Correlation of subjective global assessment with resting metabolic rate and fat free mass as measured by bioelectrical impedance analysis in non-Hodgkin lymphoma

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ABSTRACT: Subjective global assessment is used as a simple way to assess malnutrition without the use of complete body composition analysis. Increased metabolism, characterised by increased resting metabolic rate, is often found in patients with cancer. The aim of this research is to identify the correlation between subjective global assessment, resting metabolic rate and fat free mass in patients with Non-Hodgkin lymphoma. Correlation between resting metabolic rate and fat free mass are measured by bioelectrical impedance analysis and subjective global assessment and then assessed and analysed. A sample of 27 non-Hodgkin lymphoma patients was used, consisting of approximately 60% men and 40% women. Of the subjects, 7.4% were found to be well nourished, 63% were malnourished and 29.6% were severely malnourished. The mean resting metabolic rate and fat free mass were 1346.3 ± 145.7 kcal and 44.5 ± 6.8 kg respectively. Only 3% of the patients were found to have above-normal resting metabolic rates. No correlation was found between subjective global assessment and resting metabolic rate (p = 0.275) or fat free mass (p = 0.850). There was no correlation between subjective global assessment and resting metabolic rate or fat free mass as measured by bioelectrical impedance analysis in non-Hodgkin lymphoma patients.

Keywords: BIA, free fat mass, resting metabolic rate, SGA

1 INTRODUCTION

Non-Hodgkin Lymphoma (NHL) is the most commonly found haematopoietic neoplasm, ranking as the seventh most frequent of all cancers. NHL is found five times more frequently than Hodgkin lymphoma. The number of patients with NHL is increasing, and this may be related to early detection or to increased HIV infection (Sanjay, 2015; Lin & Guan, 2008).

Patients with haematologic malignancies and breast cancer rarely experience significant weight loss, unlike most patients with solid tumours, who frequently suffer from weight loss. It is estimated that the incidence of malnutrition in cancer patients ranges from 40–80% (Filipovic et al., 2010). When diagnosed, 80% of patients with upper gastrointestinal cancer and 60% of lung cancer patients have experienced obvious weight loss (Akio, 2002). In cancer patients, weight loss can be caused by increasing energy expenditure and reduced food intake. Some studies have shown an increase in energy expenditure at rest in patients with malignancies (Fredrix et al., 1991). Many methods have been developed to assess nutritional status to identify malnourished patients or patients who are at risk of malnutrition, including the Subjective Global Assessment (SGA). SGA was first introduced by Baker et al. in 1982, and is used to assess malnutrition in patients without the need for comprehensive analysis of body composition (Detsky et al., 1987).

Malnutrition can be detected earlier from the evidence provided by the changes in cell membranes and fluid imbalances that precede changes in anthropometric measurements and biochemical markers, and which can be analysed by Bioelectrical Impedance Analysis (BIA). BIA analyses the composition of body fluid indirectly by noting the change in impedance of
electrical current in parts of the body. BIA examination is quick, non-invasive and does not require active participation by patients (Fredrix et al., 1990).

BIA reflects the volume of body fluids, such as total body water, extracellular water and intracellular water, as well as total body potassium and the nutritional status of the body. These measurements are provided as Body Cell Mass (BCM), Fat Free Mass (FFM), Fat Mass (FM), Resting Metabolic Rate (RMR), total protein, mineral and glycogen and phase angle (Gudivaka et al., 1999). FFM is a combination of BCM and extracellular mass or body mass minus FM. RMR is used to determine how quickly calories are burned in the body. Burning more calories than consumed will lead to weight loss, and hypermetabolism is common in cancer patients, who present with increased metabolism of up to 50% higher than patients without cancer (Liedtke, n.d.).

Therefore, this study aims to determine whether there is any correlation between nutritional status, as measured by SGA, and RMR and FFM, as measured by BIA, in NHL patients who have not received chemotherapy.

2 METHOD

This study was conducted using a cross sectional approach at RSUP Adam Malik Hospital, Medan. The study population consisted of 27 patients with NHL in whom evidence for correlation between SGA and RMR and/or FFM was assessed and analysed. RMR and FFM were measured by BIA. Patients had to meet inclusion and exclusion criteria. The inclusion criteria for this study were NHL patients who were newly diagnosed and had not received chemotherapy. The exclusion criterion was those unwilling to participate in the study.

All NHL diagnoses were confirmed by histopathology examination, and nutritional status was investigated using SGA. BIA equipment (Maltron Bio Scan 916) made by Maltron International Ltd, Essex, UK, was used at room temperature, with a frequency of 50 kHz and an amplitude of 800 μA. Electrodes were placed on each patient’s feet and hands. BIA examination was conducted by the researchers themselves.

3 RESULTS

This study involved a total of 27 NHL patients who were newly diagnosed and had not received chemotherapy. The patients consisted of 16 (59.3%) men and 11 (40.7%) women with a mean age of 44.7 ± 12.5 years, with the youngest being 22 years and the oldest 75 years. Of the subjects, 7.4% were found to be well nourished, 63% were malnourished and 29.6% were severely malnourished. The mean RMR and FFM were 1346.3 ± 145.7 kcal and 44.5 ± 6.8 kg respectively (Table 1).

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<th>Table 1. Characteristics of the study population.</th>
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<td>FFM (kg)</td>
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<td>RMR (kcal)</td>
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Only 1 (3%) patient with NHL was found to have RMR above normal. No correlation was found between SGA and RMR (p = 0.275) or FFM (p = 0.850) (Table 2).

4 DISCUSSION

BIA is the analysis of electrical resistance and reactance in the human body (Paeratahuls et al., 1999). There are several factors that can affect BIA measurements, including sex, age and ethnicity/race. In the study by Bailey et al. (2004) it is stated that there is a difference in total body mass between men and women, with men having a total body mass 8% higher than women. Liebelt et al. (1999) present that there are different patterns of fat distribution between men and women: the pattern of fat distribution in men tends to be in the area of the upper body and abdominal areas (upper body–abdominal pattern), whereas in women the pattern of fat distribution tends to be in the gluteal and femoral regions (gluteal–femoral pattern). RMR is lower in women than in men. In men, RMR is found to be 194 kcal/day compared to 125 kcal/day in women. RMR in women is lower than in men of the same age due to premenopausal and postmenopausal processes (Dehghan & Merchant, 2008).

A decrease in FFM has a correlation with RMR in elderly subjects. Reductions in organ/tissue mass due to ageing and organ metabolic rates contribute to a decrease in RMR, an increase in FM and a decrease in FFM (Aapro et al., 2014).

SGA is a subjective, simple, inexpensive and effective method for assessing the nutritional status of cancer patients. SGA is also a tool that can assess the functional capacity or energy level of patients. Following anamnesis and physical examination patients are classified as follows: well nourished (SGA A), moderately malnourished or suspected malnourished (SGA B), or severely malnourished (SGA C). SGA has generally been used to assess malnutrition because it is simple, does not require any medical instruments and can be the first assessment tool for assessing functional capacity. Well nourished patients (SGA A) were found in 7.4% of the subjects in this study; 63% were moderately malnourished (SGA B) and 29.6% were severely malnourished (SGA C) (Table 1). Dewys et al. (1980) found a frequency of weight loss of about 31% in patients with high-risk NHL (Aapro et al, 2014).

Research in Australia by Bauer et al. (2002) using SGA scores showed that 42 out of 71 cancer patients under treatment (59%) suffered from moderate malnutrition, and 12 patients (17%) suffered from severe malnutrition. Weight loss and decreased appetite are problems that occur in cancer patients. In research by Hopkinson et al. (2006), the prevalence of weight loss as a symptom ranged from 39% to 82%, while a decrease in appetite ranged from 30% to 80%. These conditions can be related to the absence of feedback regulation caused by products of the tumour that affect the activity of enzymes. Most cancer patients are not able to meet their calorie needs, possibly as a secondary factor related to metabolic changes, fatigue or decreased appetite as a result of treatment for cancer (Susetyowati et al., 2010).

In this study, the mean RMR was 1346.3 ± 145.7 kcal and only 1 patient (3%) with NHL was found to have a RMR above normal. It may be that this may reflect ethnic RMR differences, as normal RMR in Indonesian people has not been studied. The lack of correlation between SGA and RMR (p = 0.275) and FFM (p = 0.094) (Table 2) is likely to be due to the absence of information on normal values of RMR and FM in Indonesia.

The first weakness of this study is that it does not differentiate the stages of NHL, a factor which allegedly affects nutritional status parameters. The second weakness is that the normal
FFM and RMR values used refer to the normal value of the general population worldwide, not to the normal values for the Indonesian population specifically.

5 CONCLUSION

There was no correlation between SGA and RMR or FFM as measured by BIA in NHL patients who were newly diagnosed and had not received chemotherapy.

REFERENCES


