The Relationship between Nutrition and Cancer in Elderly Hospitalized Patients: A Retrospective Chart Analysis

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Abstract

Background: The purpose of the present study was to retrospectively analyze the relationship between nutrition and cancer in elderly hospitalized patients.

Methods: A total of 339 elderly patients were divided into cancer and non-cancer groups. Information regarding nutritional blood parameters (NBP), including TP, ALB, PA, TLC, and Hb; nutritional risk screening (NRS), including ADL, MNA-SF, WST; and polypharmacy was collected and analyzed.

Results: Among the 339 patients, 94 (27.7%) were women, 81 (23.9%) were cancer patients, and 258 (76.1%) were non-cancer patients. Overall, 25.3% of patients were malnourished. Patients in the cancer group were younger, with higher rates of inflammation, lower rates of polypharmacy and swallow dysfunction, increased ADL, and decreased MNA-SF score. The BMI, TP, PA, Hb, and TLC were notably decreased in cancer patients. The MNA-SF score had a positive correlation with BMI, TP, ALB, PA, Hb, TLC, and ADL, but a negative correlation with CRP, WST score, polypharmacy, and age.

Conclusion: There was a close relationship between nutritional status and cancer in elderly patients. Geriatric patients with cancer were more prone to a poor nutritional status. Nutritional screening, assessment, and intervention should be increased to improve the prognosis in cancer patients.

Introduction

Malnutrition is a common problem among geriatric patients, especially those who have been diagnosed with cancer. Malnutrition can lead to a marked reduction in survival time, a decreased quality of life, and a high economic burden. Cancer can cause an increase in metabolism; therefore, the rate of malnutrition is typically higher in cancer patients. The incidence of malnutrition in cancer patients has been estimated to range from 15–80%[1]; however, the nutritional status of elderly hospitalized patients with cancer remains unclear.

Accordingly, the focus of the present study was to identify and analyze the nutritional status of hospitalized elderly patients with cancer with a view to providing effective and personalized nutritional support. Retrospective analysis was performed to study the nutritional status of elderly patients with malignant tumors; identify related factors; and provide clinical nutritional support, general information, and nutrition-related screening and indicators.

Methods

Study design and participants

This was a retrospective chart analysis collecting nutritional blood parameters (NBP) and nutritional risk screening (NRS) results of elderly hospitalized patients in the Geriatric unit from January 2018 to June 2019. The inclusion criteria were as follows: aged 65 years or older; an expected life span of ≥ 3 months;

and agreed to participate in the survey and accept nursing guidance. The exclusion criteria were as follows: severe liver disease (Child B or C), severe renal insufficiency (KidneDisease Outcomes Quality Initiative KDOQI > 4) and severe cognitive impairment. A total of 339 elderly participants (245 males) aged 65 – 100 years with a body mass index (BMI) of 14.9 – 34.3 kg/m^2 were randomly selected (Table 1).

Table 1
Characteristics of elderly patients with cancer and benign disease: total and subgroups

Characteristics	Non-cancer (n = 258)	Cancer (n = 81)	P-value	Total population (n = 339)
Age (years)	82.12 ± 9.74	78.62 ± 8.92	0.004	81.28 ± 9.65
Sex			0.325	
Male (%)	183 (70.9)	62 (76.5)		245 (72.3)
Female (%)	75 (29.1)	19 (23.5)		94 (27.7)
BMI (kg/m^2)	23.47 ± 3.06	22.45 ± 3.84	0.033	23.22 ± 3.28
Notes: LSD *t*-test (for normally distributed continuous data); chi-square test (for categorical data); Mann–Whitney U-test (for non-normally distributed continuous data).				
Abbreviations: BMI, body mass index.				

Data Collection

Demographic data including age, gender, body weight, and height were collected. The NRS, including activities of daily living (ADL)[2], the mini nutritional assessment-short form (MNA-SF)[3], and the water swallow test (WST)[4], and polypharmacy were performed by a trained clinical nurse in the Geriatric unit within 2 days of admission. The details of the MNA-SF and WST screening are presented in the Supplementary Material. Information regarding the NBP, including total protein (TP), albumin (ALB), prealbumin (PA), total lymphocytes (TLC), hemoglobin (Hb), C-reactive protein (CRP), and procalcitonin (PCT), was collected by geriatric professionals.

Statistical analysis

The distribution of variables was assessed using the Kolmogorov–Smirnov test. The least significant difference (LSD) *t*-test and analysis of variance (ANOVA) were applied to compare continuous variables, while Pearson's chi-square test was employed to compare proportions. Continuous data are presented as the mean ± standard deviation (SD); percentages or ratios are presented as categorical variables. $P < 0.05$ was considered statistically significant. SPSS (version 22.0) was used to perform statistical analyses.

Results

Of the 339 patients, 94 (27.7%) were women, 81 (23.9%) were cancer patients, and 258 (76.1%) were included in the analysis. Patients in the cancer group were markedly younger ($P < 0.01$) and had a lower BMI ($P < 0.05$). No significant gender difference was found between the two groups (Table 1).

There was a significant difference between the cancer and non-cancer groups in terms of the NBP and NRS. The serum levels of TP, PA, Hb, and TLC were significantly decreased in the cancer group ($P < 0.01$). In comparison with patients in the non-cancer group, we found a high level of CRP in cancer patients ($P < 0.01$); however, there was no significant difference in the levels of ALB or PCT between the two groups (Table 2).

Table 2
Comparison of patient characteristics NBP based on cancer status

Characteristics	Non-cancer (n = 258)	Cancer (n = 81)	P-value	Total population (n = 339)
TP (g/L)	63.70 ± 6.22	61.68 ± 7.21	0.015	63.22 ± 6.52
ALB (g/L)	35.47 ± 5.73	34.84 ± 5.92	0.390	35.32 ± 5.78
PA (mg/dL)	19.37 ± 6.96	16.26 ± 8.13	0.001	18.62 ± 7.37
CR (umol/L)	84.87 ± 71.04	84.25 ± 53.79	0.942	84.72 ± 67.24
Hb (g/L)	124.14 ± 22.34	117.32 ± 25.19	0.021	122.51 ± 23.20
TLC (10^9/L)	1.55 ± 0.69	1.26 ± 0.61	0.001	1.48 ± 0.68
CRP (mg/L)	27.17 ± 39.08	39.43 ± 50.78	0.048	30.10 ± 42.41
PCT (ng/mL)	0.52 ± 2.76	0.77 ± 3.56	0.515	0.58 ± 2.96
Notes: LSD *t*-test (for normally distributed continuous data).				
Abbreviations: CRP, C-reactive protein; PCT, procalcitonin; TP, total protein; ALB, albumin; PA, prealbumin; CR, creatinine; Hb, hemoglobin; TLC, total lymphocyte.				

The incidence of malnutrition (MNA-SF < 8) was 25.3% of the total population, with 25.9% in cancer patients and 25.2% in non-cancer patients ($P = 0.039$) (Table 3).

Table 3
Comparison of patient characteristics NRS based on cancer status

Characteristics	Non-cancer (n = 258)	Cancer (n = 81)	P-value	Total population (n = 339)
ADL	3.27 (0–6)	4.56 (0–6)	< 0.001	3.58(0–6)
WST	2.33 (0–5)	1.32 (1–5)	< 0.001	2.09 (0–5)
Polypharmacy (%)	229 (88.8)	64 (79.0)	0.025	293 (74.6)
MNA-SF	10.38 (3–14)	9.93 (1–14)	0.277	10.27 (1–14)
MNA-SF > 11 (%)	113 (43.8)	33 (40.8)	0.317	146 (43.1)
8 ≤ MNA-SF ≤ 11 (%)	80 (31.0)	27 (33.3)	0.576	107 (31.6)
MNA-SF < 8 (%)	65 (25.2)	21 (25.9)	0.039	86 (25.3)
Notes: LSD *t*-test (for normally distributed continuous data); chi-square test (for categorical data).				
Abbreviations: ADL, activities of daily living; WST, water swallow test; MNA-SF, mini nutritional assessment-short form.				

Patients in the cancer group had a higher ADL score, a lower WST score, and a markedly lower polypharmacy rate as compared with non-cancer patients ($P < 0.05$). However, patients with 8 ≤ MNA-SF ≤ 11 and MNA-SF > 11 showed no significant difference between the cancer and non-cancer groups (Table 3).

We also found that the MNA-SF score had a positive correlation with BMI, TP, ALB, PA, Hb, TLC, and ADL score, but a negative correlation with CRP level, WST score, polypharmacy rate, and age (Table 4).

Table 4
Comparison of patient characteristics based on the MNA-SF score

Characteristics	MNA-SF > 11 (n = 146)	8 ≤ MNA-SF ≤ 11(n = 107)	MNA-SF < 8 (n = 86)	*P*-value
Age (years)	74.66 ± 7.80	85.20 ± 8.29*	87.65 ± 6.74#	< 0.001
Sex				0.323
Male (%)	101 (69.2)	83 (77.6)	61 (70.9)	
Female (%)	45 (30.8)	24 (22.4)	25 (29.1)	
BMI (kg/m^2)	25.01 ± 3.09	22.37 ± 2.72*	21.26 ± 2.65#△	< 0.001
ADL	5.66 (0–6)	2.75 (0–6)*	1.06 (0–6)#	< 0.001
WST	1.08 (1–4)	2.29 (1–5)*	3.55 (1–5)#	< 0.001
Polypharmacy (%)	109 (74.7)	100 (93.5)*	84 (97.7)#	< 0.001
TP (g/L)	65.60 ± 5.20	61.52 ± 6.77*	61.29 ± 6.96#	< 0.001
ALB (g/L)	39.35 ± 4.50	32.91 ± 4.70*	31.50 ± 4.54#△	< 0.001
PA (mg/dL)	22.16 ± 6.31	16.74 ± 7.69*	14.96 ± 5.89#	< 0.001
CR (μmol/L)	77.86 ± 33.14	95.41 ± 88.98	83.08 ± 77.50	0.118
Hb (g/L)	135.47 ± 18.47	114.65 ± 24.14*	110.28 ± 17.71#	< 0.001
TLC (10^9/L)	1.65 ± 0.59	1.26 ± 0.64*	1.46 ± 0.79#△	< 0.001
CRP(mg/L)	17.42 ± 35.38	33.14 ± 43.53*	43.47 ± 48.05#	< 0.001
PCT (ng/mL)	0.45 ± 3.00	0.48 ± 1.84	0.93 ± 3.89	0.460

Notes: one-way ANOVA (for normally distributed continuous data); chi-square test (for categorical data).*P< 0.05, 8 ≤ MNA-SF ≤ 11 vs MNA-SF > 11; #P< 0.05, MNA-SF < 8 vs MNA-SF > 11; △P< 0.05, MNA-SF < 8 vs 8 ≤ MNA-SF ≤ 11.

Abbreviations: CRP, C-reactive protein; PCT, procalcitonin; TP, total protein; ALB, albumin; PA, prealbumin; CR, creatinine; Hb, hemoglobin; TLC, total lymphocyte.

Discussion

The incidence of cancer is gradually increasing in China and is the leading cause of death, producing a heavy disease burden [5]. Cancer patients are more likely to suffer from malnutrition due to anti-tumor therapy and high energy consumption. Malnutrition is responsible for the death of almost 20% of cancer patients[6] and is mainly caused by insufficient protein intake, which has a significant adverse effect on the daily living, survival time, and treatment success of cancer patients.

The present study analyzed 339 elderly hospitalized patients and revealed that only 40.8% of cancer patients were well nourished and 25.9% (21/81) needed improvement in nutritional status or urgent nutritional support, indicating that elderly patients with cancer are more prone to malnutrition and nutritional support should be provided in a timely manner according to the general situation of the patient.

Interestingly, our research shows that in comparison with the non-cancer group, patients in the cancer group were younger with lower rates of polypharmacy and swallow dysfunction and an increased ADL score, which may be due to the age factor. As expected, cancer patients had higher rates of inflammation, a decreased MNA-SF score, and markedly decreased levels of BMI, TP, PA, Hb, and TLC. Our results are similar to previous findings by Alifano et al.[7] showing that nutrition and systemic inflammation are prognostic determinants in lung cancer patients. Moreover, Extermann et al.[8] found that comprehensive geriatric assessment can predict mortality and morbidity in elderly patients with cancer.

We also found that the MNA-SF score had a positive correlation with BMI, TP, ALB, PA, Hb, TLC, and ADL score, but a negative correlation with CRP levels, WST score, polypharmacy rate, and age. Previous studies have also shown that the MNA-SF can be an independent predictor and useful tool in identifying elderly cancer patients at a higher risk of early mortality[9, 10].

Overall, malnutrition is an important factor in the prognosis and death of cancer patients[11]. Geriatric professionals should pay more attention to the nutritional status of cancer patients and identify the relevant factors of malnutrition, such as age, gender, BMI, NBP, and NRS, in a timely and accurate manner to provide patients with effective nutritional support, improve nutritional status and quality of life, and extend survival time.

There are several limitations of the present research. Firstly, retrospective chart analysis cannot establish causality conclusions. In addition, patients were from one medical center rather than multiple centers; thus, our research should be generalized with caution. Further research should be conducted to verify the results in a larger sample of well-represented patients from primary care using a longitudinal design. These results may not be representative of patients outside the Shenyang region in China.

Conclusion

The patients in the cancer group were younger, with a lower BMI, and were more prone to inflammation, poor NBP, and a low MNA-SF score. We also found that the MNA-SF score had a positive correlation with

BMI, TP, ALB, PA, Hb, TLC, and ADL score, but a negative correlation with CRP level, WST score, polypharmacy rate, and age.

Performing NBP and NRS at admission can help to identify nutritional deficits earlier and provide nutritional support in elderly cancer patients at risk in order to improve nutritional status and quality of life. Due to their increased nutritional needs, timely nutritional counseling and effective treatment are required.

Declarations

Ethical approval and consent to participate

The study protocol was approved by the Ethical Committee of China Medical University.

Consent for publication

Written informed consent for publication was obtained from all participants.

Availability of supporting data

The datasets used and analyzed in the present research are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Supplemental Material

Supplemental Material is not available with this version