

# Impact of the Prognostic Nutritional Index on Quality of Life of Terminal Cancer Patients

Mohammed AA<sup>\*1,2</sup> and Al-Zahrani O<sup>2</sup>

<sup>1</sup>Medical Oncology Department, Faculty of Medicine, Zagazig University, Egypt

<sup>2</sup>Oncology Center, King Salman Armed Forces Hospital, Tabuk, Kingdom of Saudi Arabia

\*Corresponding author: Mohammed AA, MBBCh, MSc, MD. Medical Oncology Department, Faculty of Medicine, Zagazig University, 29 Saad Zaghloul, Postal code, 44519, Egypt, Fax: +966125532239, Tel: 00201224141040, E-mail: amrallaabdelmoneem@yahoo.com

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## Abstract

**Background:** When cancer is terminal and cancer-directed therapy has no value, the goal of treatment is to improve the quality of life (QoL). The current work proposed to assess the prognostic nutritional index (PNI) on QoL in patients with terminal cancer.

**Methods:** The medical files of terminal cancer patients who died between February 2012 to April 2017, retrospectively reviewed to evaluate the PNI on their QoL. Presence of Emergency Department (ED) visits >1, hospital admission through the ED, and intensive care unit death is considered a representative for poor QoL.

**Results:** A total of 828 patients with terminal cancer were enrolled. The median age was 62 years, ranged from 18-107 years. The frequency of primary cancer sites was colorectal cancer in 146 patients (17.6%), hepatobiliary in 123 (14.9%), lung cancer in 112(13.5%), breast cancer in 106 (12.8%), and genitourinary in 79 (9.5%). The value of PNI experienced different levels among cancer types with mean value was  $32.9 \pm 6.7$ . High PNI was statistically significantly associated with hospital admission through the outpatient clinic (OPC), ED visits  $\leq 1$ , onward death, and survival > 2 weeks ( $P = 0.005$ ,  $P=0.015$ ,  $P=0.04$  and  $P<0.001$ ), respectively. While forfeiting the statistically significant with age, sex, and primary cancer sites ( $P =0.3$ ,  $P =0.6$ , and  $P =0.5$ ), respectively.

**Conclusion:** PNI is a simple and applicable marker associated with improved QoL in patients with terminal cancer.

**Keywords:** Terminal Cancer; Quality of Life; Prognostic Nutritional Index

## Introduction

As patients with terminal cancer approach death, life can assume a new meaning and form that is not the same as those who will endure longer. Power went down, responsibility went down, which was considered important now considered insignificant [1,2].

Despite marked progress in molecular, and genetic technology to increase the cure rate in cancer patients, still, the physicians aimed to postpone death without focusing QoL.

Many studies had identified indicators associated with aggressive EOL care in patients with terminal cancer included frequent ED visits, ICU admission, and ICU admission or death, with proof of an association between poor QoL and aggressive EOL care [1,3-5].

The prognostic nutritional index (PNI) contains a simple and objective points that may be beneficial to predict life expectancy in patients with terminal cancer [6]. It is calculated by  $10 \times \text{serum albumin (g/dL)} + 0.005 \times \text{lymphocyte count /mm}^2$  [7].

Comfort care is a core part of medical service in patients with terminal cancer. The goals of management are to help that subtype of patients to live with good QoL and to die with dignity [8].

The current work aimed to evaluate the PNI on QoL in patients with terminal cancer.

## Patients and Method

Between February 2012 and April 2017, a total of 828 patients with terminal cancer who died in King Abdullah Medical City, KSA and Medical Oncology Department Zagazig University, Egypt. Pathologically diagnosed cancer, advanced cancer, and age  $\geq 18$  years old were the inclusion criteria. Patients with hematological malignancy, curative or adjuvant treatment were excluded.

Different data include age, sex, liver function, complete blood count, primary cancer sites, ED visits, mode of inpatients' admission, place of death were collected from the electronic system and patients' medical files.

PNI was calculated by  $10 \times \text{serum albumin (g/dL)} + 0.005 \times \text{lymphocyte count /mm}^2$ , at the last admission before death.

## Statistical methods

Continuous variables were expressed as the mean  $\pm$  SD & median (range), and the categorical variables were expressed as a number (percentage). Percent of categorical variables were compared using Chi-square test or Fisher exact test. A p-value  $< 0.05$  was considered significant. All statistics were performed using SPSS 22.0 for Windows (SPSS Inc., Chicago, IL, USA).

## Results

By putting on the eligibility criteria, 828 patients with terminal cancer were entering the last analysis. The mean age was  $60.9 \pm 15.5$  years and the median (Range) was 62 years (18-107). The frequency of primary cancer sites was colorectal cancer in 146 patients (17.6%), hepatobiliary in 123 (14.9%), lung cancer in 112 (13.5%), breast cancer in 106 (12.8%), and genitourinary in 79 (9.5%). 47.8% of patients admitted to inpatient services through the ED, 60.3% visited ED  $\geq 2$ , and 84.8% died onward. The value of PNI experienced different levels among cancer types with mean value was  $32.9 \pm 6.7$  (Table 1).

	<b>Total= 828</b>	<b>%</b>
<b>Age</b>		
Mean $\pm$ SD	60.9 $\pm$ 15.5	
Median (Range)	62. (18-107)	
<b>Sex</b>		
Male	400	48.3
Female	428	51.7
<b>Primary cancer sites</b>		
Colorectal	146	17.6
Hepatobiliary	123	14.9
Lung	112	13.5
Breast	106	12.8
Genitourinary	79	9.5
Pancreas	48	5.8
Head & neck	43	5.2
Stomach	42	5.1
Prostate	21	2.5
Others	108	13
<b>Admission mode</b>		
OPD	432	52.2
ED	396	47.8
<b>ED visits</b>		
0-1visits	329	39.7
2 $\geq$ visit	499	60.3
<b>Death place</b>		
Word	702	84.8
ICU	126	15.2
<b>Prognostic nutritional index</b>		
Mean $\pm$ SD	32.93 $\pm$ 6.7	
Median (Range)	31.2 (23.7-59.3)	
Follow-up (days)		
<b>Mean <math>\pm</math> SD Median (Range) Overall Survival</b>		
>2weeks	21.45 $\pm$ 23.12	
$\leq$ 2weeks	14.0 (00-176)	
	406	49
	422	51

SD: standard deviation; OPD: out patients' clinic; ED: emergency department

**Table 1:** The main patients' Characteristics

After the follow-up period, Mean  $\pm$  SD= 21.45 $\pm$ 23.12 days and the median (Range) = 14.0 (00-176), the mean PNI was 36.7 $\pm$ 7.47 for patients survived > 2 weeks compared with 29.3 $\pm$ 2.61 for who died within 2 weeks.

High PNI was statistically significantly associated with hospital admission through the outpatient clinic (OPC), ED visits  $\leq$  1, onward death, and survival > 2 weeks ( $P = 0.005$ ,  $P=0.015$ ,  $P=0.04$  and  $P<0.001$ ), respectively. While forfeiting the statistically significant with age, sex, and primary cancer primary sites ( $P = 0.3$ ,  $P = 0.6$ , and  $P = 0.5$ ), respectively (Table 2).

Characteristics	PNI (Mean ± SD)	P-value
<b>Age</b>		
<60 years	33.08±6.73	0.395
≥60 years	32.770±6.66	
<b>Sex</b>		
Male	32.93±6.67	0.673
Female	32.91±6.69	
<b>Primary cancer sites</b>		
Colorectal	33.23±7.14	
Hepatobiliary	33.58±6.59	
Lung	32.76±6.59	
breast	32.67±6.06	0.5
Genitourinary	32.91±6.54	
Pancreas	32.31±7.52	
Head & neck	31.77±5.46	
Stomach	32.49±7.90	
Prostate	31.82±4.09	
Others	33.29±7.05	
<b>Admission mode</b>		
OPD	33.71±7.30	0.005
ED	32.06±5.84	
<b>ED visits</b>		
0-1 visits	32.47±6.74	0.015
>1 visits	33.22±6.65	
<b>Death place</b>		
Ward	32.89±6.66	
ICU	33.12±6.91	0.04
<b>Overall Survival</b>		
>2weeks	36.74±7.47	<0.001
≤2weeks	29.25±2.61	

SD: Standard Deviation; OPD: Out Patients' Clinic; ED: Emergency Department; ICU: Intensive Care Units; PNI: Prognostic Nutritional Index

**Table 2:** Distribution of: Prognostic Nutritional Index through the included patients

## Discussion

Incompatible with recommendations, aggressive EOL care is still provided to patients with terminal cancer. Supporting many previous studies, we reported that patients with terminal cancer suffered from aggressive care at the EOL in the form of multiple ED visits, inpatient admission through the ED, and death in ICU [1,3-5, 9-12].

While the hospice programs had improved the quality of EOL, it is not available in all countries. Moreover, in developed countries as the USA, where the hospice services are ready, a considerable number of patients had late hospice referrals [13].

As well, lack of palliative care services/teams for all patients might lead to poor symptom management with more ED visits with or without inpatient admission. We consider an inadequate patient-physician discussion about the disease evolution and prognosis represented the most important factor in continuing the aggressive care at the EOL without significant improvement in QoL.

In the present study, most of the primary cancer sites represented; colorectal cancer in 146 patients (17.6%), hepatobiliary in 123 (14.9%), lung cancer in 112(13.5%), breast cancer in 106 (12.8%), genitourinary in 79 (9.5%), pancreas in 48 (5.8%), H&N in 43 (5.2%) stomach in 42 (5.1%) prostate in 21(2.5), and miscellaneous tumors in 108 (13%). Contrary to a study done by Nakamura Y et al on 278 patients with gastric and colorectal cancers accounted approximately for half of the sample size (6). This observation may reflect the reality of our study.

Moreover, in the current study, patients with a high PNI level (mean± SD = 36.74±7.47) had better survival compared with the low PNI level (mean± SD =29.25±2.61), it was a statistically significant (P<0.001). These data matched with previously published studies done by Abe A et al, and Koyama N, et al [14,15].

Reid and colleagues conducted a systematically structured review of biomarkers of patients with a terminal cancer at the EOL included 30 articles showed that lymphocyte count and serum albumin are considered grade A evidence in determining the prognosis in that subtype of patients [16].

The prognostic relevance of inflammatory and nutritional status to cancer was thoroughly assessed. As a result, various immunonutritional scores developed such as PNI, Modified Glasgow Prognostic Score, Neutrophile/Lymphocyte Ratio, Granulocyte/Lymphocyte Ratio and Platelet/Lymphocyte ratio. Of these PNI have an objective analytical value made it an easy and affordable score and can be quickly measured from serum albumin and lymphocytes [17-20].

Amano K, et al surveyed to define the need for nutritional support in terminally ill cancer patients in an inpatient hospice. Throughout 60 eligible patients included, they concluded that most of the enrolled patients (76%) had unmet needs for nutritional support [21].

A systemic review included many controlled trials and relevant systemic reviews reported that when the prognosis is very poor and the risk of complication increased with nutritional support, the patients may survive by minimal nutrition or oral fluid. Although the sensation of hunger is limited in dying patients due to multiple other factors as dysphagia pain, or central nervous system issues, nutritional therapy can increase the comfort and calm caregiving burden [22]. Furthermore, Bachmann P et al summarized the recommendation for nutritional support in advanced/terminal cancer. They recommended involvement of dietitians in the management of EOL care as they may ameliorate their alimentation. Also, nutritional support may improve QoL, avoid dehydration, and decrease nutritional degradation [23].

To our knowledge, there is no enough data concerning the PNI in that subtype of patients and QoL.

## Limitations

We considered the association between low PNI level and aggressive EOL care is an indicator of bad QoL. It is better to find direct relation between PNI and four areas; mental and emotional needs, physical comfort, and practical tasks issues. Also, absence of mentality status evaluation by any way like questionnaires, as well as the family relationship. The retrospective nature of our study makes the data of poor quality as it based on documentation. Besides, the corticosteroid constantly used in those subtype of patients with its profound effect on peripheral lymphocyte concentration, so the PNI level could be changed by steroid administration.

## Conclusion

Despite everyone dies, we should support and soothe patients with terminal cancer to secure a peaceful death. For its simplicity, efficiency, and convenience, PNI may be helpful in survival estimation and getting better QoL. High PNI associated with improved QoL in the form of decreased in patient's admission through the ED, less frequent ED visits, and less ICU death, thus improvement of the nutritional state may be a target in that subtype of patients. The degree of satisfaction of patients as well as for their families should be involved in nutritional care evaluation.

## Disclosure

The authors certify that there is no conflict of interest.

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