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The enormous cost of obesity: analysis of public costs in a basic health unit in Minas Gerais, Brazil

O enorme custo da obesidade: análise dos custos públicos em uma unidade básica de saúde de Minas Gerais, Brasil

El enorme costo de la obesidad: análisis de los costos públicos en una unidad básica de salud en Minas Gerais, Brasil

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Abstract

Introduction: The higher the body mass index (BMI) of a patient, the greater the risk of the patient developing obesity-related diseases. Likewise, the severity of obesity and related diseases increases as BMI increases. *Objective*: to assess the costs of obesity and related diseases in Brazil from the perspective of society and health systems, in view of the analysis of estimated costs attributable to this main pathology, considering the costs of outpatient procedures, medicines distributed by the SUS to treat the disease and request of exam. *Methodology*: analytical observational approach developed at the Itamarati Basic Health Unit, located in the Jardim Itamarati neighborhood, in the city of Patos de Minas, Minas Gerais, using data from the Viver Platform, physical records and DATASUS. *Results and discussion*: given the results of this study and others cited here, it is noted that, considering obesity as a risk factor for hypertension and diabetes separately, the costs attributable to this disease are high, and the estimates of costs

attributable to the main diseases Chronic diseases associated with inadequate nutrition show the great economic burden of these diseases for the SUS. The data show the need to prioritize integrated and intersectoral policies for the prevention and control of hypertension, diabetes and obesity. *Conclusion*: Obesity imposes a high cost to the health of people and public administration. Thus, by understanding the pathophysiology of obesity, it will allow healthcare providers to better manage the set of diseases supported by this main pathology that affect an individual.
Keywords: Obesity; Public health; Costs; Management; Comorbidities.

Resumo

Introdução: Quanto maior o índice de massa corporal (IMC) de um paciente, maior se torna o risco de o paciente desenvolver doenças relacionadas à obesidade. Da mesma forma, a gravidade da obesidade e doenças relacionadas aumenta à medida que o IMC aumenta. *Objetivo*: avaliar os custos da obesidade e doenças relacionadas no Brasil na perspectiva da sociedade e dos sistemas de saúde, perante análise de estimativa dos custos atribuíveis a essa patologia principal, considerando custos de procedimentos ambulatoriais, medicamentos distribuídos pelo SUS para tratamento da doença e solicitação de exame. *Metodologia*: abordagem observacional analítica desenvolvido na Unidade Básica de Saúde Itamarati, localizada no bairro Jardim Itamarati, na cidade de Patos de Minas, Minas Gerais, sob dados da Plataforma Viver, prontuários físicos e DATASUS. *Resultados e discussão*: perante resultados deste estudo e dos outros aqui citados, nota-se que, considerando separadamente a obesidade como fator de risco para hipertensão e diabetes, os custos atribuíveis a essa doença são altos, e as estimativas dos custos atribuíveis às principais doenças crônicas associadas à alimentação inadequada evidenciam a grande carga econômica dessas doenças para o SUS. Os dados mostram a necessidade de priorizar políticas integradas e intersetoriais para a prevenção e o controle da hipertensão, do diabetes e da obesidade. *Conclusão*: A obesidade impõe um custo alto à saúde das pessoas e da administração pública. Desse modo, ao compreender a fisiopatologia da obesidade, permitirá que os provedores em saúde gerenciem melhor o conjunto de doenças corroboradas por essa patologia principal que afetam um indivíduo.
Palavras-chave: Obesidade; Saúde pública; Custos; Gestão; Comorbidades.

Resumen

Introducción: Cuanto mayor es el índice de masa corporal (IMC) de un paciente, mayor es el riesgo de que el paciente desarrolle enfermedades relacionadas con la obesidad. Asimismo, la gravedad de la obesidad y las enfermedades relacionadas aumenta a medida que aumenta el IMC. *Objetivo*: evaluar los costos de la obesidad y enfermedades relacionadas en Brasil desde la perspectiva de la sociedad y los sistemas de salud, en vista del análisis de los costos estimados atribuibles a esta patología principal, considerando los costos de los procedimientos ambulatorios, medicamentos distribuidos por el SUS para tratar la enfermedad y solicitud de examen. *Metodología*: enfoque observacional analítico desarrollado en la Unidad Básica de Salud Itamarati, ubicada en el barrio Jardim Itamarati, en la ciudad de Patos de Minas, Minas Gerais, utilizando datos de la Plataforma Viver, registros físicos y DATASUS. *Resultados y discusión*: dados los resultados de este estudio y otros aquí citados, se observa que, considerando la obesidad como factor de riesgo de hipertensión y diabetes por separado, los costos atribuibles a esta enfermedad son elevados y las estimaciones de costos atribuibles a los principales Enfermedades Las enfermedades crónicas asociadas a una nutrición inadecuada muestran la gran carga económica de estas enfermedades para el SUS. Los datos muestran la necesidad de priorizar políticas integradas e intersectoriales para la prevención y control de la hipertensión, la diabetes y la obesidad. *Conclusión*: la obesidad impone un alto costo para la salud de las personas y la administración pública. Así, al comprender la fisiopatología de la obesidad, permitirá a los proveedores de salud manejar mejor el conjunto de enfermedades que sustenta esta patología principal que afecta a un individuo.
Palabras clave: Obesidad; Salud pública; Costos; Gestión; Comorbilidades.

1. Introduction

The biggest myth in the health area is that obesity is an induced problem, but that it can be cured by eating less and performing more physical activity. Despite decades of treating obesity with traditional diet and exercise methods, little progress has been made. While these conventional methods are successful in people who are overweight, patients with obesity often progress beyond the tipping point, thus conventional and phenotypic ways of losing weight are less effective. Studies suggest that genetic resetting arises when adipose tissue corroborates tissue dysfunction (Andolfi & Fisichella, 2018; Costa et al., 2017; Gosh et al., 2003).

The higher the body mass index (BMI) of a patient, the greater the risk of the patient developing obesity-related diseases. Likewise, the severity of obesity and related illnesses increases as BMI increases (Finkelstein et al., 2012). Screening and measuring a patient's BMI is critical as it is a key tool to identify patients with a BMI of 25 kg/m 2 and above who are classified as overweight and are at risk of progressing to obesity and corroborate the appearance of related diseases.

Overweight patients (BMI 25-29.9 kg / m 2) generally do not yet have advanced genetic reset amplification, thus keeping them in the overweight range or bringing them to a lower BMI could prevent obesity-related diseases. obesity, given that as soon as a patient gains weight, the environment starts to impact their genes and change the way genes work for weight control (Thorpe et al., 2015).

Insulin resistance (IR) is one of the most significant side effects of obesity and has been recognized as an integral feature of the metabolic syndrome, which includes glucose intolerance, hypertriglyceridemia, high LDL cholesterol, hypertension, and accelerated atherosclerosis. When IR occurs, the pancreas can still produce and secrete insulin, but the target cells are unable to respond effectively to blood concentrations. This, in turn, stimulates the beta cells in the pancreas to produce ever higher levels of insulin, making hyperinsulinemia one of the main signs of developing diabetes mellitus (Pedersen et al., 2015; Anjos, 2006).

Dyslipidemia is a disorder of lipoprotein metabolism in which there are abnormal amounts of lipids in the blood, and is often found in patients with obesity and is one of the first signs that some metabolic dysfunction is occurring. One in 3 Americans dies from heart disease and stroke, and both diseases are linked to dyslipidemia (Xu et al., 2015). As abdominal fat increases, fat also accumulates around the heart. That is, there is evidence that an increase in visceral fat can produce an increase in leptin and a reduction in adiponectin, and may be the signal that accelerates the accumulation of atherosclerotic plaques. Allied to this, diabetes mellitus increases the development of cardiomyopathy, leading to a distinct diabetic myocardial phenotype known as diabetic cardiomyopathy (Bueter et al., 2009; Freitas & Py, 2018).

The majority of the Brazilian population depends exclusively on the Unified Health System (SUS) for medical assistance, while only 25% of the general population has access to the Supplementary Health System (approximately 47 million Brazilians). Financing these systems is complex and resources limited. The growing number of cases of obesity constitutes, in the long term, a threat to the sustainability of the treatment of these individuals both in the public and private spheres (Gouvea et al., 2013). Allied to this, it is notorious that the pathophysiology of obesity corroborates later comorbidities, such as systemic arterial hypertension (SAH), diabetes mellitus, thyroid disorders and dyslipidemia (Oliveira et al., 2015). Allied to this, chronic noncommunicable diseases (NCDs) represent a great burden for the public health system in Brazil, given that they are one of the main causes of death and illness in the population, and, in this sense, due to their negative effects direct effects on health, added to the indirect effects resulting from associated chronic diseases, obesity represents a double burden for health systems (Figueiredo et al., 2021; Guh et al., 2009).

Thus, the objective of this study is to evaluate the costs of obesity and related diseases in the world and in Brazil from the perspective of society and health systems, considering the analysis of estimated costs attributable to this main pathology, considering the costs of outpatient procedures, medications distributed by the SUS for treating the disease and requesting exams, it can help subsidize the improvement and prioritization of policies for preventing and coping with CNCDs, in addition to strengthening the defense of more robust interventions in relation to fiscal and regulatory measures, improving public health management.

2. Methodology

The present study is based on an analytical observational approach developed at the Itamarati Basic Health Unit, located in the Jardim Itamarati neighborhood, in the city of Patos de Minas, Minas Gerais, with the objective of creating a profile of the unit's obese patient, associating it with those to their respective comorbidities corroborated by the main disease, in order to subsequently calculate the costs of the Unified Health System (SUS) reorganized for these patients, based on the SUS Platform. The research was carried out at USF Itamarati, through the Vivver Platform and, later, through individual and detailed analysis of physical records that are present in the Institution. The participants included in the study were all those

registered, under care at the USF, with the CID E-66 (referring to obesity) in their medical records, in the period comprised of one year (03/03/20 to 03/03/21). Patients whose medical records are not accessible, who are not residing in locations not attributable to UBS Itamarati or who died were excluded from this sample.

For the following study, electronic medical record numbers were collected from patients whose CID E-66 were included, in the corresponding period of one year. After collection, the physical records of the respective patients were evaluated in detail. Subsequently, the costs attributable to the sample were calculated, such as consultations, medications and exams, via price tabulation, according to the 2018 SUS Procedures, Medications and OPM Table Management System (DATASUS), from 2018. This project was submitted to the Committee of Ethics in Research of the University Center of Patos de Minas via Plataforma Brasil. It will obey the current national legislation, to carry out the research involving human beings, according to the Resolution of the National Health Council 466/2012. The present study was supported by academic works between 2007 and 2021, through access to the main databases, namely: *National Library of Medicine* (PubMed MEDLINE), *Scientific Electronic Library Online* (Scielo), Cochrane Database of Systematic Reviews (CDSR), Google Scholar, Virtual Health Library (BVS) and EBSCO *Information Services,* in the period between April and August 2021.

3. Results and Discussion

For data provision, essentially, the total number of obese patients whose ICD E-66 was inserted in the medical record, and who are currently registered in the unit in question, were evaluated. As shown in Table 1, the USF in the Itamarati neighborhood covers a total of 55 obese people registered according to CID E-66, which are represented by 16 men and 39 women, respectively, 29% and 71%, in which it is possible to observe a general prevalence of obese women. In addition, as shown in Table 2, the average age of the profile of obese patients is between 40 and 60 years, which illustrates the higher prevalence of this pathology in adulthood. Data referring to the profile of the obese patient currently registered at the USF Itamarati, between the ages of 10-77 years, were collected on the Viver Platform, in the stipulated period of 1 year, and arranged in the following tables:

Table 1 - Total number of patients in the sample divided by sex.

Sex	fan	fr (%)
Masculine	16	29%
Feminine	39	71%
Total	55	100%

Source: Authors (2021).

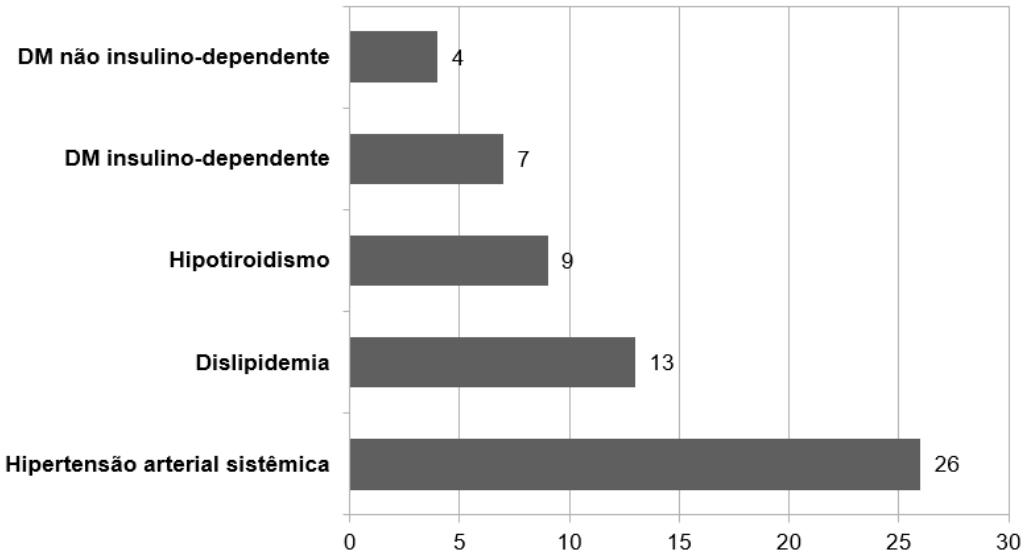
Table 2 - Total number of patients in the sample divided by age.

Age	fan	fr (%)
10 ⎪---- 20	4	7%
20 ⎪---- 30	4	7%
30 ⎪---- 40	11	20%
40 ⎪---- 50	13	24%
50 ⎪---- 60	14	26%
60 ⎪---- 70	6	11%
70 ⎪---- 80	3	5%
Total	55	100%

Source: Authors (2021).

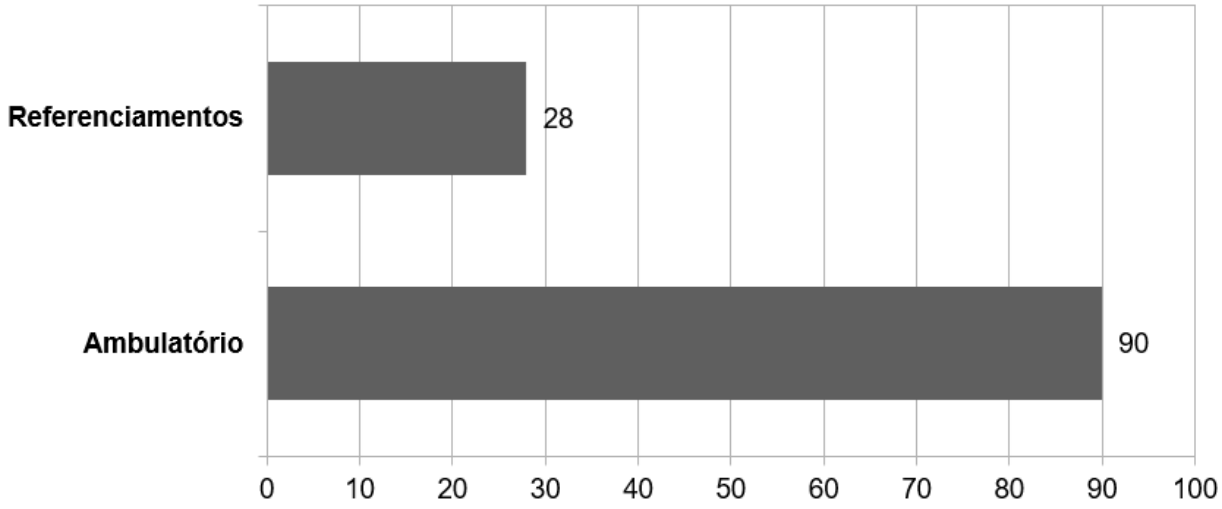
Insulin-dependent and non-dependent diabetes mellitus, with SAH being the pathology of greater association, according to the unique analysis of medical records in the sample space. Furthermore, Graph 2 shows, in a quantitative manner, the number of outpatient visits and referrals targeted at this sample. In association, Graph 3 postulates the total number of tests requested for the patients studied, with the total blood count being the most requested by primary care.

Graph 1 - Quantitative association of obese patients with secondary comorbidities.



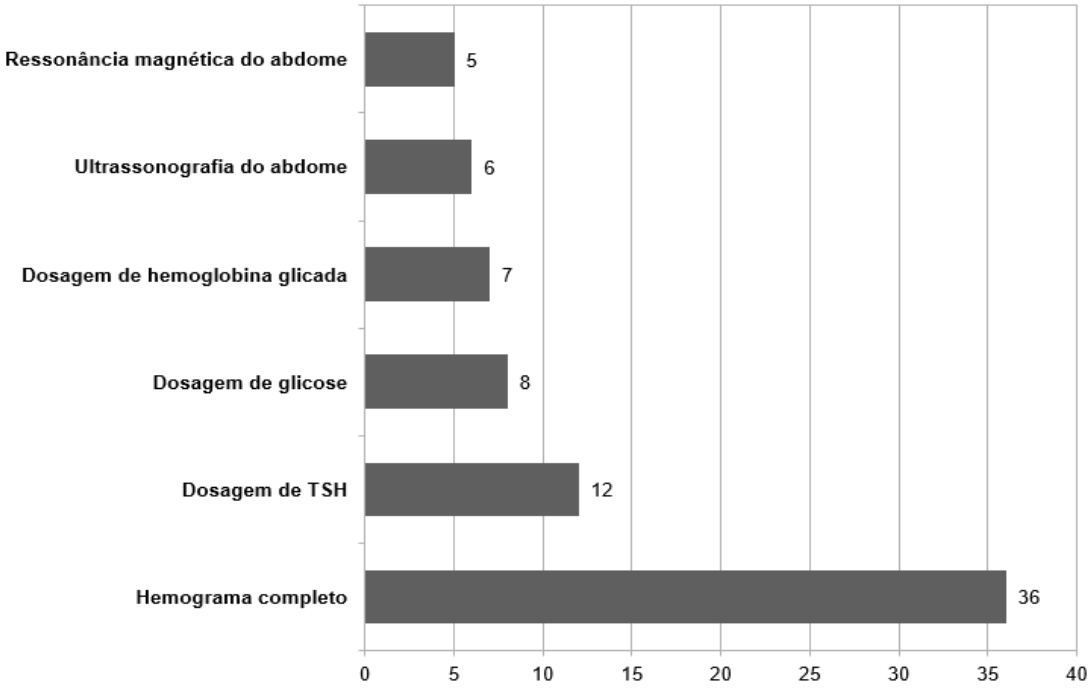
Source: Authors (2021).

Graph 2 - Number of services provided to the sample.



Source: Authors (2021).

Graph 3 - Number of complementary exams requested.



Source: Authors (2021).

The tabulation of the costs of referrals, outpatient care and additional tests requested for the sample of this study, are described in Table 3 and Table 4, through the SUS Procedures, Medications and OPM Table Management System (DATASUS), from 2018.

Table 3 - Values, in R$, of services performed for the sample.

Attendances	Referrals (specialized queries)	Ambulatory in Basic Health Unit
Unitary value	56.00	60.60
Amount	1568.00	5454.00

Source: Authors (2021).

Table 4 - Values, in R$, of the complementary exams requested for the sample.

complementary exam	Complete blood count	TSH dosage	glucose dosage	Glycosylated hemoglobin dosage	abdominal ultrasound	Abdominal MRI
Unitary value	4.11	8.96	1.85	7.86	68.40	268.75
Amount	147.96	107.52	14.80	55.02	410.40	1343.75

Source: Authors (2021).

Table 5 shows the medications used by the sample for the treatment of diabetes mellitus, dyslipidemia, systemic arterial hypertension and thyroid disorders, divided by number of patients using the medication and number of boxes used during the 12-month period (of the retrospective study), and taking into account the dosage of 1 tablet a day for oral medications, and 10 IU/ML when dealing with injectable human insulin. In addition, table 6 elucidates the values of these drugs, which were stipulated through the Management System of the Table of Procedures, Medications and OPM of the SUS (DATASUS), from 2018.

Table 5 - Quantitative analysis of medications provided by SUS for the sample.

medicine	Losartan Potassium 50mg	Captopril 25mg	Hydrochlorothiazide 25mg	Atenolol 25 mg	enalapril maleate 10mg	Simvastatin 20mg	Metformin Hydrochloride 500mg	Human Insulin 100 IU/ML	glibenclamide 5mg
Number of patients using the medication	21	3	15	two	3	10	5	3	1
Number of used boxes of medication during the 12-month study period	252	36	180	24	36	120	60	108	12

Source: Authors (2021).

Table 6 - Values, in BRL, for each box of medicine provided by SUS, in line with Table 5.

medicine	Losartan Potassium 50mg	Captopril 25mg	Hydrochlorothiazide 25mg	Atenolol 25 mg	enalapril maleate 10mg	Simvastatin 20mg	Metformin Hydrochloride 500mg	Human Insulin 100 IU/ML	glibenclamide 5mg
value per box	4.80	2.70	1.50	3.00	4.50	6.90	6.90	20.08	2.10
Amount	1209.60	97.20	270.00	72.00	162.00	828.00	414.00	2168.64	25.20

Source: Authors (2021).

Table 7 shows the total costs of care (outpatient and reference), complementary exams and medications, requested and offered to the study sample, as well as the final expenditure.

Table 7 - Total amount of expenses related to obesity

Attendances	Complementary exams	Medications	Total
7022.00	2079.45	5246.64	14347.64

Source: Authors (2021).

Study by Sichieri et al., (2007) estimated the costs of hospitalizations related to diseases associated with overweight/obesity through data on hospitalizations of men and women aged 20 to 60 years from the Hospital Information System of the Unified Health System (SIH-SUS) for the year 2001. They demonstrated that approximately 3 to 5% of all hospitalizations in Brazil were due to diseases directly related to obesity. In addition, they also evaluated productivity loss data by identifying the number of days of hospitalization. The number of workdays lost due to obesity and associated diseases ranged from 3.9 to 10.6 days/year. The most common cause of lost productivity was diabetes *mellitus,* followed by cardiovascular disease (Hammond et al., 2010).

Cardiovascular diseases, probably the most frequent, accounted for 67% of costs, followed by cancer treatment. Considering that indirect costs (loss of productivity, sick leave, premature death) were not included and data on medical expenses were obtained through the DATASUS database, that is, amounts reimbursed to health units, the authors point out that these These numbers are a rather conservative estimate of public spending on obese patients, as the actual cost of treatment is classically higher than reimbursed amounts. The estimated costs were equivalent to 0.09% of the national GDP in 2010, much lower than those shown in international studies (Allender & Rayner, 2007; IBGE, 2010).

Bahia et al., (2014) demonstrated the medical costs related to outpatient and hospital treatment of diseases associated with overweight and obesity in the years 2008 to 2010. Based on relative risks (international data) and prevalence of overweight and obesity in Brazil, it is possible to estimate the attributable fraction of obesity on outcomes of interest. It was estimated that the SUS annually spends about R$ 3.6 billion per year on the treatment of these diseases, with R$ 2.4 billion on hospital treatment (68%) and R$ 1.2 billion (32%) with outpatient treatment, as shown in Table 8.

Table 8 - SUS costs with outpatient and hospital treatment for obesity-related diseases (average for the years 2008 to 2010)

group of diseases		Outpatient costs (BRL)	Hospital costs (BRL)	Total costs (BRL)
	Cardiovascular (all)	148,593,269	1,128,947,735	1,277,541,004
	Coronary artery disease	110,805,178	662,593,988	773,399,166
Cardiovascular	Cardiac insufficiency	2,592,687	269,357,625	271,950,312
	Arterial hypertension	23,103,255	37,287,453	60,390,708
	Stroke	12,092,150	159,708,669	171,800,819
Neoplasms*		407,377,251	102,321,674	509,698,926
Diabetes mellitus**		1,447,915	37,212,371	40,376,996
Osteoarthritis***		6,696,476	9,907,512	16,603,988

* related to overweight (colorectal, endometrium, ovary, pancreas, breast, kidney, bladder); **only as a first diagnosis; ***knee and hip only. Source: Bahia et al., 2014.

Thus, given the results of this study and others cited here, it is noted that, considering separately obesity as a risk factor for hypertension and diabetes, the costs attributable to this disease are high, and the estimates of costs attributable to the main chronic diseases associated with inadequate nutrition show the great economic burden of these diseases for the SUS. The data show the need to prioritize integrated and intersectoral policies for the prevention and control of hypertension, diabetes and obesity.

4. Conclusion

Obesity imposes a high cost on the health of people and public administration. Thus, by understanding the pathophysiology of obesity, it will allow health providers to better manage the set of diseases corroborated by this main pathology that affect an individual. Furthermore, keeping it as the central focus and foundation of all treatment strategies for obesity and related comorbidities is essential and of paramount importance for the management of current diseases, as well as the prevention of future diseases.

In this way, knowledge about the costs attributable to diseases can support the improvement and prioritization of policies for preventing and coping with CNCDs, in addition to strengthening the defense of more robust interventions for the prevention of these diseases, including fiscal and regulatory measures, thus adding obesity to these comorbidities allows a more complete estimate of the economic impact of obesity on the SUS (Figueiredo et al., 2021). Therefore, it is of paramount importance that further studies cover the subject, mainly with the aim of increasing sensitivity for public management, revealing the areas with higher expenses and helping to identify the areas that require more interventions and preventive measures against obesity.

References

Allender, S., & Rayner, M. (2007). The burden of overweight and obesity-related ill health in the UK. *Obes Rev*. 8(5), 467-473.

Andolfi, C., & Fisichella, P. M (2018). Epidemiologia da obesidade e comorbidades associadas. *Revista de Técnicas Cirúrgicas e Laparoendoscópicas Avançadas*, 28 (8), 1-6.

Anjos, L. A. (2006). *Obesidade e saúde pública.* Editora FIOCRUZ, 1-101.

Bahia, L. R., et al. (2014). Impacto econômico da obesidade no Brasil. *Revista HUPE*, 13 (1), 13-17.

Brasil, Ministério da Saúde (2018). Banco de dados do Sistema Único de Saúde (DATASUS). http://sigtap.datasus.gov.br/tabela-unificada/app/sec/inicio.jsp.

Bueter, M., et al. (2009). Cirurgia bariátrica e hipertensão. *Surg Obes Relat Dis*, 5 (1), 615–620.

Costa, A. F., et al. (2017). Carga do diabetes mellitus tipo 2 no Brasil. *Cadernos de Saúde Pública*. 33 (2), 1-14.

Figueiredo, B. Q., et al. (2021). O enorme custo da obesidade para a saúde pública brasileira: Uma breve revisão de literatura. *Research, Society and Development.* 10 (9), 1-9.

Finkelstein, E. A., et al. (2012). A obesidade e as previsões de obesidade grave até 2030. *Am J Prev Med*, 42 (1), 563–570.

Freitas, E. V., & Py, L. (2018). *Tratado de geriatria e gerontologia*. (4a ed.), Guanabara Koogan, 1638p.

Ghosh, A., et al. (2003). Association of food patterns, central obesity measures and metabolic risk factors for coronary heart disease (CHD) in middle aged Bengalee Hindu men, Calcutta, India. *Asia Pacific Journal of Clinical Nutrition.* 12 (2), 166-171.

Gouvea, H. R., et al. (2013). Validação da ultrassonografia para a avaliação da gordura abdominal visceral em obesos clinicamente graves. *Arq. Bras. Cir. Dig*. 26 (1), 43-46.

Guh, D. P., et al. (2009). The incidence of co-morbidities related to obesity and overweight: A systematic review and meta-analysis. *BMC Public Health*. 88 (9).

Hammond, R. A., & Levine, R. (2010). The economic impact of obesity in the United States. *Diabetes Metab Syndr Obes*. 3 (1), 285-295.

Instituto Brasileiro de Geografia e Estatística. Produto Interno Bruto (2010). Rio de Janeiro: IBGE. http://www.ibge.gov.br/home/

Oliveira, M. L. (2013). *Estimativa dos custos da obesidade para o Sistema Único de Saúde do Brasil* [Tese de Doutorado em Nutrição Humana]. Brasília: Universidade de Brasília.

Pedersen, D. J., et al. (2015). Um importante papel da insulina no pro- inflamação do tecido adiposo associada à obesidade. *Mol Metab*, 4 (1), 507-518.

Sichieri, R., et al. (2007). The burden of hospitalization due to overweight and obesity in Brazil. *Cad Saúde Pública*. 23 (7), 1721-1727.

Thorpe, R. J., et al. (2015). Explicando as disparidades raciais na obesidade entre homens: O lugar importa? *Am J Mens Health*, 9 (1), 464-472.

Xu, W., et al. (2015). Massa corporal índice e mortalidade por todas as causas em pacientes com hipertensão. *Obesity*, 23 (1), 1712–1720.