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Suggestive symptoms of intestinal dysbiosis and its relation to the prevalence of depressive symptoms in elderly intestinal dysbiosis and depression

Abstract

To identify the presence of suggestive symptoms of intestinal dysbiosis correlated with the prevalence of depressive symptoms in elderly people attending a living institution in Fortaleza-Ceará.

Methods: Cross-sectional, observational, descriptive and analytical study with a quantitative approach. Data were collected through the Metabolic Screening Questionnaire and the General Health Questionnaire to assess the prevalence of symptoms of dysbiosis and depression, respectively and Anthropometry (BMI, circumference waist and calf) in 83 elderly patients of both sexes.

Results: There was a prevalence of eutrophy in 53.01% (n = 44) and high risk of developing cardiovascular disease after waist circumference in 66.26% (n = 55) of the sample. A high prevalence of depressive symptoms was observed in these elderly (48.19%, n = 40) and in this group, 95.7% (n = 22) had symptoms of intestinal dysbiosis. Another important finding was the identification of the use of drugs such as antibiotics and proton pump inhibitors in the group with symptoms suggestive of intestinal dysbiosis, making a total of 82.6% (n = 19) and 69.6% (n = 16), respectively.

Conclusion: The study revealed the presence of symptoms of intestinal dysbiosis in elderly with prevalence of depression, revealing factors related to the microbiota status. Thus, further clinical trials are recommended that may elucidate this relationship.

Keywords: depressive symptoms, dysbiosis, older adults, nutritional status.

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Abbreviations: GUT, gastrointestinal tract; ENS, enteric nervous system; MTQ, metabolic tracking questionnaire; BMI, body mass index; AC, abdominal circumference; CC, calf circumference; FICF, Free and Informed Consent Form.

Introduction

Depression in the elderly population is a very recurrent pathology due to social, behavioral, physiological and psychological changes however, it's generally underdiagnosed due to the presence of other comorbidities presented at this stage of life, thus increasing the possibility of a low quality of life.[1,2] Depression represents a significant burden of global diseases and this is already considered one of the biggest causes of disability in the world, with Brazil occupying the 3rd position among the average cases of depression in adults and elderly people worldwide.[3,4]

Morphofunctional changes in the gastrointestinal tract (GUT) caused by the aging process require specialized attention because it's possible to observe a trend in the loss of the integrity of the intestinal mucosal epithelial barrier, culminating in a process of chronic inflammation that may be influenced by GUT microorganisms residents: the intestinal microbiota.[5,6] The term intestinal dysbiosis describes the presence of pathogenic bacteria that can produce harmful effects to the host, mainly due to the qualitative and quantitative change in the intestinal microbiota itself or in its metabolic activity and distribution sites.[7]

Recent studies show that changes in the composition of this microbiota have been shown to be present in mental disorders such as depression, anxiety, Parkinson's and Alzheimer's, the common symptoms to these diseases being: poor digestion, constipation and cramps, thus showing the existence of two-way communication that occurs between the gut-brain axis, mediated by the enteric nervous system (ENS), which may be responsible for the influence of the gut at the brain level.[8-10]

Some experimental studies have emerged in an attempt to elucidate the bowel-brain relationship, however there is a lack of population studies correlating the relationship between intestinal dysbiosis and the prevalence of depression in the elderly, this being a pioneering study. Thus, the objective of the present study was to identify the presence of suggestive symptoms of intestinal dysbiosis by correlating them with the prevalence of depressive symptoms in elderly people attending a living institution in the city of Fortaleza/CE.

Methods

This is a cross-sectional, observational, descriptive and analytical study with a quantitative approach.

Sample and data collection

The sample of this research was defined as simple random, the data were collected from January to April 2022 with non-institutionalized elderly people participating in a coexistence group, in a social institution in the city of Fortaleza-Ceará.

The data collection was carried out in four stages: The first through the use of a sociodemographic questionnaire, the second with the application of the Metabolic Tracking Questionnaire (MTQ) which aims to identify suggestive symptoms of intestinal dysbiosis.[11] The third stage aimed to identify depressive symptoms in the elderly population using the General Health Questionnaire and in the fourth stage the anthropometric assessment was carried out.[12]

The anthropometric evaluation included the measurement of weight and height, using an electronic scale (150kg) and a stadiometer, respectively. The body mass index (BMI) was calculated from the ratio between weight and height squared (BMI = weight / height²).[13] For the classification of the nutritional status of the participants according to the BMI, the cutoff points were adopted according to values of the Nutrition Screening Initiative (NSI).[14] The measurement of abdominal circumference (AC) was measured using an inelastic tape with a two meters graduation, being measured at the height of the umbilical scar and classified according to the cutoff points adopted by WHO.[15]

The calf circumference parameter (CC) was also used, measured with the elderly people seated, and their left leg at an angle of 90 degrees, the measurement being taken in the region of greatest calf enhancement, without compressing it13. Values below <31cm indicate loss of muscle mass, with a diagnosis of lean muscle depletion.[16]

Exclusion criteria

All the elderly people who participated in the institution's activities were invited to participate in the research. Excluded from the study were those who had any condition that would interfere with the execution of the questionnaires and anthropometry, such as the presence of colostomy, edema or those who reported gastrointestinal symptoms related to a pathology already diagnosed (lactose intolerance, food allergies, celiac disease, Crohn's disease, ulcerative colitis, among other enteritis).

Ethical responsibility

The study was approved by the Research Ethics Committee of the Centro Universitário Estácio do Ceará, Fortaleza, under opinion No. 2.459,725. After the presentation and identification of the researcher, each volunteer received information about the procedures, as well as signed the Free and Informed Consent Form (FICF), in compliance with resolution 466/12 of the National Health Council.[17]

Statistical analysis

The statistical analysis was performed using Microsoft Office Excel® software version 2010 and, later, the data were treated using the statistical software SPSS® (Statistical Package for the Social Science) in version 23.0. The relationships between categorical variables were assessed using the Chi-square test to compare frequencies or Fisher's exact test. The level of significance used was 95%. Bilateral p-value less than 0.05 ($p < 0.05$) is considered statistically significant.

Results

Among the individuals analyzed, 78.32% (n = 65) were female and 21.68% (n = 18) were male. The average age was 71.91 ± 7.39. Regarding occupation, 12.05% (n = 10) performed paid professional activity and 87.95% (n = 73) were retired without exercising any other activity. All respondents lived with companions or family members and lived in the city of Fortaleza-Ce.

Regarding the presence of pathology, 73.49% (n = 61) had some diagnosis, among them the participants reported having Diabetes Mellitus n = 16 (19.27%), Systemic Arterial Hypertension n = 50 (60.24%), Dyslipidemias n = 10 (12.05%), cardiovascular disease n = 6 (7.23%) and Osteoporosis n = 11 (13.25%).

Table 1 shows the distribution of the elderly people in relation to age and anthropometric variables according to sex. It is observed that there is a prevalence of eutrophy in the variables BMI, AC and CC of both sexes.

Table 1 Distribution of the elderly people evaluated, according to anthropometric variables, age and sex. Fortaleza, CE, 2012

Adequacy of variables	Sex					
	Male		Female		Total	
	n	%	n	%	n	%
Age range (years)						
60 - 69	4	4,81	24	28,91	28	33,73
70 - 79	12	14,46	31	37,34	43	51,82
80 or more	2	2,40	10	12,05	12	14,46
Total	18	21,68	65	78,32	83	100
BMI (kg/m2) *						
Low weight	1	5,60	13	20	14	16,87
Eutrophy	12	66,63	32	49,23	44	53,01
Overweight	5	27,77	20	30,77	25	30,12
Total	18	21,68	65	78,32	83	100
AC (cm) *						
Very high risk	9	50	46	70,76	55	66,26
High risk	6	33,33	14 21,55		22	26,51
Risk-free	3	16,67	5	7,69	6	7,23
Total	18	21,68	65 78,32		83	100
CC (cm) *						
Eutrophy	16	19,28	58	69,88	74	89,16
Depletion	2	2,41	7	8,43	9	10,84
Total	18	21,68	65	78,32	83	100

BMI; Body Mass Index, CC; Calf circumference, AC; Abdominal Circumference Cut-off point BMI - Low weight: <22 kg / m²; Eutrophy: 22- 27 kg / m²; Overweight:> 27 kg / m²

When the presence of signs and suggestive symptoms of intestinal dysbiosis were assessed, it was found that 27.71% (n = 23) of the respondents had this finding while 72.29% (n = 60) didn't present suggestive symptoms of the pathology. When the anthropometric variables and the presence of signs and suggestive symptoms of pathology were crossed, there was no significant difference in the distribution of the classification variables of nutritional status by anthropometric measures between patients with and without dysbiosis, as can be seen in Table 2.

Table 2 Distribution of anthropometric data of patients stratified according to the presence or absence of dysbiosis. Fortaleza, CE, 2022

Adequacy of Variables	Presence of Intestinal Dysbiosis		Absence of Intestinal Dysbiosis		X^2
	n	%	n	%	P Value*
BMI (kg/m2) *					$X^2 = 0,365$
Low Weight	3	13	11	18,3	p*= 0,833
Eutrophy	13	56,5	31	51,7	
Overweight	7	30,4	18	30	
Total	23	27,71	60	72,29	
AC (cm) *	17	73,9	38	63,3	$X^2 = 1,431$
Very high risk					p*= 0,489
High risk	5	21,7	15	25	
Risk-Free	1	4,3	7	11,7	
Total	23	27,71	60	72,29	

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Table Continued....

Adequacy of Variables	Presence of Intestinal Dysbiosis		Absence of Intestinal Dysbiosis		X^2
	n	%	n	%	P Value*
CC (cm) *					
Eutrophy	23	100	51	85	X^2 = 6,251
Depletion	0	0	9	15	pa = 0,057
Total	23	27,71	60	72,29	

*Chi-square test for comparison between distributions. aFisher's Exact Test for comparison between distributions

Regarding depression, it was found that 48.19% (n = 40) of the sample had depressive symptoms while 51.81% (n = 43) didn't have these symptoms. When the anthropometric variables and the presence of depression were crossed, there was no significant difference in the distribution of the classification variables of the nutritional status by anthropometric measures between patients with and without depression (P = 0.989 and 0.813 for BMI and AC, respectively).

Table 3 shows the distribution of the elderly people in relation to the variables intestinal dysbiosis and depression. It's observed that there is a significant positive statistical relationship between individuals who have intestinal dysbiosis to the proportion of those who have depression, being significantly higher than those who don't have depression

Table 3 Distribution (frequency) of depression in stratified patients according to the presence or absence of intestinal dysbiosis. Fortaleza, CE, 2022

	Presence of Intestinal Dysbiosis		Absence of Intestinal Dysbiosis		X^2
	n	%	n	%	P Value*
Presence of Depression					
Yes	22	95,7	18	30	X^2 = 33,42
Not	1	4,3	42	70	P<0,001*
Total	23	27,71	60	72,29	

*Fisher's Exact Test for Comparison between distributions. *p<0,05

When assessing the intake of alcoholic beverages and the presence or absence of intestinal dysbiosis, no statistically significant linear relationship was found between these variables (P = 0.145).

Table 4 shows the distribution of the use of Antibiotics and H + Pump Inhibitors in the elderly people in relation to the variables presence or not of intestinal dysbiosis. It´s observed that there is a significant statistical correlation between the use of these drugs and those individuals who present signs and suggestive symptoms of intestinal dysbiosis.

Table 4 Comparison of the distribution (frequency) of the use of drugs by stratified patients according to the presence or absence of intestinal dysbiosis. Fortaleza, CE, 2022

	Antibiotics				X^2	H+ Pump Inhibitors				X^2
					P Value*					PValue*
	Presence of Intestinal Dysbiosis		Absence of Intestinal Dysbiosis			Presence of Intestinal Dysbiosis		Absence of Intestinal Dysbiosis		
	n	%	n	%		n	%	n	%	
Yes	19	82,6	26	43,3	X^2=11,11	16	69,6	12	20	X^2=17,802
No	4	17,4	34	56,7	P<0,001#	7	30,4	48	80	P <0,001#
Total	23	27,71	60	72,29		23	27,71	60	72,29	

*Fisher's Exact Test for Comparison between distributions. #P<0,05

When assessing the relationship between the presence of pathologies and the presence of suggestive symptoms of intestinal dysbiosis, no statistically significant linear relationship was found between these variables.

Discussion

In the present study, no significant age difference was found, however, females were predominant in the study sample, as well as in the study by Braga18 with elderly people attended at the nutrition clinic in Juazeiro do Norte, Ceará. The presence of pathologies was observed in most of the population, confirming what the current literature has been showing about the emergence of Chronic Noncommunicable Diseases (CNCDs) in the elderly population, an event that negatively affects the quality of life of this group, increasing the risk of hospitalization and hospital stay.[18,19]

The aging process brings with it major changes in body structure such as, for example, body redistribution of fat that increases the chances of developing CVD and metabolic changes such as insulin resistance, subclinical inflammation, glucose intolerance and endothelial damage.[19] In our study, it was observed that the majority of the elderly had a very high risk for the development of CVD similar to the results found in the study by Braga18 with elderly people seen at the nutrition clinic in Juazeiro do Norte, Ceará.

[20]Most of the elderly included in this study had an eutrophy nutritional status according to BMI, which corroborates the findings by Fontenelle who assessed the nutritional and health status of the elderly people linked to the family health strategy in Teresina, Piauí. This data is important when associated with other anthropometric parameters, because even with a nutritional diagnosis of eutrophy in this sample, it showed high abdominal circumference, which is considered a risk factor for the development of heart diseases and metabolic changes.

Regarding the calf circumference, a high preservation of muscle mass was observed in most of the sample, a data different from the one found by Fontenelle and Braga.[18,21] However, it's noteworthy that the sample consisted of active elderly people and that the research institution itself offered physical activities such as dancing and stretching to the regulars. It's already well described in the literature that the practice of physical activity positively influences the preservation of mass and decreases the risk of sarcopenia in the elderly people.[21]

A small part had suggestive symptoms of intestinal dysbiosis, noting that there are still no studies with the elderly population using the QRM. However, the studies by Costa[22] and Moreira[23] that used the same tool with obese individuals and muscle training practitioners, respectively, obtained similar results in their studies, where a small sample within the population presented these symptoms.

Changes in the gastrointestinal tract of the elderly people influence the composition of the intestinal microbiota, which differs from young adults, due to an increasing number of harmful bacteria, such as: enterobacteria and the genus Clostridium, compared to the essential microbiota, such as the Lactobacillus and Bifidobacteria.[24] Thus, it's believed that a much larger number of elderly people could have suggestive symptoms of intestinal dysbiosis, however, as the tool needs a retrospective analysis of the last few weeks, it may not be as appropriate for this age range.

In this study, the anthropometric variables didn't correlate with the presence of suggestive symptoms of intestinal dysbiosis and with symptoms of depression, different from what the literature shows for the two variables.[22,25]

However, this discrepancy is due to the fact that the sample is active and assiduous with the practice of physical activity that is important in body changes that reflect on the individual's nutritional status.[21]

The study by Cardoso[26] that aimed to assess the prevalence of symptoms of depression in the elderly people assisted by a basic health unit, using the same tool used in this research, found in his population 18.2% of elderly people with depression, especially in those who had comorbidities such as diabetes mellitus, systemic arterial hypertension and dyslipidemia corroborating with the data found in this study.

The correlation between intestinal dysbiosis and depression in the elderly people was confirmed by performing statistical tests, as shown in Table 3. Raygan[27] investigated symptoms of depression and intestinal dysbiosis (using another tool) in adults and the elderly people aged 45 to 85 years old who had type 2 Diabetes Mellitus and Cardiovascular Diseases. After identifying symptoms, supplementation of probiotics and vitamin D (50,000 IU) was performed, which significantly helped to reduce depressive symptoms. The same author published a study with the same population (however, with a different sample) that in addition to identifying symptoms of intestinal dysbiosis and depression, treated this population with probiotics and selenium (200 µg/d) showing improvement in depressive symptoms in this sample.[28]

It's known today that both depression and intestinal dysbiosis have an inflammatory character that hinders both the success of pharmacological therapy and the worsening of that patient's clinical condition. An inflammation at the intestinal level is characterized by greater intestinal permeability, so metabolites from the microbiota can influence brain homeostasis when mediated by the ENS or vagus nerve carrying inflammatory cytokines, such as interleukins (IL) -6, -1, acute phase proteins, such as C-reactive protein (CRP), Tumor Necrosis Factor TNF-α and Interferon (IFN-y) that are associated with an increased incidence of depressive symptoms.[9,24]

The class of drugs known as Proton Pump Inhibitors (H+) also has a strong influence on the resident intestinal microbiota. In this study, it was possible to observe that most of the elderly people who had suggestive symptoms of intestinal dysbiosis used this medication group in the past two weeks. Hojo[29] found in their study that after treatment with H + inhibitors, the composition of the microbiota in 20 elderly patients diagnosed with gastroesophageal reflux was negatively altered with the growth of bacteria of the genus Streptococcus.

Other data in the literature reveal that H+ inhibitors may be linked to the emergence and failure of pharmacological therapy in depression, since it alters the composition of microorganisms in the large intestine, small intestine (causes bacterial overgrowth in the small intestine, Small intestinal Bacterial Overgrowth-SIBO, due to the loss of the defensive barrier to gastric acid), with an increase in genera such as Streptococcaceae and Enterococcacea. This change causes a potential risk for the development of enterocolitis caused by Clostridium difficile, as well as spontaneous bacterial peritonitis and community-acquired pneumonia.[29]

Factors such as the sample number and the tool to check the symptoms of intestinal dysbiosis may have influenced the negative correlation between this variable and the presence of pathologies, different from what is shown in the literature, which reveals a strong correlation between intestinal dysbiosis and the NCDs.[22]

Regarding the application of the QRM aimed at symptoms of intestinal dysbiosis, although it is not possible to compare it with other studies in the elderly people using the same tool, the results obtained are in agreement with the current literature on the subject. It was possible to identify a low percentage of elderly people with intestinal dysbiosis and a high prevalence of depressive symptoms, thus it is allowed to point out an existing relationship between gastrointestinal symptoms and the prevalence of depressive symptoms in the elderly people, although the questionnaire doesn't make a direct association with the presence of dysbiosis, it may come to be used in the practice of clinical nutrition, as a way of intestinal dysbiosis risk screening in elderly patients.

However, further research in the clinical area should be carried out in order to verify the presence of these symptoms and their correlation with mental health and the development of depression, since few studies in humans have proposed to investigate such a relationship, due to recent updates at the experimental level that aim to mimic this behavior model and clarify how this communication works.

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Conflicts of interest

The author states there are no conflicts of interest.

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