median disease duration was 12 months (range: 1–166 months). Most patients were female (54.9%), urban residents (73.2%), and married (90.8%). The presence of comorbid diseases was noted in 39% of patients, and 32.5% were smokers. Table (1) demonstrates this sociodemographic variable. Malnutrition was more prevalent among males. Figure (1) shows this result.

Table 1: The sociodemographic characteristic of the sample.

Variables		Frequency	Percentage
Age/years	<60	189	64.1%
	≥ 60	106	35.9%
Sex	Male	133	45.1%
	Female	162	54.9%
Residency	Urban	216	73.2%
	Rural	79	26.8%
Marital status	Married	268	90.8%
	Unmarried	27	9.2%
Occupation	Employed	44	14.9%
	Retired	41	13.9%
	Free worker	60	20.3%
	Student	9	3.1%
	Housewife	141	47.8%
Smoking	Non smoker	199	67.5%
	Smoker	96	32.5%
Education	Illiterate	81	27.5%
	Primary school	123	41.7%
	Secondary school	49	16.6%
	Undergraduate	40	13.6%
	Postgraduate	2	0.7%
BMI kg/m ²	Underweight	40	13.6%
	Normal	142	48.1%
	Overweight	70	23.7%
	Obese	43	14.6%
Comorbid diseases	Yes	115	39%
	No	180	61%

Regarding nutritional status, 68.2% of patients were malnourished (39% moderate, 29.2% severe), while

31.8% were well-nourished. Table (2) shows this prevalence.



*** chi-square test

Figure (1) Distribution of malnutrition according to the sex.

Table 2: Frequency of nutritional status category in the studied patients.

Nutritional status		Frequency	Percent
Category	Severe malnutrition	86	29.2%
	Moderate malnutrition	115	39.0%
	Well nourished	94	31.8%
	Total	295	100.0%

Chemotherapy was received by 91.5% of patients, while 8.5% did not undergo this type of treatment. Metastatic disease was present in 52.2% of cases. The most common cancer type was breast cancer (28.5%),

followed by lower GIT (14.6%) and respiratory cancer (13.2%). Figure (2) shows the prevalence of each cancer type in the patients.

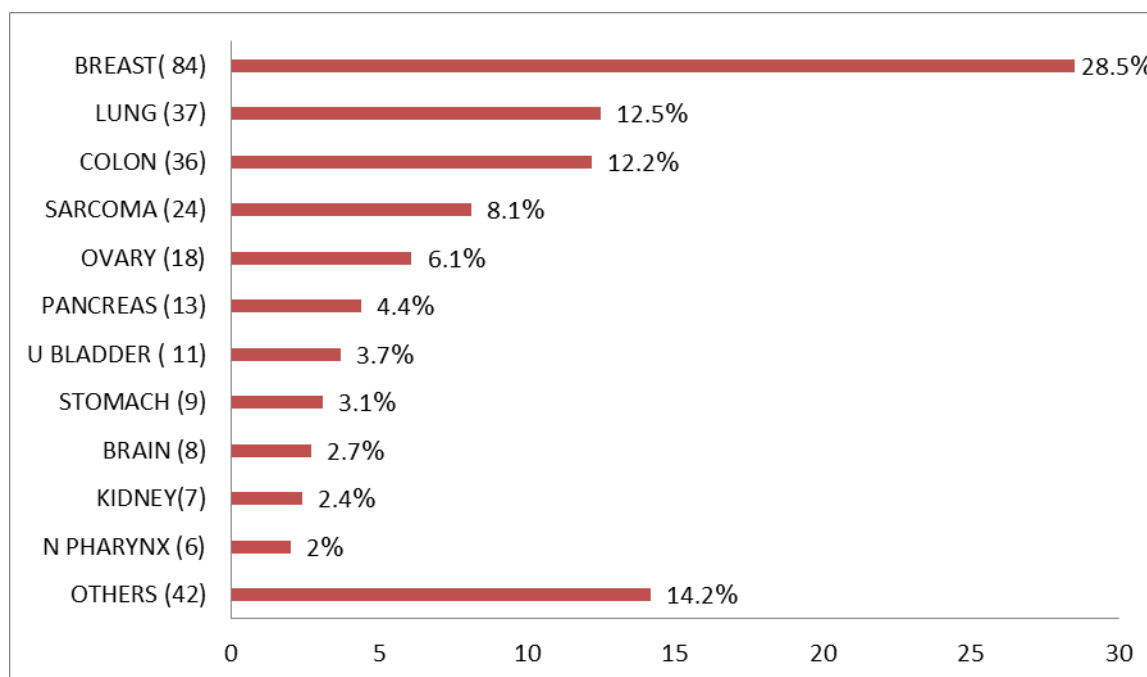


Figure (2): Percentage of specific cancer type in the studied patients.

Statistical analysis using the chi-square test showed a significant association between malnutrition and age, BMI ($P < 0.001$), as shown in Table (3). Also, the

association was significant with disease duration ($P < 0.010$) and metastatic stage ($P < 0.001$). This result is illustrated in table (4).

Table 3: Association between nutritional status and sociodemographic characteristics of the adult cancer patients.

variables		Well nourished	Moderate malnutrition	Severe malnutrition	Total	P .value
Sex	Male	36 / 27.1%	51 / 38.3	46 / 34.6%	133	0.121
	Female	58 / 35.8%	64 / 39.5%	40 / 24.7%	162	
Age/years	≥ 60	20 / 18.9	43 / 40.6	43 / 40.6%	106	0.001*
	< 60	74 / 39.2%	72/ 38.1%	43 / 22.8%	189	
Marital state	Married	85 / 31.7%	100 / 37.3%	83 / 31.0%	268	0.066
	Unmarried	9 / 33.3%	15 / 55.6%	3 / 11.1 %	27	
Residency	Rural	21 / 26.6%	32 / 40.5%	26 / 32.9 %	79	0.465
	Urban	73 / 33.8%	83 / 38.4%	60 / 27.8%	216	
Education	Illiterate	24 / 29.6%	29 / 35.8%	28 / 34.6%	81	0.357
	Primary	34 / 35.0%	44 / 35.8%	36 / 29.3%	123	
	Secondary	10/ 20.4%	24 / 49.0%	15/ 30.6%	49	
	Undergraduate	16 / 40.0%	17 / 42.5%	7 / 17.5%	40	
	Postgraduate	1 / 50.0%	1 / 50.0%	0 / 0.0%	2	
BMI kg/m ²	Underweight	3/ 7.5%	9/ 22.5%	28 / 70%	40	0.001*
	Normal	35/ 24.6%	61 / 43.0%	46/ 32.4%	142	
	Overweight	37/ 52.9%	23 / 32.9 %	10 / 14.3%	70	
	Obese	19 / 44.2%	22 / 51.2%	2 / 4.7%	43	
Occupation	Employed	13/ 29.5%	18 / 40.9%	13/ 29.5%	44	0.124
	Retried	6/ 14.6%	17/ 41.5%	18 / 43.9%	41	
	Free worker	20 / 33.3%	21/ 35.0%	19/ 31.7%	60	
	Student	4 / 44.4%	5/ 55.6%	0/ 0.0 %	9	
	Housewife	51 / 36.2%	54 / 38.3%	36 / 25.5%	141	

*chi-square test.

Table (4) Distribution of malnutrition in the studied sample according to the clinical characteristic.

Variables		Well nourished	Moderate malnutrition	Severe malnutrition	Total	P .value
Hospitalization Frequency	Frequent	78 / 30.0%	102/ 39.2%	80 / 30.8%	260	0.111
	First visit	16 / 45.7%	13 / 37.1%	6 / 17.1%	35	
Duration of disease/ years	≥ 1	32/ 23.4%	57/ 41.6%	48/ 35.0%	168	0.010**
	< 1	62/ 39.2%	58/ 36.7%	38/ 34.1%	137	
Chemotherapy	with	83 30.7%	106 39.3%	81 30.0%	270	0.348
	Without	11 44. %	9 36%	5 20%	25	
Metastasis	With	35 22.7%	59 38.3%	60 39.0%	154	0.001**
	Without	59 41.8%	56 39.7%	26 18.4%	141	

**chi-square test

Regarding the type of neoplasm, the association was significant with this variable (p-value = 0.001), with the upper and lower GIT cancers having the highest

malnutrition rates (91.4% and 88.4%, respectively). This is demonstrated by table (5).

Table (5) Association between cancer type and nutritional status of the patients.

Cancer type	Nutritional status category			Total	Malnutrition %	P. value
	Well nourished	Moderate malnutrition	Severe malnutrition			
Respiratory	13(33.3%)	12 (30.8%)	14 (35.9%)	39	66.7%	0.001*
Male genital	2 (40.0%)	2 (40.0%)	1 (20.0%)	5	60%	
Lower GIT	5 (11.6%)	22 (51.2%)	16 (37.2%)	43	88.4%	
Breast	37(44.0%)	37 (44.0%)	10 (11.9%)	84	45.9%	
Musculoskeletal	8 (33.3%)	13 (54.2%)	3(12.5%)	24	66.7%	

Upper GIT	3 (8.6%)	6 (17.1%)	26 (74.3%)	35	(91.4%)
Gynecological	13(44.8%)	12 (41.4%)	4 (13.8%)	29	55.2%
Neurological	4 (44.4%)	2 (22.2%)	3(33.3%)	9	55.5%
Dermatological	1 (100.0%)	0(0.0%)	0(0.0%)	1	0.0%
Urological	5 (26.3%)	6 (31.6%)	8 (42.1%)	19	73.7%
Immunological	1 (33.3%)	2 (66.7%)	0 (0.0%)	3	66.7%
Endocrinologic	1 (50.0%)	0(0.0%)	1 (50.0%)	2	50.0%
Hematological	1 (50.0%)	1 (50.0%)	0 (0.0%)	2	50.0%

*chi-square test

The PG-SGA score ranged from 1 to 32, with a mean of 10.60 (SD \pm 7.83), indicating that 53.2% of patients

required critical nutritional intervention. This is shown in table (6).

Table 6: Frequency of each category of PG-SGA score based on recommended intervention.

PG-PSG Score	Action	Frequency	Percent
0-1	No intervention needed	29	9.8
2-3	Dietary Education	48	16.3
4-8	Need nutritional support	61	20.7
9 and above	Critical need for interventions	157	53.2
	Total	295	100.0

DISCUSSION

This study assessed the nutritional status of cancer patients attending Thiqar Oncology Center for admission, chemotherapy, or follow-up visits. Cancer patients are highly vulnerable to malnutrition, which significantly impacts survival but is often overlooked in clinical settings. Among the 295 patients studied, 68.2% had malnutrition (39% moderate, 29.2% severe). This aligns with regional studies, such as in Baghdad^[20] the percentage was (74%) and in Palestine^[15] the prevalence was (67%), but differs from Vietnam (84%).^[27] The high prevalence highlights the metabolic stress of cancer and treatment-related adverse effects, necessitating targeted interventions.

Demographic factors such as marital status, occupation, education level, and residency showed no significant association with malnutrition. However, advancing age was linked to a higher prevalence of malnutrition, consistent with findings from the American Cancer Society^[21] and studies from China.^[22] This may be due to various physiological mechanisms such as loss of appetite in the elderly or decrease in digestion or absorption of nutrients in those patients, so elderly particularly those with comorbidities like diabetes and hypertension (which is prevalent in 39% of them), require additional nutritional support.

The average disease duration was 22.9 months, longer than the 14.95 months reported in an Ethiopian study^[23], and the association was significant (p-value = 0.010). This means that the longer the duration of disease, the more risk of development of malnutrition. The prevalence of malnutrition was higher in males (72.9% compared to 64.1% in females) and this is because most cases of female cancer were breast (51%) and the prevalence of malnutrition in patients with breast cancer

was the lowest (45.9%) compared to other types which is more prevalent in male, but the association was not statistically significant with this variable (p value= 0.121), differing from studies in Kenya^[24] and Iraq^[20] which is show significant association with sex. The mean PG-SGA score was 10.60, indicating a critical need for nutritional intervention in 53.2% of patients. Compared to India^[25] the percentage was (20%), the higher proportion in this study underscores the need for enhanced nutritional services and caregiver education.

Despite 91.5% of patients undergoing chemotherapy, no significant association with malnutrition was found, This may be due to variations in chemotherapy exposure among patients because many of the patients were interviewed during their first attendance to the oncology center before receiving the first cycle of chemotherapy and also because about 8.5% of them were unfit to this modality of treatment due to multiple causes. BMI was significantly associated with malnutrition (low BMI associated with more malnutrition), supporting previous findings from Iraq^[20] but differing from a Thai study.^[26] However, the mean BMI remained within the normal range (24.1) due to the high prevalence of obesity in breast and colon cancer patients which comprise 40.7% of total cases. This is supported by a study conducted in Iraq that shows that overweight and obesity are prevalent (77%) in Iraqi society.^[5]

Malnutrition was strongly associated with advanced-stage cancer (52.2% of patients had metastasis, and 77.8% of those with metastasis were malnourished) with a p-value of 0.001. A significant correlation was also observed with tumor location (p=0.001), with the highest prevalence in upper gastrointestinal (91.1%) and lower gastrointestinal cancers (88.4%). So the risk of malnutrition is exaggerated in patients presenting with

upper gastrointestinal cancer (including gastric cancer) with advanced metastatic stage which represents 57% of total upper gastrointestinal cases which is a high percentage that aligns with a study done in Iraq (13) that shows 62.4% of gastric cancer diagnosis with advance stage. This dual presence leads to increased metabolic demand, difficulty in food intake, and treatment side effects that exacerbate malnutrition.

Study limitations include reliance on patient recall for dietary history and past weight, exclusion of hematological cancer patients (because the patients with hematological malignancy were treated in another center). Despite these limitations, this is the first study in Thiqr to explore malnutrition risk factors in cancer patients. It highlights the need for early nutritional assessment, targeted support for high-risk patients (older adults, those with low BMI, gastrointestinal cancers, more duration of disease, and advanced stage), and improved nutritional interventions to enhance functional outcomes.

CONCLUSION

This study highlights the high prevalence of malnutrition (68%) among cancer patients at Thiqr Oncology Center in 2024, with 39% experiencing moderate and 29% severe malnutrition. Several factors were significantly associated with poor nutritional status, including older age, lower BMI, longer disease duration, gastrointestinal cancers, and advanced-stage tumors. Given the critical impact of malnutrition on treatment outcomes, early nutritional assessment, and intervention are essential to improving patient health and quality of life. So the following is recommended :

- 1-Application of screening program to all patients with cancer in all stages of its treatment period for early detection of malnutrition to decrease morbidity and mortality.
- 2- Applying programs in oncology centers to increase the healthcare professional's awareness of this problem to improve the quality of care for patients.
- 3- There is another need for further studies in Thiqr that deal with the problem from another perspective especially the most common symptoms that raise the score of patients toward malnutrition.

ACKNOWLEDGMENT

I would like to express my great thanks to all patients, doctors, and staff in Thiqr Oncology Center for their cooperation during sample collection, and special thanks to my family and everyone who helped me to complete this work.

CONFLICT OF INTEREST

All authors declared no conflict of interest.

DATA ACCESS STATEMENT

Data is available on request.

FUNDING STATEMENT

None.

REFERENCES

1. World Health Organization. Cancer. Updated 2018. Available from: [https://www.who.int/cancer].
2. American Cancer Society. What is cancer? Cancer basics. Last revised July 2024. Available from: [https://www.cancer.org/cancer/cancer-basics.html].
3. Cancer Research UK. Last reviewed 9 October 2023. Available from: [https://www.cancerresearchuk.org].
4. Global Burden of Disease Cancer Collaboration. Global, regional, and national cancer incidence, mortality, years of life lost, years lived with disability, and disability-adjusted life-years for 29 cancer groups, 1990 to 2016: a systematic analysis for the Global Burden of Disease Study. *JAMA Oncol*, 2018; 4(11): 1553–68.
5. Obaid Al-Bayati HF, Ali Mousah Easah Albadri, Salam Jasim Mohammed. Obesity Among Adult Patients Aged 18 Years Old And Above Attending Main Primary Health Care Centers In Babil Governorate, Iraq 2015: Prevalence And Some Possible Risk Factors. *KMJ*, 2023 Dec.15; 19(2): 102-15.
6. American Cancer Society. Report about latest global cancer statistics. April 2024. Available from: [https://www.cancer.org/research/latest-cancer-statistics.html].
7. Alwan NAS, Lami F, Al Nsoor M, Kerr D. Trends in the incidence and mortality of the most common cancers in Iraq (Iraqi Cancer Registry 1999-2019). *Gulf J Oncolog*, 2022 Sep; 1(40): 47-57.
8. Al Alwan, N. Developing Comprehensive National Cancer Control Programs in Iraq Focusing on the Leading Cancers. *Iraqi Postgraduate Medical Journal*, 2023; 22(4): 368-371. doi: 10.52573/ipmj.2023.182257
9. Muscaritoli M, Arends J, Aapro M. From guidelines to clinical practice: a roadmap for oncologists for nutrition therapy for cancer patients. *Ther Adv Med Oncol*, 2019; 11: 1–14.
10. Kubrak C, Martin L, Gramlich L, Scrimger R, Jha N, Debenham B, Chua N, Walker J, Baracos VE. Prevalence and prognostic significance of malnutrition in patients with cancers of the head and neck. *Clin Nutr*, 2020; 39: 901–9.
11. Seo SH, Kim SE, Kang YK, et al. Association of nutritional status-related indices and chemotherapy-induced adverse events in gastric cancer patients. *BMC Cancer*. 2016; 16: 900.
12. World Health Organization. Global cancer burden. 2018. Available from: [https://www.who.int/cancer/global-cancer-burden].
13. Hussein, S., Alzubaidi, A. Risk Factors and Clinicopathological Characteristics among Patients with Gastric Cancer in Oncology Teaching Hospital. *Iraqi Postgraduate Medical Journal*, 2021; 21(2): 190-195. doi: 10.52573/ipmj.2021.174630.
14. Shrivastava SR, Shrivastava PS. Bridging the gap in the delivery of cancer care in low- and middle-income nations. *Med J Babylon* 2022; 19: 747-9

15. Badrasawi M, Al-Adhame A, Doufish A. Association of malnutrition and low quality of life among cancer patients receiving chemotherapy, Palestine. *East Mediterr Health J.* 2021 May 27; 27(5): 459-66. doi: 10.26719/2021.27.5.459. PMID: 34080674.
16. Blackburn GL, Bistrian BR, Maini BS, Schlamm HT, Smith MF. Nutritional and metabolic assessment of the hospitalized patient. *JPEN J Parenter Enteral Nutr.* 1977; 1(1): 11-22. doi: 10.1177/014860717700100101. PMID: 98649.
17. Bauer J, Capra S, Ferguson M. Use of the scored Patient-Generated Subjective Global Assessment (PG-SGA) as a nutrition assessment tool in patients with cancer. *Eur J Clin Nutr.* 2002; 56: 779–85.
18. Malone A, Mogensen KM. Key approaches to diagnosing malnutrition in adults. *Nutr Clin Pract.* 2022 Feb; 37(1): 23-34. doi: 10.1002/ncp.10810. Epub 2021 Dec 22. PMID: 34936131.
19. Pourhoseingholi MA, Vahedi M, Rahimzadeh M. Sample size calculation in medical studies. *Gastroenterol Hepatol Bed Bench.* 2013; 6(1): 14-17.
20. Jasim ZK, Ali BM, Hussein AG, Mohsin FY. Prevalence of malnutrition among adult cancer patients in oncology teaching hospital. *HIV Nursing J.* 2023; 23(2).
21. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2015. *CA Cancer J Clin.* 2015; 65: 5-29.
22. Kang J, Li H, Shi X, et al. Validation of the efficacy of the NUTRISCORE for the nutritional screening of cancer patients in China. *BMC Cancer.* 2022; 22: 43.
23. Muhamed AN, Tesema BB, Hiruy EG, Shiferaw SM, Aychew DT, Abate MD. Nutritional status and its determinants among adult cancer patients undergoing chemotherapy treatment at Hawassa University Comprehensive Specialized Hospital, Southern Ethiopia. *J Nutr Metab.* 2022 Sep 28; 2022: 8740272.
24. Opanga Y, Kaduka L, Bukania Z. Nutritional status of cancer outpatients using scored Patient-Generated Subjective Global Assessment in two cancer treatment centers, Nairobi, Kenya. *BMC Nutrition.* 2017; 3: 63.
25. Parasa K, Avvaru K. Assessment of nutritional status of cancer patients using scored PG-SGA tool. *IOSR J Dent Med Sci.* 2016; 15: 2279–86.
26. Nitichai N, Angkatavanich J, Somlaw N, Voravud N, Lertbutayanukul C. Validation of the Scored Patient-Generated Subjective Global Assessment (PG-SGA) in Thai setting and association with nutritional parameters in cancer patients. *Asian Pac J Cancer Prev.* 2019 Apr 29; 20(4): 1249-55
27. Van Tap N, Bang HT, Huong DT, Chi PC, Anh LTN. Malnutrition in hospitalized cancer patients: a single-center, cross-sectional study in Southern Vietnam. *SAGE Open Med.* 2023 May 3; 11.