

# Evaluation of Health Related Quality of Life in Cancer Patients Receiving Chemotherapy

Abdelrahim Saad Shoulah, Mahmoud Ali Saleh, Shereen Mohamed Abdelwahab, Mona Ahmad Elawady\*, Eman Fadel Elsheikh

Department of Community Medicine, Faculty of Medicine, Benha University, Benha, Egypt

## Email address:

MONA.YOUSSEF@f.med.bu.edu.eg (M. A. Elawady), Dr\_monaelawady@yahoo.com (M. A. Elawady)

\*Corresponding author

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**Abstract:** *Background:* Cancer is considered as the second leading cause of death worldwide. *Objectives:* To evaluate health-related quality of life (HRQOL) among cancer patients receiving chemotherapy and to identify the most important determinants that affect them. *Methods:* This cross-sectional study included 190 cancer patients who have been received chemotherapy at the day care clinics in Nasser Institute Cancer Center (NICC). To address our subject, we analyzed HRQOL, as measured by the Functional Assessment of Cancer Therapy-General questionnaire (FACT-G), Arabic Version 4, and depicted the complex relations among physical, psychological, social, and cultural factors. *Results:* From cancer patients (190) [aged from 23 to 81 years ( $50.63 \pm 11.79$ )] 153 patients (80.53%) were females. FACT-G total score ranged from 21.2 to 87 ( $63.24 \pm 12.74$ ) which is considered relatively poor (the physical and functional domains were more affected). HRQOL of the study group was not affected by gender, employment status, education level, smoking habits or marital status while it was negatively correlated with age, time since diagnosis of cancer, and disease stage. Patients' HRQOL shown to be affected by the presence of many variables like low-performance status as evaluated by Eastern Cooperative Oncology Group (ECOG) scale, associated comorbidities, exposure to radiotherapy, history of surgery, and absence of menstrual status in female patients. A positive correlation was found between HRQOL and higher body mass index (BMI), and it was observed that the HRQOL of patients with higher perceived financial status was better. *Conclusion:* The HRQOL of cancer patients tended to be lower than the norms of the healthy people. Preplanned health programs should be designed to support early disease diagnosis, optimizing treatment choices, controlling of associated comorbidities, improving patients' performance status as well as working on improving health insurance coverage.

**Keywords:** Cancer, Chemotherapy, Health Related Quality of Life

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## 1. Introduction

Cancer is a major public health problem worldwide; it is the second leading cause of death in developing countries (following heart diseases) [1] [2].

Recently cancer treatment has improved and survival has stopped being the sole end point of treatment. Actually cancer patients started to be looked upon as chronic disease patients and improving their quality of life (QOL) has been become a vital outcome for survivors. HRQOL covers the subjective perceptions of the positive and negative aspects of

symptoms of cancer patients, including physical, emotional, social, cognitive functions and most importantly disease symptoms and side effects of treatment [3].

Studies show that poor HRQOL is associated with multiple factors among cancer patients, including sleep disturbances, fatigue, pain, anxiety, and depression [3].

Chemotherapy is still based on the use of cytotoxic drugs which interfere directly with the process of mitosis. They have no ability to distinguish between cancer cells and normal cells, and so inhibit cell division in both populations. This accounts for many of their side effects [4]. Cancer patients and their health care providers are becoming more

and more concerned with maintaining HRQOL as it frequently decreases after diagnosis or treatment [5].

Patients receiving chemotherapy often have many important concurrent symptoms, which may be constant or cyclic (a clinical model). Such a model is useful for formulating a set of expected changes in HRQOL over time, and deciding when and how often to assess HRQOL. These in turn can be used to specify research study design and hypotheses [6]. Therefore, identifying which factors specifically contribute to poorer HRQOL in cancer patients and exploring possible ways to improve it have become very important therapeutic goals [7].

## 2. Subjects and Methods

This cross sectional study had been carried out at NICC in Cairo governorate, during the period from April 2015 and December 2015. A sample size was calculated according to the following equation:  $N = (Z^2 * P * Q) / (E^2)$  [  $Z=1.96$ ,  $P=$ No of affected population  $=12.5\%$ ,  $Q=1-p=87.8\%$ ,  $E$  error  $= .05$  and  $N = (1.96^2 * 12.5 * 87.5) / (.05^2) = 168$  ].

A total number of 190 patients were included in our study according to the following inclusion criteria: patients above age of 18, diagnosed with any cancer diagnosis, received chemotherapy regimen with 2 or 3 weekly administration cycles, no obvious cognitive impairments and agreed on written informed consent to participate in our study. The presented patients were assessed for the last week from their last chemotherapy administration using a validated HRQOL questionnaire. (FACT-G: Functional Assessment of Cancer Therapy General, version 4).

On the first Saturday from every month in the specified period, patients who met our inclusion criteria were interviewed (by systemic random sample method through interviewing consecutive 32 patients) and data were collected using a validated Arabic version of FACT-G questionnaire [8] [9] (version 4) to measure patients HRQOL. (A permission for the use of FACTI-F questionnaire was obtained by contacting Dr. Cella with written approval of Lauren Lent, DHA, MS; Exec. Director, FACIT.org)

FACT-G is a measurement system questionnaire, which includes the FACT-General scale, as well as many disease-specific, symptom-specific, and treatment-specific subscales. It comprises 27 questions and assesses 4 dimensions of QOL for last seven days: physical well-being (PWB; 7 items; 0–28), social well-being (SWB; 7 items; 0–28), emotional well-being (EWB; 6 items; 0–24), and functional well-being (FWB; 7 items; 0–28). The FACT-G uses 5-point Likert-type response categories ranging from 0 (“not at all”) to 4 (“very much”). The total FACT-G score is the summation of the 4 subscale scores (0 to 108). The FACT-G is a widely used QOL instrument that has been adapted for use with Arabic-speaking patients with cancer. It has been fully validated for use in both clinical practice and clinical trials. It has got both discriminative properties (reliability and cross sectional validity) and strong evaluative properties (responsiveness and longitudinal validity) [8] [9].

Higher scores for the scales and subscales indicate better HRQOL. Average FACT-G scores for our group of patients were compared to normative data to determine the HRQOL of the patients relative to the general U. S. population. These comparisons facilitate meaningful interpretation of HRQOL in patient populations. The scores of our patients were also compared with scores of other trials in which FACT-G questionnaire was used.

Multiple linear regression analysis of FACT-G scores was carried out using the stepwise method, including sex, age, marital status, time since diagnosis, TNM stage, ECOG scale, smoking, history of surgery, history of hormonal therapy, history of radiotherapy, comorbidities, BMI, employment, level of education, perceived functional status. Predictors with a P-value  $<0.05$  were considered as significant.

All data were collected, tabulated and statistically analyzed using STATA/SE version 11.2 for Windows (STATA Corporation, College Station, Texas). Continuous data were expressed as the mean  $\pm$  SD and range, and categorical data were expressed as a number and percentage. Variations in QOL scores were examined using the Student t-test (t) to compare two groups and one-way. Analysis of Variance (ANOVA, F) to compare more than two groups regarding parametric data followed by a post hoc test using the Bonferroni correction to test differences in pairs. The Pearson correlation coefficient (r) was used to assess the correlation between HRQOL scores and estimated parameters.

The study design and methodology were approved by the Ethical Committee of Scientific Research, Faculty of Medicine, Benha University. Also a written approval from the general manager of NICC was taken. Written informed consents were obtained from all participants before starting the interview.

## 3. Results

### *Socio-Demographic Characteristics*

This study has been included 190 cancer patients; 153 patients (80.53%) were females, ages ranged between 23 and 81 years with mean age of 50.63 years, a number of 119 patients (62.63%) were unemployed, their level of education was variable, with only 60 patients (31.58%) had education more than high school and majority of patients were married (84.74%).

The studied group included patients with different disease stages. Very early cancer disease (stage I) was represented in only 4 patients (2.11%), while metastatic conditions (stage IV) were found in 74 patients (38.95%) Most of the studied group patients 165 (86.85%) were presented with good performance status (ECOG scale 0 and 1).

The majority of the participants; 166 patients (87.37%) were non-smokers. History of hormonal therapy was found in 31 patients (16.32%), while history of radiotherapy was found in 39 patients (20.53%). Most of patients (75.26%) had no associated comorbidities of hypertension, diabetes, or viral hepatitis. BMI ranged from 17.6 to 52.5 with a mean BMI of 29.27 kg/m<sup>2</sup>. The menstrual status was absent in 109 patients (71.24%) of the

female participants of the studied group (Tab. 1).

In regard to cancer type: more than half of the studied group; 109 patients (57.37%) was diagnosed with breast cancer, other cases were diagnosed with other types of cancers such as lymphoma; 20 patients (10.53%), ovarian cancer; 12 patients (6.32%), mesothelioma; 9 patients (4.74%), colon cancer; 8 patients (4.21%), and other different types of cancer; 23 patients (12.1%) (Fig. 1).

**Table 1.** Socio-demographic and Clinical Features of the Sample (n=190).

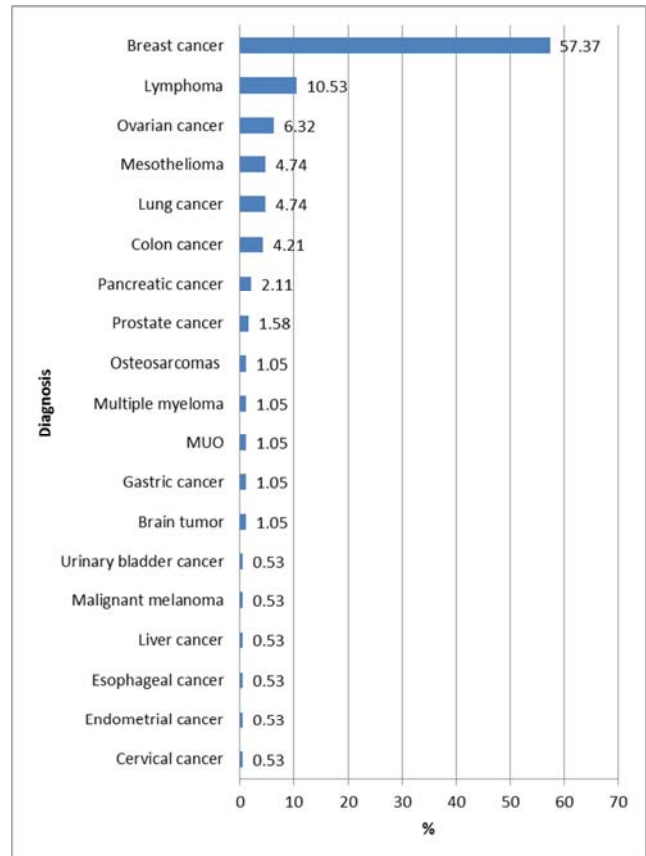
Variable (No.=190)		No.	%
Sex	Female	153	80.53
	Male	37	19.47
Age (years)	Mean $\pm$ SD; (range)	50.63 $\pm$ 11.79; (23-81)	
	23-35	27	14.21
	36-50	61	32.11
	51-65	83	43.88
	66-81	19	10.0
	<high school	49	25.79
Level of education	>high school	60	31.58
	High school	81	42.63
Employment	Employed	71	37.37
	Unemployed	119	62.63
Marital status	Married	161	84.74
	Single	13	6.84
	Widow	16	8.42
	Mean $\pm$ SD; (range)	8.65 $\pm$ 11.76; (1-84)	
Time since diagnosis (months)	1- 6	129	67.89
	7-12	22	11.58
	13- 24	22	11.58
	25- 84	17	8.95
TNM stage	Stage I	4	2.11
	Stage II	47	24.74
	Stage III	65	34.21
	Stage IV	74	38.95
	0	20	10.53
ECOG scale	1	145	76.32
	$\geq 2$	25	13.16
Smoking Habit	No	166	87.37
	Yes	24	12.63
Comorbidities	No	143	75.26
	DM	12	6.32
	DM & HTN	12	6.32
	HCV	6	3.16
	HTN	17	8.95
BMI (kg/m <sup>2</sup> )	Mean $\pm$ SD; (range)	29.27 $\pm$ 5.48; (17.6-52.5)	
	Underweight/normal (<25)	41	21.58
	Overweight (25-29.9)	63	33.16
	Obese ( $\geq 30$ )	86	45.26

History of hormonal therapy	No	159	83.68
	Yes	31	16.32
History of radiotherapy	No	151	79.47
	Yes	39	20.53
Menstrual status* (No.=153)	Absent	109	71.24
	Present	44	28.76

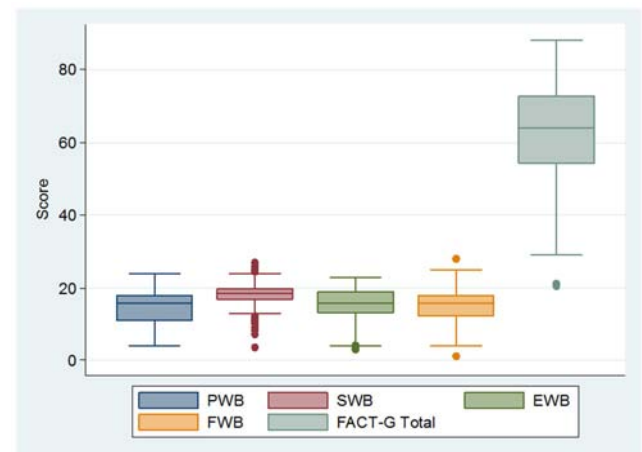
\* For only female participants

SD: standard deviation, TNM: Tumor/lymph node/metastasis, ECOG: Eastern Cooperative Oncology Group, DM: diabetes, HTN: hypertension, HCV: hepatitis C virus, BMI: body mass index



\*MUO: metastasis of unknown origin

**Figure 1.** Cancer diagnosis among patients of the study.



**Figure 2.** Functional Assessment of Cancer Therapy-General (FACT-G) Scores of patients of the study group. Total score was ranged between 21.2 and 87 with mean 63.24.

#### HRQOL as Assessed by FACT-G Questionnaire

FACT-G total score ranged between 21.2 and 87 with mean (63.24 $\pm$ 12.74) with being the physical and functional domains were more affected (Fig. 2). HRQOL of studied cancer patient was not affected by gender, employment status, level of education, smoking habits or marital status. A negative correlation was found between HRQOL and age; being lower in elderly, time since diagnosis of cancer, and TNM cancer stage with lowest FACT-G scores in stage IV

disease patients. Lower FACT-G scores were also observed in patients with lower performance status as evaluated by having  $> 2$  in ECOG scale. A negative relation between exposure of our patient to radiotherapy treatment and their HRQOL was observed. Associated comorbidities had a

negative effect on patients' HRQOL. There was a positive correlation between HRQOL and BMI, in addition, patients who have higher perceived financial status tended to have better HRQOL. (Tab. 2 & 3)

**Table 2.** Relation between patients' socio-demographic characteristics and HRQOL Outcome Variables.

HRQOL Variables	PWB		SWB		EWB		FWB		FACT-G total	
Patients characteristics	Statistics	P value	Statistics	P value	Statistics	P value	Statistics	P value	Statistics	P value
Age (years)¶	-0.20	0.005	-0.10	0.17	-0.01	0.85	0.17	0.02	-0.15	0.04
Time since diagnosis (months) ¶	-0.16	0.03	-0.04	0.62	-0.22	0.002	-0.20	0.005	-0.20	0.006
BMI ¶	0.05	0.46	0.05	0.48	0.07	0.34	0.21	0.004	0.14	0.04
Sex*	1.39	0.16	0.77	0.44	0.04	0.97	0.99	0.32	0.43	0.66
Employment*	1.11	0.27	2.01	0.04	0.01	0.99	1.27	0.20	1.33	0.18
Education*	1.15	0.32	3.17	0.04	2.32	0.10	1.99	0.14	2.64	0.07
Marital status*	0.91	0.40	1.91	0.15	0.37	0.69	0.58	0.56	0.81	0.44
TNM stage‡	6.80	0.001	3.12	0.04	7.12	0.001	9.88	<0.001	9.75	<0.001
ECOG scale‡	23.71	<0.001	3.96	0.02	10.92	<0.001	18.67	<0.001	24.19	<0.001
Smoking habit*	0.17	0.86	0.73	0.46	0.78	0.43	0.22	0.82	0.48	0.63
History of surgery*	1.33	0.18	2.15	0.03	1.08	0.28	1.13	0.26	1.97	0.05
History of radiotherapy*	2.13	0.03	0.23	0.82	3.57	<0.001	1.80	0.07	2.27	0.02
Comorbidities*	3.85	<0.001	0.09	0.92	0.13	0.89	1.91	0.06	2.04	0.04
Menstrual Status (Females n=153)*	2.23	0.03	2.62	0.01	1.74	0.08	3.11	0.002	3.08	0.002
Perceived Financial Status*	15.90	<0.001	6.36	0.002	2.79	0.06	11.73	<0.001	14.67	<0.001

¶ as analyzed by Pearson correlation coefficient (r), ‡ as analyzed by ANOVA (F), \*as analyzed by Student t-test (t) PWB: physical well-being; SWB: social well-being; EWB: emotional well-being; FWB: functional well-being; FACT-G: Functional Assessment of Cancer Therapy-General questionnaire, BMI: body mass index TNM: Tumor/lymph node/metastasis, ECOG: Eastern Cooperative Oncology Group.

**Table 3.** Multiple linear regression analysis for FACT-G Scores.

Variable (No.=190)	B	95% CI	P value
Physical Wellbeing (PWB) Score			
Sex	2.05	0.67 to 3.43	0.004
Male vs. female			
*TNM stage			
Stage I & stage II			
Stage III	-0.89	-1.60 to -0.18	0.01
Stage IV			
Comorbidities	-2.48	-3.75 to -1.21	<0.001
Yes vs. no			
*ECOG scale			
Scale 0			
Scale 1	-3.32	-4.49 to -2.14	<0.001
Scale $\geq 2$			
F-test	18.76		
Overall P value	<0.001		
Social Wellbeing (SWB) score			
*TNM stage			
Stage I & stage II			
Stage III	-0.60	-1.21 to 0.01	0.05
Stage IV			
*Perceived financial status			
Low			
Middle	1.35	0.52 to 2.19	0.002
High			
F-test	8.38		
Overall P value	<0.001		
Emotional Wellbeing (EWB) score			
History of radiotherapy	-2.18	-3.56 to -0.81	0.002
Yes vs. no			
*ECOG scale			
Scale 0			
Scale 1	-2.47	-3.61 to -1.32	<0.001
Scale $\geq 2$			

Variable (No.=190)	B	95% CI	P value
F-test	16.01		
Overall P value	<0.001		
Functional Wellbeing (FWB) score			
*ECOG scale			
Scale 0			
Scale 1	-2.21	-3.54 to -0.88	0.001
Scale $\geq 2$			
*TNM stage			
Stage I & stage II			
Stage III	-1.01	-1.73 to -0.30	0.005
Stage IV			
*Perceived functional status			
Low			
Middle	1.22	0.15 to 2.29	0.025
High			
F-test	16.97		
Overall P value	<0.001		
FACT-G total score			
*ECOG scale			
Scale 0			
Scale 1	-7.87	-11.76 to -3.98	<0.001
Scale $\geq 2$			
*TNM stage			
Stage I & stage II			
Stage III	-2.80	-4.88 to -0.72	0.009
Stage IV			
*Perceived functional status			
Low			
Middle	4.05	0.92 to 7.17	0.01
High			
F-test	21.46		
Overall P value	<0.001		

\*The scores were used as continuous value to get trends

HRQOL affected domains: (Table 3)

Physical wellbeing (PWB) score was affected by many variables, it was significantly higher in male patients compared to female group [B=2.05; 95% CI (0.67 to 3.43);  $p<0.01$ ] but it was significantly lower with advanced disease stages (TNM stage) [B= -0.89; 95% CI (-1.60 to -0.18);  $p<0.05$ ], in patients with associated comorbidities compared to patients without [B=-2.48; 95%CI(-3.75 to -1.21);  $p<0.01$ ] and with advanced performance status ECOG scale score [B=-3.32; 95% CI (-4.49 to -2.14);  $p<0.01$ ]. Many variables had an effect on social wellbeing (SWB) score; it was significantly lower with advanced disease stages (TNM stage) [B=-0.60; 95% CI (-1.21 to -0.01);  $p=0.05$ ] but it was significantly higher with higher perceived financial status [B=1.35; 95% CI (0.52 to 2.19);  $p<0.01$ ]. Emotional wellbeing (EWB) score was significantly lower in patients with history of radiotherapy [B=-2.18; 95% CI (-3.56 to -0.81);  $p=0.002$ ] and in patients with higher ECOG scale scores [B=-2.47; 95% CI (-3.61 to -1.32);  $p<0.001$ ].

Regarding functional wellbeing (FWB) score; it was affected by many variables; it was significantly lower in patients with lower performance status as evaluated by ECOG scale [B=-2.21; 95% CI (-3.54 to -0.88);  $p<0.01$ ] and in patients with advanced disease stages TNM [B=-1.01; 95% CI (-1.73 to -0.30);  $p<0.01$ ], but was significantly better with higher perceived financial status [B=1.22; 95%CI(0.15 to 2.29);  $p<0.05$ ].

FACT-G total score was significantly lower in patients with lower performance status [B=-7.87; 95% CI (-11.76 to -3.98);  $p<0.01$ ] and in patients with advanced disease stages [B=-2.80; 95% CI (-4.88 to -0.72);  $p<0.01$ ]. On the other side, HRQOL was significantly higher in patients with higher perceived financial status [B=4.05; 95% CI (0.92 to 7.17);  $p<0.05$ ] (Tab. 3).

## 4. Discussion

HRQOL covers the subjective perceptions of the positive and negative aspects of patients' symptoms, including physical, emotional, social, cognitive functions and most importantly, disease symptoms and side effects of treatment [3].

In our study, participants who were receiving chemotherapy have been shown degrees of HRQOL impairment as measured by the FACT-G questionnaire and having a mean total score of  $63.24 \pm 12.74$  (range 21.2-87) with being the physical and functional domains were more affected (Fig. 2). In comparison to other studies, these results are considered lower than that obtained from normal U. S population or U. S cancer patients [8][9]; but similar to results of South American study [10].

HRQOL of studied group of cancer patients at NICC was not affected by gender, employment status, level of education, smoking habits or marital status while it was affected by some other variables. Age was one among other factors to which HRQOL was negatively correlated. It has been suggested that younger patients may have higher expectations concerning their physical and functional status

[11].

HRQOL in our study was negatively correlated with time since diagnosis of cancer. It has been postulated that some cancer survivors have lower HRQOL after a decade of diagnosis, even in remission [12].

Strong negative correlations were found between HRQOL and disease staging as determined by TNM staging system. Tumor stage was proven to be a strong relevant determinant of patients' ratings on the FACT-G overall measure of QOL. It was also an influencing clinical factor on physical wellbeing. Specifically, patients with loco-regional diseases (stage I & II) vs. advanced-stage cancer (stage III&V) reported better HRQOL. Similar results were described among Hispanic and African-American cancer patients [13].

HRQOL in the studied group was strongly affected by patient's performance status as evaluated by the ECOG scale for all FACT-G domains. The higher the ECOG scale rates the lower the quality of life scores with lowest FACT-G scores in patients with ECOG scale of  $\geq 2$  as compared with those with ECOG scale between 0-1 ( $p < 0.01$  for PWB, EWB, FWB & FACT-G scores, and  $p < 0.05$  for SWB score).

Emotional wellbeing scores have been affected by the exposure of patient to radiotherapy treatment in our study. Similar results have been shown in a recent study that was conducted in Jordan in which patients' fatigue level and QOL were affected by the exposure to radiotherapy [14]. In the study of Mei et al, the QOL was negatively correlated with the presence of co-morbidities [15], similar association was observed in our study.

In our study; QOL was positively correlated with BMI which has been ranged from 17.6 to 52.5 with a mean score of  $29.27 \text{ kg/m}^2$  and it is considered relatively high (Classification as overweight is being having a score of  $25.0\text{--}29.9 \text{ kg/m}^2$ ). In many studies, deviation away from normal BMI was associated with lower QOL with the best recorded scores in the group of patients with average BMI scores of  $18.5\text{--}24.99 \text{ kg/m}^2$  [16]. Increased BMI was associated with poorer QOL among uterine cancer patients [17]. The results of our study may be explained by that the length and body weight of the patient were taken in the 1<sup>st</sup> presentation to the cancer center unit and before starting treatment plan (time since diagnosis of majority of patients was ranged between 1-6 months in 67.89% of patients), most of patient then had weight loss either due to disease or the chemotherapy. Hence the decrease of BMI (due to weight loss) even to optimum levels may be associated with poorer QOL scores.

There was a significant difference in the HRQOL among female patients according to their menstrual status being better with patients in preserved menstrual activity. QOL was found to be lower in the setting of irregular menses and likely profound impairment of ovarian function [18].

Perceived financial status is strongly positively correlated with QOL. The amount of family income proved to be a relevant positive determinant of QOL, and similar observation was found in our study [10].

Multiple linear regression analyses of FACT-G scores and its subscales using the stepwise method were performed.

These analysis included multiple variations like sex, age, marital status, smoking habits, time since diagnosis, TNM stage, performance status as evaluated by ECOG scale, history of surgery, history of hormonal therapy, history of radiotherapy, associated comorbidities, BMI, employment, level of education, and perceived functional status [10].

Regarding physical wellbeing (PWB) scores of our study group, it was found to be affected by many variables; it was lower among female patients, advanced disease stage, presence of associated comorbidities and patients with lower performance status [7].

Social wellbeing (SWB) scores of our study group were also affected by many variables. It was significantly lower with advanced disease stages (TNM stage); the higher the TNM stage the lower the SWB score ( $B=-0.60$ ; 95% CI, -1.21 to -0.01;  $p=0.05$ ). SWB score was significantly higher with higher perceived financial status; the higher the perceived financial status the higher the SWB score ( $B=1.35$ ; 95% CI, 0.52 to 2.19;  $p<0.01$ ) (Tab. 3). These results are compatible with results of Daputo *et al* 2005 except for TNM stage which did not significantly affect the SWB score ( $B=-2.27$ ;  $p>0.05$ ) [10].

Regarding Emotional wellbeing (EWB) scores of our study group, it was found to be affected by many variables. It was significantly lower in patients with history of radiotherapy compared to patients without ( $B=-2.18$ ; 95% CI, -3.56 to -0.81;  $p<0.01$ ). EWB score was significantly lower with advanced ECOG scale score; the higher the ECOG scale the lower the EWB score ( $B=-2.47$ ; 95% CI, -3.61 to -1.32;  $p<0.01$ ) (Tab. 3). These results are also compatible with results of Daputo *et al* 2005 except for history of radiotherapy which did not significantly affect the EWB score ( $B=0.80$ ;  $p>0.05$ ) [10].

Functional wellbeing (FWB) scores of our study group was found to be affected by patients' performance status, it was significantly lower with advanced ECOG scale score; the higher the ECOG scale the lower the FWB score ( $B=-2.21$ ; 95% CI, -3.54 to -0.88;  $p<0.01$ ). In addition, it was significantly lower with advanced disease stages with the lower FWB score as disease get advanced ( $B=-1.01$ ; 95%CI, -1.73 to -0.30;  $p<0.01$ ). Patients FWB scores were also significantly higher with higher perceived financial status; with higher scores as the perceived financial status is higher ( $B=1.22$ ; 95%CI, 0.15 to 2.29;  $p<0.01$ ). (Tab. 3) These results are compatible in regard to all variables with the results of the same previous study in which determinants of quality of life in patients with cancer were evaluated [10].

FACT-G total score of our study group was found to be significantly lower with higher ECOG scale score, and advanced disease stages. FACT-G total score was significantly higher with higher perceived financial status. (Tab. 3) These results are compatible with results of other studies [10].

## 5. Conclusion

The health related quality of life of cancer patients who

were receiving chemotherapy at Nasser Institute Cancer Center in our study was relatively low and have been shown to be affected by many variables. Preplanned health programs should be designed for cancer patients considering treatment related side effects and supporting improving patients' quality of life.

## Funding

This study was not funded by any institution.

## Competing Interests

The authors declare that they have no conflict of interest.

## Ethical Approval

All procedures performed were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

## Abbreviations

BMI: higher body mass index  
DM: diabetes  
ECOG: Eastern Cooperative Oncology Group  
EWB: emotional well-being  
FACT-G: functional assessment of cancer therapy  
FWB: functional well-being  
HCV: hepatitis C virus  
HRQOL: health related quality of life  
HTN: hypertension  
MUO: metastasis of unknown origin  
NICC: Nasser Institute Cancer Center  
PWB: physical well-being  
QOL: quality of life  
SWB: social well-being  
TNM: Tumor/lymph node/metastasis

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