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Correlation of chemotherapy costs with quality of life in nasopharyngeal cancer patients

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Abstract:

Background: Nasopharyngeal cancer (NPC) is the most common neck/head cancer occurring in Indonesia and is the fourth most malignant after breast cancer, cervical cancer, and lung cancer. It is known that the cost of chemotherapy may not be separated from quality of life (QoL) to reflect the success of therapy, especially in cancer patients. Thus, studies on the correlation between chemotherapy cost and the QoL in NPC patients are needed.

Methods: The participants were recruited by a consecutive sampling method. All patients diagnosed with NPC using a paclitaxel-cisplatin chemotherapy regimen in August–March 2019 for first until the third chemotherapy cycle were assessed for their the chemotherapy cost and QoL before the first chemotherapy cycle and after the third cycle using the EORTC QLQ-C30 questionnaire. Chemotherapy cost and QoL were analyzed using SPSS version 20 to find out the correlation.

Results: Data from 26 patients showed a notable increase in the QoL after the third chemotherapy cycle. Thus, there was a relationship between chemotherapy cost and QoL in NPC patients. The total cost of chemotherapy increased with the increase in cycles of chemotherapy. We further analyzed the correlation between QoL and the cost of chemotherapy. We found that there was a correlation between the cost and the aspects of global health status, the QoL.

Conclusions: It is concluded that chemotherapy that is followed by the increase in cost in chemotherapy improves the QoL.

Keywords: chemotherapy, cost, cisplatin, paclitaxel, QoL, nasopharyngeal cancer

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Introduction

Nasopharyngeal carcinoma (NPC) is a squamous cell carcinoma that appears in the nasopharynx (the area above the throat and behind the nose), which shows a mild or ultrastructured microscopic squamous differentiation. In Indonesia, NPC is the fourth most malignant cancer after breast cancer, cervical cancer, and lung cancer. While in Dr. Soetomo Hospital, Indonesia, it accounts for the most cancers after breast cancer, cervical cancer and acute lymphoblastic leukemia [1], [2].

Therapies for NPC patients are radiation, chemotherapy, or a combination of both, and symptomatic drugs such as supporting therapy in accordance with the symptoms. Based on the 2017 Indonesian Ministry of Health and Culture's Nasopharyngeal Cancer Management Guide, chemotherapy for NPC is given in stages II, III, IVA and IVB. In cases of recurrent or metastatic cancer single therapy chemotherapy, or a combination can be given. Regimentation of chemotherapy is often done in NPC patients in Dr. Soetomo Hospital is a combination of cisplatin-paclitaxel [2]. Cisplatin is a platinum group cytotoxic, which works to covalently bind DNA and interfere with the function of DNA in cancer cells. Paclitaxel is a group of taxanes that work to inhibit cancer cell mitosis. Both are used in various types of cancer, including in NPC [3], [4].

Patients with NPC although already treated with modern therapeutic modalities, are still faced with the threat of recurrence or complications that can be caused by treatment, and changes in physical, emotional

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and/or social functioning during the follow-up period. A study conducted by Cengiz et al. in 2004 said that NPC affects the quality of life (QoL) of patients. Factors that can affect the QoL of NPC patients are cancer stage, sex and long-term follow-up done in patients [5], [6].

The main problem of cancer is the cost of care and the long treatment time. This not only causes economic loss for sufferers but also for families and the government [7]. Indonesian Government Health Insurance aims to provide health care guarantees for Indonesian people with INA CBG's (Indonesian Case-Based Group) financing system that claims to be based on a diagnosis by a physician (primary and secondary) and all treatments [8].

The cost for chemotherapy accounts for 59% of the total cost of treating cancer patients in hospitals, while the costs of other drugs and examinations account for 25% and 16% of total medical expenses, respectively. With increasing attention being paid to the cost of current health services, pharmacists and other health care providers need to have cost analysis results to get health economic information related to drug therapy [9], [10].

Chemotherapy can cause undesirable side effects such as nausea, vomiting, weakness, myelosuppression up to the occurrence of nephrotoxicity. Especially with the use of cisplatin which has serious nephrotoxic side effects. Cancer and its side effects are often associated with a decrease in QoL. Although progress in the field of cancer treatment can improve the therapeutic outcomes of cancer patients, such as survival rates and disease-free conditions, patients continue to feel the major impact of cancer and its treatment in several physical and psychosocial conditions [2], [11].

Materials and methods

Subjects

This research has been approved by the authors' Institutional Review Board and complied with the criteria in the Declaration of Helsinki. Participants were those who were willing to take part in the study after receiving information on consent and who signed the informed consent. Participation in this study was taken by a consecutive sampling method of all patients diagnosed with NPC who were using a paclitaxel-cisplatin chemotherapy regimen in August–March 2019 and who fulfilled the inclusion criteria of the study. The inclusion criteria were: (1) NPC patients using the paclitaxel-cisplatin regimen first to third cycle; (2) patients who were willing to take part in the study; and (3) patients with complete data (medical records, financial data, namely the total cost of chemotherapy and drug data). Moreover, the exclusion criteria were: (1) NPC patients who used the paclitaxel-cisplatin regimen but did not reach the third cycle; (2) NPC patients using the paclitaxel-cisplatin regimen and experienced regimen changes during cycle 2 or 3; (3) NPC patients using the paclitaxel-cisplatin regimen, who were given radiotherapy before the first, second or third cycle.

Methods

There were 30 participants assessed for QoL before the first chemotherapy cycle. Two participants did not continue the second cycle of chemotherapy and two participants experienced changes in the regimentation of their chemotherapy, and thus dropped out of the study. There were 26 patients who completed the third cycle and were assessed for their QoL on the third day after chemotherapy. Assessment of QoL before the first chemotherapy cycle and after the third chemotherapy cycle was conducted using a validated EORTC QLQ-C30 questionnaire because it has three aspects of QoL, namely global health status, functional status, and symptoms. The cost calculated in this study is the total cost of chemotherapy.

Data of this study were processed based on the characteristics of participants, QoL before the first chemotherapy cycle and after the third chemotherapy cycle, and data on chemotherapy costs during the first cycle and during the third cycle. Then the cost data was correlated so that the relationship of QoL with the total cost of chemotherapy was obtained using SPSS version 20 (IBM corp, Chicago IL, USA).

Results

Assessment of QoL

In the EORTC QLQ-C30 questionnaire there are three aspects of QoL, global health status, function, and symptoms. The functional status assessment is further divided into physical, role, emotional, cognitive and social functions. The symptoms are divided into fatigue, nausea and vomiting, pain, dyspnea, insomnia, appetite, constipation, diarrhea, and financial difficulties. There was a difference before the first cycle and after the third cycle. It was shown that there were increase in the global health status and the functional scores. Conversely, the symptom scores showed a decrease (Table 1).

Table 1: QoL score based on EORTC QLQ-C30.

QoL based on EORTC QLQ-C30	Before first cycle \pm SD	After third cycle \pm SD
Global health/QoL		
Global health status	46.15 \pm 14.18	66.34 \pm 18.63
Functional status		
Physical function	62.94 \pm 25.44	76.02 \pm 26.49
Role function	55.76 \pm 26.64	74.35 \pm 26.76
Emotional function	78.84 \pm 22.14	95.51 \pm 9.78
Social function	82.05 \pm 17.59	94.97 \pm 12.26
Cognitive function	72.43 \pm 29.79	78.67 \pm 28.92
Symptom		
Fatigue	45.31 \pm 25.12	35.49 \pm 25.54
Nausea and vomiting	33.33 \pm 30.55	66.02 \pm 28.86
Pain	60.89 \pm 29.04	22.44 \pm 25.79
Dyspnea	19.23 \pm 32.89	5.13 \pm 12.26
Insomnia	42.31 \pm 39.51	23.08 \pm 27.92
Appetite loss	39.75 \pm 34.01	46.15 \pm 29.93
Constipation	10.26 \pm 24.53	7.69 \pm 17.15
Diarrhea	5.12 \pm 29.93	6.41 \pm 16.38
Financial difficulties	20.51 \pm 29.93	12.82 \pm 21.24

QoL, quality of life; SD, standard deviation.

Statistical analysis of QoL before the first cycle of chemotherapy and after the third cycle of NPC patients who used cisplatin-paclitaxel chemotherapy regimens was performed using the paired T-test method. There was a difference between QoL before chemotherapy in the first cycle and after the third cycle. Differences were shown in several functional statuses such as physical, role, social and emotional, but not cognitive function. Other differences were shown in several symptoms such as nausea and vomiting, pain, dyspnea, and insomnia, but not in fatigue, appetite loss, constipation, diarrhea, and financial cost. The normality test showed that the test result was normally distributed with a p value >0.05 (Table 2).

Table 2: Analysis of the QoL of patients.

QoL based on EORTC QLQ-C30	Changes in QoL	Significance (p)
Global health/QoL		
Global health status	-20.19	0.001 ^a
Functional status		
Physical function	-13.08	0.017 ^a
Role function	-18.58	0.004 ^a
Emotional function	-16.67	0.001 ^a
Social function	-12.83	0.003 ^a
Cognitive function	-6.23	0.234
Symptom		
Fatigue	9.82	0.126
Nausea and vomiting	-32.46	0.001 ^a
Pain	38.46	0.001 ^a
Dyspnea	14.10	0.009 ^a
Insomnia	19.23	0.005 ^a
Appetite loss	-6.41	0.503

Constipation	2.56	0.627
Diarrhea	-1.28	0.770
Financial difficulties	7.69	0.247

QoL, quality of life.

^ap score \leq 0.05; significantly changed.

Cost of chemotherapy

The total cost of chemotherapy is obtained from the amount of maintenance costs and the cytostatic drugs and handling costs. The cost in the third cycle is cumulative from the total cost of chemotherapy from the first cycle to the third cycle. In the first cycle, the total cost of chemotherapy was obtained at an average of IDR 5,575,970.37. After the third cycle, the cost was IDR 16,266,016.21 (Table 3).

Table 3: Correlation between QoL and cost of chemotherapy before the first cycle.

QoL based on EORTC QLQ-C30 vs. first cycle cost of chemotherapy	n	Pearson's correlation	p-score
Global health/QoL			
Global health status	26	0.074	0.721
Functional status			
Physical function	26	-0.048	0.814
Role function	26	0.218	0.285
Emotional function	26	0.170	0.406
Social function	26	0.106	0.179
Cognitive function	26	0.065	0.607

QoL, quality of life.

Correlation of chemotherapy cost with QoL

The statistical analysis of QoL with the cost of chemotherapy tested using Pearson's correlation used with SPSS version 20. It was found that the QoL after the third cycle was slightly, but not significantly, correlated with the cost of chemotherapy before the first cycle. A similar result was shown in the third cycle (Table 4).

Table 4: Correlation between the QoL and the cost of chemotherapy after the third cycle.

QoL based on EORTC QLQ-C30 vs. third cycle cost of chemotherapy	n	Pearson's correlation	p-score
Global health/QoL			
Global health status	26	0.535	0.005
Functional status			
Physical function	26	0.134	0.515
Role function	26	0.244	0.230
Emotional function	26	0.068	0.740
Social function	26	0.265	0.191
Cognitive function	26	0.300	0.136

QoL, quality of life.

Discussion

NPC is a squamous cell carcinoma that arises from the nasopharyngeal epithelial layer. These neoplasms can arise from any part of the nasopharynx, and are more often seen in smaller fossa, the location of the fracture is located medially from the medial crura of the eustachian tube [12], [13], [14]. QoL is a broad multidimensional concept that usually includes subjective evaluations of positive and negative aspects of life. QoL has a broad meaning, including not only the existence of disease but also individual perceptions of life goals, expectations, and concerns [15], [16], [17]. QoL related to health refers to how health impacts a person's ability to get welfare and function physically, mentally, and socially in life. Part of the function that is included in routine activities are self-care and doing activities such homework or a career. This also includes social functions comprising the ability to interact with family members or the surrounding environment [18], [19].

The present study showed that the presence of chemotherapy significantly increases the QoL. Cancer and its treatment have a major impact on the lives of patients, which causes difficulties in fulfilling family roles, the ability to work or participate in joint social activities. The EORTC system examines not only the impact of cancer in terms of longer survival, but also in understanding the general effects of cancer on a patient as a whole person. This is referred to as an assessment of the QoL [18], [20], [21]. Taken together, it is suggested that the present study shows the positive changes in QoL during chemotherapy.

Further, the present study found that there were differences between QoL before chemotherapy in the first cycle and after the third cycle, especially in physical, role, social, and emotional functions. It initially caused or worsened the nausea, vomiting, pain, dyspnea, and insomnia. A paired T-test analysis showed that there are differences in most aspects of QoL. It is important to note that there was no significant change in the financial difficulties. It is suggested that the involvement of the national health insurance in covering the expense of medicines and its handling affect the negative finding in the change of the financial issue related to the QoL score [10], [22].

Indonesia has a national health insurance system, locally it is popular with the Jaminan Kesehatan Nasional (JKN) system, organized by a state institution called Badan Penyelenggara Jaminan Sosial (BPJS). The payment method, the INA CBG's system, consists of several components that are interrelated with each other. Those, which are directly related to service output, are clinical pathways, coding and information technology [10], [22]. The cost of chemotherapy in this study was obtained directly from this system acquiring the amount of maintenance costs and the cost of cytostatic drugs and handling costs. The cost in the third cycle is cumulative from the total cost of chemotherapy from the first cycle to the third cycle. In the first cycle, the total cost of chemotherapy was at an average of IDR 5,575,970.37, and after the third cycle of chemotherapy was IDR 16,266,016.21. Together with QoL data, it is possible that the improvement in QoL seems to be followed by the increase in the cost of chemotherapy. Further investigation is still needed to examine the detailed fluctuation of QoL in each cycle to get a more comprehensive conclusion related to cost-QoL relationships.

We further correlated the QoL and the cost of chemotherapy to find whether the factors are influencing each other. It is found that the QoL before the first cycle did not correlate with cost of chemotherapy before the first cycle. The result suggests that the cost of chemotherapy that should be subjected to either patients or insurance does not correlate and possibly does not influence the QoL of NPC patients. Similarly, it is found that the QoL after the third cycle showed a slight correlation with the cost of chemotherapy that was subjected to the patients or insurance. Together, this result suggests that the cost of chemotherapy may not correlate to the QoL of NPC patients.

Conclusions

It is concluded that chemotherapy improves the QoL of NPC patients. Further, there is no correlation between the cost that should be covered and the QoL as an outcome. The findings suggest that the insurance systems should put more support into covering the chemotherapy procedure to increase the QoL of NPC patients.

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