Impact of Adjuvant and Neoadjuvant Chemotherapy on BMI of Patients with Non-Metastatic Breast Cancer in Center of High Complexity Oncology in Southern Brazil

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Methods: Data from 122 medical records center of high complexity oncology in Southern Brazil for patients diagnosed with non- metastatic malignant breast cancer and undergoing chemotherapy for one year. Statistical analysis was performed by SPSS v.20.0.

Keywords: adjuvant therapy; neoadjuvant therapy; body weight; body mass index; breast cancer.

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Methods: Data from 122 medical records center of high complexity oncology in Southern Brazil for patients diagnosed with non- metastatic malignant breast cancer and undergoing chemotherapy for one year. Statistical analysis was performed by SPSS v.20.0. For to associate the nutritional status categories, the Mc Nemar test was used. the level of significance was considered at 5% for comparisons.

Results: The mean age of the sample was 53.48 ± 12.23 years. 44.3% of patients were post- menopausal. 90.2% of patients have invasive ductal carcinoma and most patients were stage IIB. 51.6% underwent chemotherapy neoadjuvant, 36.1% adjuvant chemotherapy and 12.3 underwent both types. the BMI in the first consultation before chemotherapy, the mean was 29.25±5.94; BMI at the last consultation, the mean was 29.32 ± 6.01. By Student's T Test, the weights and BMI before and after chemotherapy were P=0.711 and P=0.774 respectively.

Conclusion: This study did not reveal significant weight changes after one year of chemotherapy adjuvant and/or neoadjuvant. Further studies are suggested on the trend of change in weight and association with long term chemotherapy. Furthermore, most patients with breast cancer followed up in the period did not change the classification of the Body Mass (BMI) according to the World Health Organization (WHO).

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I. Background

B reast cancer is the second most frequently diagnosed malignancy, it is also the leading cause of cancer death in women. cancer patients early-stage breast cancer undergo primary breast and lymph node surgery regions, with or without radiotherapy. Afterwards, adjuvant systemic therapy may be indicated. However, some patients with early-stage invasive breast cancer may be treated with neoadjuvant therapy first. Chemotherapy is associated with effects side effects, including nausea, vomiting, diarrhea, hair loss, fatigue, mucositis, cytopenia, ovarian failure, cardiac toxicity, and emotional and psychiatric. Among the known side effects of chemotherapy, the weight change and its association with a poor prognosis of the disease (1- 3)

Weight change in breast cancer patients can influence the quality of life, self-esteem and development of new comorbidities. Studies report greater risk of disease recurrence and worse prognosis when performing the treatment (1-6). One meta-analysis showed that a weight gain of 10% or more after the diagnosis of Breast cancer is associated with a higher mortality rate (4). On the other hand, there are recent studies showing no significant changes in the weight of patients with breast cancer undergoing chemotherapy (3,5,6). Based on these data, studies have also demonstrated the importance of nutritional monitoring and exercise during the chemotherapy treatment (7-9).

A meta-analysis showed that weight gain during chemotherapy was greater in articles published up to the 2000s and that there is a trend of weight gain be decreasing over the years (1). In line with this idea, a meta-analysis Canadian added that weight gain is more associated with chemotherapy adjuvant, with long-term treatments and increased in pre menopause (10). In this context, the literature suggests that the duration of chemotherapy can also be a factor for weight gain (11,12) and also shows that pre-menopausal patients

show greater weight gain than post-menopausal patients (6,13). The association between weight gain and chemotherapy treatment has shown general trend of decreasing magnitude in recent years. It is known that changes in weight change may be unfavorable in body composition. the consequence disease- free survival and self-esteem, associated with the emergence of psychiatric disorders in patients with breast cancer after chemotherapy evidences the importance of research on the subject. Therefore, this study aims to evaluate changes in weight and BMI (Body Mass Index) in breast cancer patients non-metastatic patients undergoing adjuvant and/or neoadjuvant chemotherapy in a of oncology in southern Brazil.

II. OBJECTIVES

a) Primary Purpose

To evaluate weight and BMI changes in non-invasive breast cancer patients undergoing adjuvant and/or neoadjuvant chemotherapy in the Center of High Complexity Oncology in Southern Brazil in the period from March 2020 to December 2021.

b) Secondary Objectives

a. Outline the epidemiological profile and the presence of other comorbidities in non- metastatic breast cancer patients undergoing adjuvant chemotherapy and or neoadjuvant treatment in the Center of High Complexity Oncology in Southern Brazil.
b. To analyze whether there was a change in the WHO classification of the BMI of patients with non-metastatic breast cancer undergoing adjuvant chemotherapy and/or neoadjuvant in the Center of High Complexity Oncology in Southern Brazil.

III. STUDY DESIGN

Observational, Descriptive and Retrospective Study

IV. STUDY POPULATION AND METHODOLOGY

Population Studied: Data from 122 medical records at the Center of High Complexity Oncology in Southern Brazil of patients diagnosed with malignant neoplasm of the non-metastatic breast and submitted to neoadjuvant and/or adjuvant chemotherapy during March 2020 until December 2021.

Methodology: The data were entered in the Excel program and later exported to the SPSS program v. 20.0 for statistical analysis. Categorical variables were described by frequencies and percentages. The normality of quantitative variables was verified by the Kolmogorov Smirnov test. Quantitative variables were described by the mean and the standard deviation. Mean weight and BMI were compared before and during the chemotherapy by Student's t test for paired samples. To associate the categories of nutritional status before and after the Mc Nemar test was used. It

was considered a significance level of 5% for the established comparisons.

Inclusion and Exclusion Criteria: All patients who received chemotherapy participated in the study. neoadjuvant and/or adjuvant for breast cancer in March of 2020 until December 2021 with the diagnosis through anatomopathological analysis of neoplasia non-metastatic breast cancer, regardless of histological type with stages clinics from I to IIIC. In the inclusion criteria were considered: Being of the sex feminine; Be over 18 years of age; No neoplasm metastatic; Maintaining follow-up at medical consultation and nutrition during the study period. For this study, data were collected from 190 patients, the following were excluded: male patients, deaths, metastatic tumors; patients with loss of oncological follow-up and patients with incomplete data.

Research Ethics Committee: The present study comprises the analysis of data from medical records and exams already performed, not requiring direct intervention with human beings, was written only a term of secrecy and confidentiality. The study was approved by the Ethics Committee and Research at the General Hospital of Caxias do Sul-RS.

V. OUTCOME

122 female patients with non-metastatic breast cancer and mean age 53.48 ± 12.23 years were followed up for one year. 44.3% of patients were post-menopausal. Regarding the comorbidities presented, the following stand out: Systemic Arterial Hypertension (34.4%), Hypothyroidism (10.7%), Dyslipidemia (6.6%), Diabetes (3.8%), Deep Vein Thrombosis (2.5%), Rheumatologic Disorders (3.3%), Cardiac (2.5%). 1.6% of the patients maintained their alcohol consumption and 12.3% maintained the smoking during treatment. In the studied sample, 3.3% had generalized anxiety, 12.3% depression, and other psychiatric disorders in follow-up were found in 4.1% of patients. During this period, 7.4% of the patients developed COVID 19. Table 1 shows the characteristics of patients.

Regarding the type of breast cancer, 90.2% of the patients have breast cancer invasive ductal carcinoma, while 3.3 had invasive lobular carcinoma and 3.3% the others types. 70.5% of the patients had the positive hormone receptor subtype and 35.2% Her-2 positive. The stages of breast cancer were also analyzed, with the majority being of stage IIB patients (35.2%). Table 2 shows the characteristics of cancers of breast.

As shown in table 3, in the analyzed sample, 51.6% performed neoadjuvant chemotherapy, 36.1% adjuvant chemotherapy and 12.3 underwent both types of chemotherapy. The chemotherapy time was less than or equal to 1 year for 77% of patients. In the annual follow-up, 9% had adverse reactions to chemotherapy, the majority being a mild reaction. It is known that the

treatment of breast cancer it is multifactorial. In relation to other treatments associated with chemotherapy, 45.9% of patients underwent hormone therapy and 50% of patients underwent radiotherapy.

Patients were classified according to the BMI classification of the World Health Organization (WHO) before and after chemotherapy. You results are described in table 4. Most of the sample was pre chemotherapy with weight at the first visit before chemotherapy with a mean of 75.4 ±16.95kg; Weight at the last post-chemotherapy visit with a mean of 75.61 ±17.29 kg; Height had a mean of 160.39 ± 7.20. The BMI at the first consultation before the chemotherapy presented an average of 29.25±5.94; BMI at the last consultation showed an average of 29.32 ± 6.01. When statistically comparing by Student's T Test the weights and BMI before and after chemotherapy showed P=0.711 and P=0.774 respectively. A non-significant relationship was observed between the patients' baseline weight and postpartum weight. chemotherapy.

Regarding the BMI classification according to WHO, there was no significant change in the status between pre and post chemotherapy P=0.607. 67.3% remained in the eutrophic category. 54.5% remained in the obesity category I. 83.3% remained in the obesity category II. 57.1% remained in the obesity category III. 59.6% remained overweight. Variations in ranking during follow-up are represented in table 5.

VI. DISCUSSION

We evaluated pre- and post-chemotherapy weight changes among women with non- metastatic breast cancer. Most of the studied sample presented time of chemotherapy less than or equal to one year. The medical literature suggests that the duration of chemotherapy can be a factor for weight change, and long-term treatments duration have greater weight gain. (10). Furthermore, unlike the presented in our study, young and pre-menopausal women would have greater weight gain according to some previous research (10,11,14,15)

Consistent with our results, a narrative review suggested that women with normal BMI at baseline were more likely to gain weight compared with overweight women (10). We demonstrated that eutrophic women had more chance of gaining weight than overweight patients after chemotherapy. 32.1% of patients in the eutrophic classification were overweight after chemotherapy and 22.7% of patients with Grade I Obesity had Grade II Obesity after chemotherapy, while 5.6% of patients with grade II obesity had Grade III obesity.

In the same context, other articles also demonstrated no significant weight change among patients with non-metastatic breast cancer before and after chemotherapy (3,6). Article in Saudi Arabia

followed 228 women between 18-80 years of age with non-metastatic breast cancer and early-stage chemotherapy and did not obtain significant changes in weight (3). Likewise, a Korean survey evaluated 260 women with non-metastatic breast cancer and showed no change in significant weight (5). Furthermore, although weight gain still prevails as an effect post-chemotherapy collateral, studies have shown a tendency for a decrease in weight change in women with breast cancer after chemotherapy over the years (1).

Some factors may have contributed to the non-weight gain of patients in our study: regular follow-up with a nutrition team, the time of chemotherapy and the type of chemotherapy performed. Studies show that the increase of taxanes in treatments has suggested less weight gain in more recent years (1). The group of patients in follow-up was also considered to have less previous comorbidities in relation to the reference studies, being another possible fator not to change weight. 51.6% of patients underwent neoadjuvant chemotherapy, it is known that studies on the association of neoadjuvant chemotherapy and changes in weight are still limited in the medical literature.

VII. CONCLUSION

This study did not reveal significant weight changes after one year of adjuvant and/or neoadjuvant chemotherapy. Furthermore, most patients with breast cancer followed-up during the period did not change their BMI classification according to WHO. Since studies show a trend towards a reduction in Weight changes over the next few years in breast cancer patients are needed new studies, considering the different regional features.

Conflicts of interest
None

Financial relationships
None

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Table 1: Characteristics and previous comorbidities of the patients studied

Characteristics and Previous comorbidities	Outcomes
Age	53,4 ± 12,2
Pre- Menopausal Women	55,7% (68)
Pos- Menopausal Women	44,3% (54)
Arterial Hypertension Systemic	34,4% (42)
Diabetes	9,8% (12)8
Deep Vein Thrombosis	2,5% (3)
Hypothyroidism	10,7% (13)
Dyslipidemia	6,6% (8)
COVID19	7,4% (9)
Anxiety	3,3% (4)
Depression	12,3% (15)
Other Disorders Neuropsychiatric	4,1% (5)
Alcoholism	1,6% (2)
Smoking	12,3% (15)
Rheumatological Comorbidities	3,3% (4)
Cardiological Comorbidities	2,5% (3)

Table 2: Characteristics of Studied Breast Cancer

Characteristics	Outcomes
Invasive Ductal Carcinoma	90,9% (110)
Invasive Lobular Carcinoma	3,3% (4)
Other Types of Carcinoma	3,3% (4)
Positive Hormone Receptor	70,5% (86)
Negative Hormone Receptor	29,5% (36)
HER 2 Positive	35,2% (43)
HER 2 Negative	64,8% (79)

Table 3: Characteristics of Chemotherapy

Characteristics	Outcomes
Chemotherapy Type	
Neoadjuvant	51,6% (63)
Adjuvant	36,1% (44)
Neoadjuvant + Adjuvant	12,3% (15)
Chemotherapy time:	
Less than or equal to one year	77,0% (94)
Major to one year	23,0% (28)
Presence of reaction to chemotherapy	9,0% (11)

Table 4: BMI Classification according to WHO

Classification	Outcomes
Pre-Chemotherapy	
Eutrophic	23,0% (28)
Grade I Obesity	18,0% (22)
Grade II Obesity	14,8% (18)
Grade III Obesity	5,7% (7)
Overweight	38,5% (47)
Pos- Chemotherapy	
Eutrophic	25,4% (31)
Grade I Obesity	16,4% (20)
Grade II Obesity	18,9% (23)
Grade III Obesity	4,1% (5)
Overweight	35,2% (43)

Table 5: BMI Classification according to WHO pre-chemotherapy X BMI Classification according to WHO pos-chemotherapy

Classification Pre-Chemotherapy

Classification Pos-Chemotherapy

	Eutrophic	I Obesity	II Obesity	III Obesity	Overweight
Eutrophic	67,9%	0%	0%	0%	32,1%
I Obesity	0%	54,5%	22,7%	0%	22,7%
II Obesity	0%	5,6%	83,3%	5,6%	5,6%
III Obesity	0%	14,3%	28,6%	57,1%	0%
Overweight	25,5%	12,8%	2,1%	0%	59,6%