Nutritional Assessment of Oncology Elderly by Different Methods

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Estado Nutricional de Idosos Oncológicos por meio de Diferentes Métodos
Nutritional Assessment of Oncology Elderly by Different Methods

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Abstract

Introduction: The nutritional status and localization of the tumor are essential in the evaluation of the elderly with cancer, since they are related to morbimortality and have a direct impact on survival. **Objective:** To evaluate the nutritional status according to the mini nutritional assessment, body mass index and calf circumference, to identify the degree of agreement between these parameters and to verify the association between the nutritional status and the different types of cancer. **Method:** Cross-sectional study with elderly oncology patients admitted to a referral hospital in Salvador, Bahia. Data were collected using the mini nutrition assessment (reduced version), structured questionnaire for the collection of clinical data and sociodemographic profile, and anthropometric data. Descriptive analysis, chi-square test (x^2) and Kappa test were performed. **Results:** It was observed that 41%, 54.3% and 74.3% of the patients presented adequate nutritional status according to the mini nutritional assessment, Body Mass Index and Calf Circumference, respectively, with moderate agreement (Kappa=0, 59) between Body Mass Index and mini nutritional assessment. The highest nutritional status was observed in patients diagnosed with head and neck cancer. **Conclusion:** In this study the mini nutritional assessment was more sensitive to identify inadequacy in the nutritional status when compared with the Body Mass Index and calf circumference; an association between nutritional status and tumor location was also observed. Probably, the subjective parameters of the mini nutritional assessment justify the diagnosis of earlier malnutrition, favoring nutritional intervention.

Key words: Aged; Nutritional Status; Nutritional Assessment; Body Mass Index; Body Composition.

Resumo

Introdução: O estado nutricional e a localização do tumor são essenciais na avaliação do idoso com câncer, pois relacionam-se com morbimortalidade e impactam diretamente na sobrevida. **Objetivo:** Avaliar o estado nutricional segundo a mini avaliação nutricional, índice de massa corporal e circunferência da panturrilha, identificar o grau de concordância entre esses parâmetros e verificar a associação entre o estado nutricional e os diferentes tipos de câncer. **Método:** Estudo transversal, com pacientes idosos oncológicos internados em um hospital de referência em Salvador, Bahia. Na coleta dos dados, utilizou-se a mini avaliação nutricional (versão reduzida), questionário estruturado para coleta de dados clínicos e perfil sociodemográfico, e antropométricos. Realizaram-se análise descritiva, teste de qui-quadrado (x^2) e teste Kappa. **Resultados:** Observou-se que 41%, 54,3% e 74,3% dos pacientes apresentavam estado nutricional adequado segundo a mini avaliação nutricional, índice de massa corporal e circunferência da panturrilha, respectivamente, com uma concordância moderada (Kappa=0,59) entre índice de massa corporal e mini avaliação nutricional. Os maiores comprometimentos do estado nutricional foram observados nos pacientes com diagnóstico de câncer de cabeça e pescoço. **Conclusão:** Neste estudo, a mini avaliação nutricional foi mais sensível para identificar inadequação no estado nutricional quando comparada com o índice de massa corporal e circunferência da panturrilha; observou-se ainda associação entre o estado nutricional e a localização do tumor. Provavelmente, os parâmetros subjetivos da mini avaliação nutricional justificam o diagnóstico de desnutrição mais precoce, favorecendo a intervenção nutricional.

Palavras-chave: Idoso; Estado Nutricional; Avaliação Nutricional; Índice de Massa Corporal; Composição Corporal.

Resumen

Introducción: El estado nutricional y localización del tumor son esenciales en la evaluación del anciano con cáncer, pues se relacionan con morbimortalidad e impactan directamente en la supervivencia. **Objetivo:** Evaluar el estado nutricional según la mini evaluación nutricional, índice de masa corporal y circunferencia de la pantorrilla, identificar el grado de concordancia entre esos parámetros y verificar la asociación entre el estado nutricional y los diferentes tipos de cáncer. **Método:** Estudio transversal, con pacientes ancianos oncológicos internados en un hospital de referencia en Salvador, Bahia. En la recolección de los datos se utilizó la mini evaluación nutricional (versión reducida), cuestionario estructurado para recolección de datos clínicos y perfil sociodemográfico, y antropométricos. Se realizó análisis descriptivo, prueba de chi-cuadrado (x^2) y prueba Kappa. **Resultados:** Se observó que 41%, 54,3% y 74,3% de los pacientes presentaban adecuado estado nutricional según la Mini Evaluación Nutricional, Índice de Masa Corporal y Circunferencia de la pantorrilla, respectivamente, con una concordancia moderada (Kappa=0, 59) entre índice de masa corporal y mini evaluación nutricional. Dado que los mayores compromisos del estado nutricional se observaron en los pacientes con diagnóstico de cáncer de cabeza y cuello. **Conclusión:** En este estudio la mini evaluación nutricional fue más sensible para identificar inadecuación en el estado nutricional cuando comparada con el Índice de Masa Corporal y Circunferencia de la pantorrilla; se observó una asociación entre el estado nutricional y la localización del tumor. Probablemente, los parámetros subjetivos de la mini evaluación nutricional justifican el diagnóstico de desnutrición más precoz, favoreciendo la intervención nutricional.

Palabras clave: Anciano; Estado Nutricional; Evaluación Nutricional; Índice de Masa Corporal; Composicion Corporal.

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INTRODUCTION

Accelerated population aging poses a major challenge for public health, with an increase in the prevalence of chronic noncommunicable diseases, including cancer[1,2]. Brazilian studies have shown that aging is associated with an increase in the percentage of cancer cases, with the highest incidence in individuals 60 to 64 and 65 to 74 years of age[3]. Nutritional status is modified in cancer patients and can interfere in prognosis, besides bearing a direct association with treatment response[4].

Malnutrition is common in cancer patients and is related to tumor location and staging, besides the adverse effects of antineoplastic treatment[5]. High nutritional risk is associated mainly with the elderly population, independently of the patient's sex, due to the biological alterations inherent to old age, with a progressive decrease in muscle, bones, organs, and bodily fludis[6]. Thus, various parameters such as physical examination, clinical and laboratory data, food survey, and anthropometric data should be used to identify nutritional status in this population[7]. However, the parameters should be sensitive enough to detect alterations early[8].

Nutritional screening at hospital admission can identify nutritional risk or malnutrition early and improve the patient's prognosis. Nutritional screening protocols for cancer patients feature the Patient-Generated Subjective Global Assessment (PG-SGA), considered specific and sensitive in the assessment of these patients[7,9]. There is also the Mini Nutritional Assessment (MNA), a validated and sensitive tool capable of identifying malnutrition or risk of malnutrition in patients 65 years and older[10].

Given the various available methods for the identification of nutritional status in elderly cancer patients and the need for a sensitive and easily applicable nutritional assessment tool that can identify nutritional risk early, the current study aims to assess nutritional status according to the MNA short form, body mass index (BMI), and calf circumference (CC), identify the degree of agreement between these methods, and verify the association between nutritional status and different types of cancer in elderly cancer patients in a referral hospital in Salvador, Bahia, Brazil.

METHOD

This was a cross-sectional study conducted in a referral hospital for cancer in the city of Salvador, Bahia, Brazil. The current study is part of a multicenter research project led by the Brazilian National Cancer Institute José Alencar Gomes da Silva (INCA) in 50 institutions that care for cancer patients in various cities in Brazil and Portugal.

The sample consisted of elderly individuals of both sexes hospitalized in the institution's clinical and surgical wards from September to October 2014. The study used a non-probabilistic sample that included 371 elderly patients aged ≥65 years with malignant tumors, regardless of tumor location or disease stage. The sample excluded patients that were unable to answer the MNA questionnaire or without an accompanying person capable of providing the information, or those who declined to sign the free and informed consent form. The study also excluded patients who presented edema in the lower limbs that prevented measurement of calf circumference.

The precision of the collected information was guaranteed by specific training for the project team. Data collection used a structured questionnaire for gathering clinical and sociodemographic data, with questions on date of admission, age (years), sex (male; female), diagnosis of systemic arterial hypertension and/or diabetes mellitus, current or prior smoking or alcohol abuse, reason for admission, and clinical data with the tumor location. The data only included the primary cancer for patients with more than one tumor site. For purposes of analysis, the variable "tumor location" was categorized as follows: gastrointestinal tract, breast, prostate, respiratory tract, skin, urinary tract (kidney, bladder, and ureter), head and neck, female reproductive system (ovaries and uterus), male reproductive system (penis and testes), upper abdominal organs (liver, gallbladder, pancreas, and spleen), and others (pelvis, retroperitoneum, and skeletal system).

Assessment of patients' nutritional status used BMI, CC, and MNA short-form. BMI was calculated as patient's weight divided by height squared. Body weight was measured with a calibrated digital scale (Techline®) with the patient in standing position at the center of the scale's platform, barefoot and wearing light clothing. Patient's height was estimated with an inelastic tape measure calibrated to 1 mm to measure knee height with the leg at an angle of 90º with the knee and ankle, according to World Health Organization (WHO) guidelines[11]. The study adopted the estimation of height as proposed by Chumlea et al.[12]. Classification of the patients' nutritional status according to BMI used the specific cutoff points for the elderly population recommended by the Pan American Health Organization (PAHO)[12], as follows: underweight (BMI<23 kg/m^2); normal weight (23<BMI<28 kg/m^2); pre-obesity (28<BMI<30kg/m^2); and obesity (BMI>30 kg/m^2)[12]. For purposes of analysis, patients with BMI<23 kg/m^2 were classified as "inadequate weight" and patients with BMI>23 kg/m^2 were grouped into the single category "adequate weight".

CC was measured with the patient sitting with feet slightly apart and the legs at 90º, positioning the flexible

inelastic tape measure around the calf according to WHO guidelines[11]. The cutoff point for CC was ≥31 cm as adequate and <31 cm as inadequate[12].

Screening using the short form of MNA included subjective questions on modification of food intake in the previous three months (severe, moderate, or no decrease), weight loss in the previous three months (> 3 kg, 1 to 3kg, does not know, or no weight loss), mobility (bedridden or confined to a wheelchair, walks but does not leave the house, or moves normally), presence of psychological stress or acute illness in the previous three months, and neuropsychological problems (severe dementia or depression, mild dementia, or without problems). Objective information included anthropometric data (weight, height, and CC).

Classification of nutritional status according to MNA used the sum of the scores from the questionnaire validated by Kaiser et al.[10], with 14 points as the maximum. Stratification of nutritional status according to the score was as follows: adequate nutritional status (MNA 12-14 points); risk of malnutrition (MNA 8-11 points); and malnutrition (MNA 0-7 points). For purposes of analysis, patients classified by MNA as risk of malnutrition and malnutrition (<12 points) were grouped into a single category (inadequate), while patients classified as having adequate nutritional status (≥12 points) were included in the "adequate" category.

Data analysis used the *Statistical Package for the Social Sciences* - SPSS version 20.0 (SPSS for Windows, 2008). Chi-square test (χ^2) was used to assess the associations between nutritional status obtained by MNA versus BMI and MNA versus CC, as well as to assess the association between nutritional status (MNA and BMI) and tumor location. Kappa test was used to verify agreement between the different methods (MNA, BMI, and CC). The study adopted the scale proposed by Landis and Koch[14], with the following kappa values: <0: poor agreement; 0 to 0.2: very slight agreement; 0.21 to 0.4: slight agreement; 0.41 to 0.6: moderate agreement; 0.61 to 0.8: substantial agreement; 0.81 to 1: near perfect agreement. Significance was set at 5% ($p<0.05$) for all the analyses.

Considering ethical aspects, participants were informed of the study procedures, in compliance with the institution's provisions and Resolution 466/12 of the Brazilian National Health Council. The elderly patients participated on a voluntary basis by signing or affixing their thumbprint to the informed consent form. The study was approved by the Institutional Review Board of INCA under case review number 688.258, as well as that of Hospital Aristides Maltez, Liga Baiana Contra o Câncer, case review number 925.172.

RESULTS

As shown in Table 1, the majority of the patients were males (61%), with a predominance in the 65-75-year age bracket (74.6%).

In Table 1, the nutritional classification based on the above-mentioned parameters and according to the MNA showed the majority of the patients with inadequate nutritional status (59.0%). According to BMI and CC, 45.7% and 25.7%, respectively, were classified as inadequate, with statistically significant differences (MNA vs. BMI, p=0.000 and MNA vs. CC, p=0.000).

Table 2 shows the frequencies of the subjective items in the MNA short-form. The majority of the patients reported not having decreased their food intake in the

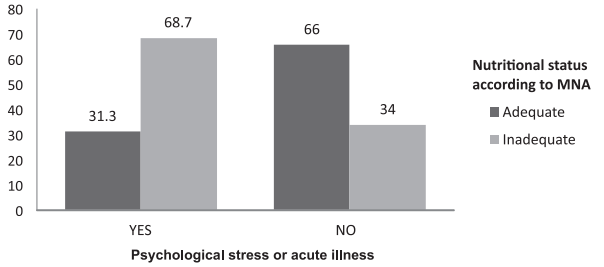
Table 1. Demographic, clinical, and lifestyle characteristics of elderly cancer patients in a referral hospital in Salvador, Bahia, Brazil, 2014.

	Variables	n (%)
Sex	Male	211 (61.0)
	Female	135 (39.0)
Age	65-75	258 (74.6%)
	76-85	74 (21.4%)
	86-95	12 (3.5%)
	96-105	2 (0.6%)
SAH[1]	Yes	208 (60.1%)
	No	138 (39.9%)
DM[2]	Yes	67 (19.4)
	No	279 (80.6)
Alcohol abuse	Yes	34 (9.8)
	No	312 (90.2)
Smoking	Yes	48 (13.9)
	No	298 (86.1)
MNA[3]	Adequate (≥ 12 points)	142 (41.0)
	Inadequate (<12 points)	204 (59.0)
BMI[4]	Adequate (>23kg/m2)	188 (54.3)
	Inadequate (≤ 23kg/m2)	158 (45.7)
CC[5]	Adequate (≥ 31cm)	257 (74.3)
	Inadequate (< 31 cm)	89 (25.7)
Types of cancer	Prostate	29.2%
	Skin	22.8%
	Breast	9.5%
	Head and neck	9.2%
	Gastrointestinal tract	7.5%

[1]SAH: systemic arterial hypertension; [2]DM: diabetes mellitus; [3]MNA: Mini Nutritional Agreement: adequate (12-14 points); risk of malnutrition (8-11 points); malnutrition (0-7 points); [4]BMI: body mass index: adequate (BMI>23kg/m^2) and low weight (BMI<23kg/m^2); [5]CC: calf circumference: adequate (CC≥31cm) and malnutrition (CC<31cm).

previous three months (65.9%), did not report a weight loss (58.1%), had normal mobility (80.4%), and were not suffering from neuropsychological problems (98.6%). On the other hand, the majority had undergone psychological stress or acute illness in the previous three months (72.0%). When analyzing the association between psychological stress and nutritional status according to the MNA, 68.7% of the patients reporting stress were classified as having inadequate nutritional status (Graph 1), and this association was statistically significant (p=0.000).

As shown in Table 3, the majority of patients with diagnosis of head and neck cancer presented inadequate nutritional status according to the study parameters: 81.2% (MNA) and 78.1% (BMI), and this association was statistically significant (p=0.007 and p=0.000, respectively). Among patients with gastrointestinal cancer, 80.8% (MNA) and 50% (BMI) presented inadequate nutritional status, but the association was only statistically significant for MNA (p=0.019). Compared to BMI, MNA identified a higher percentage of patients with nutritional risk or malnutrition, for the five most prevalent types of cancer (Table 3).



Graph 1. Association of nutritional status according to MNA short form with psychological stress ou acute illness in the previous three months among elderly cancer patients in a referral hospital in Salvador, Bahia, Brazil, 2014.
*Pearson's chi-square test (p-value= 0.000)

Table 2. Clinical and nutritional data obtained from the five subjective items of the MNA applied to elderly cancer patients in a referral hospital in Salvador, Bahia, Brazil, 2014

	Variables	n (%)
Decreased food intake in the previous 3 months	Severe decrease	35 (10.1)
	Moderate decrease	83 (24.0)
	No decrease	228 (65.9)
Weight loss in the previous 3 months	>3kg	51 (14.7)
	Does not know	45 (13.0)
	1 to 3 kg	49 (14.2)
	No weight loss	201 (58.1)
Mobility	Bedridden or confined to wheelchair	7 (2.0)
	Walks but does not leave home	61 (17.6)
	Normal	278 (80.4)
Psychological stress or acute illness in the previous 3 months	Yes	249 (72.0)
	No	97 (28.0)
Neuropsychological problems	Severe dementia or depression	0 (0)
	Mild dementia	5 (1.4)
	None	341 (98.6)

[1]SAH: systemic arterial hypertension; [2]DM: diabetes mellitus; [3]MNA: Mini Nutritional Agreement: adequate (12-14 points); risk of malnutrition (8-11 points); malnutrition (0-7 points); [4]BMI: body mass index: adequate (BMI>23kg/m^2) and low weight (BMI<23kg/m^2); [5]CC: calf circumference: adequate (CC≥31cm) and malnutrition (CC<31cm).

Table 4 shows the degree of agreement between the classifications of nutritional status according to BMI and CC, compared to MNA short-form. BMI showed moderate agreement with MNA (kappa=0.590), and the test was statistically significant (p=0.000). However, the agreement between MNA and CC was slight (kappa=0.335) but statistically significant (p=0.000).

DISCUSSION

The current study found a predominance of male patients, and the most prevalent age bracket was 65 to 75 years, which explains why prostate cancer was the most prevalent type in this study. Similar results were found by Sousa-Muñoz et al., who analyzed the hospitalization rates for elderly cancer patients[15].

There was a low prevalence of alcohol abuse and smoking in this study's sample. However, this information may be underestimated, since the question referred to current use, without including history of these habits. Importantly, cancer of the head and neck was the third most frequent type in this population; tobacco use is known to be the main risk factor for the development of head and neck cancer, and can be intensified when associated with alcohol abuse[16].

As for nutritional status, MNA (when compared to BMI and CC) identified more patients with inadequate nutritional status (nutritional risk and malnutrition). Other studies have found similar results, showing a higher percentage of nutritional risk and malnutrition based on MNA when compared to BMI[17,18].

We believe that the inclusion of subjective data in the MNA protocol favors earlier diagnosis of nutritional

Table 3. Association of the five most prevalent types of cancer with nutritional status using classification by BMI and MNA among elderly cancer patients in a referral hospital in Salvador, Bahia, Brazil, 2014.

Tumor location	MNA[1] (%)		p-value*	BMI[2] (%)		p-value*
	Adequate (≥12 points)	Inadequate (<12 points)		Adequate (>23kg/m²)	Inadequate (≤23kg/m²)	
Prostate	52.5	47.5	0.005	60.4	39.6	0.146
Others	36.3	63.7		51.8	48.2	
Skin	36.7	63.3	0.373	49.4	50.6	0.313
Others	42.3	57.7		55.8	44.2	
Breast	57.6	42.4	0.042	75.8	24.2	0.009
Others	39.3	60.7		52.1	47.9	
Head and neck	18.8	81.2	0.007	21.9	78.1	0.000
Others	43.3	56.7		57.6	42.4	
Gastrointestinal	19.2	80.8	0.019	50.0	50.0	0.644
Others	42.8	57.2		54.7	45.3	

[1]BMI: body mass index: adequate (BMI>23kg/m2) and low weight (BMI<23kg/m2); [2]MNA: Mini Nutritional Assessment: adequate (12-14 points); risk of malnutrition (8-11 points); malnutrition (0-7 points); *Pearson's chi-square test.

Table 4. Agreement between nutritional diagnoses according to classifications by BMI and CC with MNA in elderly cancer patients in a referral hospital in Salvador, Bahia, Brazil, 2014.

	N	Classification according to MNA[3]		Kappa* (IC 95%)
		Adequate (≥12 pontos)	Inadequate (<12 pontos)	
Classification by BMI[1]				
Adequate (>23kg/m²)	188	129 (68.6%)	59 (31.4%)	0.590
Inadequate (≤23kg/m²)	158	13(8.2%)	145 (81.8%)	P=0.000
Classification by CC[2]				
Adequate (≥31cm)	257	137 (53.3%)	120 (46.7%)	0.335
Inadequate (<31cm)	89	5 (5.6%)	84 (94.4%)	P=0.000
Total	346	142	204	

[1]BMI: body mass index: adequate (BMI>23kg/m2) and low weight (BMI<23kg/m2); [2]CC: calf circumference: adequate (CC ≥31cm) and malnutrition (CC<31cm); [3]MNA: Mini Nutritional Assessment: adequate (12-14 points); risk of malnutrition (8-11 points); malnutrition (0-7 points);
*Scale proposed by Landis and Koch (1977). kappa: <0: poor agreement; 0 to 0.2: very slight agreement; 0.21 to 0.4: slight agreement; 0.41 to 0.6: moderate agreement; 0.61 to 0.8: substantial agreement; 0.81 to 1: near perfect agreement 14.

risk. In this study, the subjective variable in MNA "have you undergone psychological stress or an acute illness in the last three months?" showed a high percentage and statistically significant association with nutritional status. This finding may be explained by the fact that that cancer patients, mainly elderly ones, present biopsychosocial disorders and depression that are closely related to the disease process and thus the decline in nutritional status and quality of life[19,20].

Similar results were also obtained in the multicenter study conducted by INCA, of which the current study is a part. The larger INCA study included 3,257 patients (including institutions from Brazil and Portugal); of these, 73% presented malnutrition or nutritional risk according to MNA, while 60.6% and 64.6% showed adequate nutritional status according to BMI and CC, respectively[21].

The current study found an association between nutritional status and tumor location according to MNA and BMI. The results indicate that according to both methods (MNA and BMI), the majority of patients with head and neck cancer were at nutritional risk or already malnourished, when compared to the other types of cancer, followed by gastrointestinal cancer. Marques et al.[22] and Thieme et al.[23] observed that among the types of cancer, those located in the pancreas, stomach, and head and neck were the ones with the highest prevalence of malnutrition (30% to 80%). Importantly, tumor location involves different clinical symptoms and adverse events that directly affect nutritional status[8].

Analysis of the assessment according to MNA and BMI showed moderate agreement between the two methods, while there was only slight agreement between MNA and CC. Leandro-Merhi et al.[24] found similar results when analyzing the agreement in nutritional diagnosis of elderly inpatients (age ≥ 60 years), using MNA versus BMI and MNA versus CC, where BMI showed moderate

agreement with MNA (kappa=0.44), and CC showed slight agreement with MNA (kappa=0.29). As a caveat, the authors were assessing non-oncological elderly inpatients.

Ferreira et al.[25] compared different methods for assessing nutritional status (BMI, MNA, and SGA) in elderly inpatients and concluded that there are some limitations to diagnosing nutritional status based on BMI. This anthropometric method fails to take some fundamental issues into account in geriatric nutritional assessment, such as functional capacity, depression, and food intake. Although anthropometric parameters are widely used to assess the nutritional status of elderly cancer patients, they present several limitations, since aging itself alters the body's composition, and clinical complications may hinder the measurement of such indicators. Meanwhile, these issues are addressed in subjective nutritional screening methods like MNA.

The fact that MNA assigns different weights to these subjective parameters may heavily influence the method's results, regardless of the nutritional status obtained by anthropometry[24]. The subjective parameters in MNA are essential, since they can identify the reason for the patient's malnutrition (reduced food intake, weight loss, psychological stress, or difficulty in mobility), thereby favoring early diagnosis and specialized nutritional intervention.

The study's limitations were the inclusion of elderly patients 65 years and older, which was the criterion for the multicenter study, and the fact that it was not possible to use other anthropometric parameters such as skinfolds and arm circumference or other nutritional screening methods such as PG-SGA.

CONCLUSIONS

In this study, when compared to BMI and CC, MNA identified more patients with inadequate nutritional status. The study also showed an association between tumor location and nutritional status, according to both MNA and BMI. There was moderate agreement between MNA and BMI.

We believe that the subjective parameters in MNA facilitate early nutritional diagnosis, thereby favoring timely nutritional intervention. Detailed and thorough nutritional assessment is essential, using appropriate instruments for the target population in order to favor early detection of patients with nutritional risk or malnutrition.

CONTRIBUTIONS

Lucivalda Pereira Magalhães Oliveira worked in the data analysis and elaboration of the article. Taise Andrade da Anunciação worked in the elaboration of the article. Maria Lúcia Varjão da Costa worked in the patient assessment and data collection and led the study.

CONFLICT OF INTEREST:

None.

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