

Metabolic syndrome and sleep disorders in Brazil: a short review

Abstract

Purpose: The present study analyzed the production on metabolic syndrome and sleep disorders in Brazil in the indexed scientific literature.

Methods: Keywords such as “Metabolic Syndrome”, “Cardiometabolic Risk Factors”, and “Sleep Wake Disorders” were used to find relevant research papers in PubMed and Latin American and Caribbean Literature in Health Sciences – Virtual Health Library (LILACS - VHL). Additionally, a table was built with the synthesis of the publications recovered in the two databases to characterize the publications found and an analysis of textual bodies and similarity was carried out, in order to better understand the connections between the terms that emerged from the analyzed abstracts.

Results: Regarding the central theme, of the 15 publications 9 were related to the quantity and quality of sleep, focusing mostly on obstructive sleep apnea (OSA), with metabolic syndrome. In addition to these, 2 publications present the relationship between metabolic syndrome with ethnicity and chronic non-communicable diseases. And 4 publications have as their main theme sleep-related disorders only. The similarity analysis showed us that there is a relationship between the structure that circumscribes the term “sleep” with strong connective features, that is, with greater width, between the aforementioned term and the following: “metabolic syndrome”; “index”; “risk factor”; “obstructive sleep apnea – OSA” and “association”.

Conclusion: This short review evidenced that the theme related to metabolic syndrome and sleep disorders in Brazil, based on the search strategies carried out, showed little literature, as well as indicating a high relationship perceived by the mathematical model of co-occurrences between the term “sleep” with “OSA”, “risk factor” and “metabolic syndrome”.

Keywords: metabolic syndrome, cardiometabolic risk factors, sleep wake disorders

Volume 9 Issue 1 - 2022

Paola Cocchi Piccaro,¹ Elisangela Aparecida Da Silva Lizzi,² Roberta Cristina Barboza Galdencio,³ Sidney Marcel Domingues^{1,4}

¹Municipal University of São Caetano do Sul (USCS), Brazil

²Federal Technological University of Paraná, Brazil

³Federal University of Rio de Janeiro, Avenida Carlos Chagas Filho, 373 – Cidade Universitária, Brazil

⁴Education Institute, Hcor-Hospital do Coração - São Paulo (SP), Brazil

Correspondence: Dr Sidney Marcel Domingues, Municipal University of São Caetano do Sul (USCS), Rua Treze de Maio, 681 - Bela Vista, São Paulo – SP, Brazil, 01327-000, Email: sidney.domingues@online.uscs.edu.br; sdomingues@hcor.com.br

Received: August 22, 2022 | **Published:** September 29, 2022

Introduction

Automatism, perfectionism and immediacy are terms that characterize the process of urbanization and industrialization that have taken place over the last few centuries. There is a growing demand for productivity, in addition to the depletion of errors, generating an extremely stressful pattern and harmful to the health of those involved. This can generate physical and organic diseases, which currently have manifested as difficulties sleeping, weight gain and increased blood pressure. Associated with this process, the change in the food pattern led to a greater consumption of industrialized products, which contain a lot of sodium, sugar and preservatives, dispensing with the consumption of vegetable and vegetable fiber. Thus, the diet became more hypercaloric and fatty, and less organic and healthy, which, associated with considerable deleterious changes in the human standard of living – with a greater load of daily stress – considerably affected the pattern of diseases expressed in the population.

According to the 2018 Institute for Health Metrics and Evaluation (IHME), cardiovascular diseases, such as ischemic heart disease and cerebrovascular disease, rank first and second as the leading cause of death.¹ This ends up being a portrait of all the change brought about by industrial and technological revolutions, which can bring standards of living that are increasingly harmful to people's health. If carelessness is continued, there will be an increase in risk factors for metabolic syndrome and problems secondary to stress, such as difficulty sleeping.

Metabolic Syndrome (MS) is a term that describes a set of risk factors for chronic diseases, being established through interactions

of genetic and environmental characteristics, with a plurimetabolic character. It is defined, according to the International Diabetes Federation (IDF), by the presence of two or more risk factors for cardiovascular diseases, namely: systemic arterial hypertension ($\geq 130/85$ mmHg or in drug treatment); elevated fasting glucose (≥ 100 mg/dL or diagnosis of type 2 diabetes); triglycerides equal to or greater than 150 mg/dL (or in specific treatment for this lipid abnormality); HDL cholesterol less than 40 mg/dL in men and less than 50 mg/dL in women (or undergoing specific treatment for this lipid abnormality); central obesity (waist circumference equal to or greater than 94 cm for men and equal to or greater than 80 cm for women).²

In turn, sleep is defined as a readily reversible suspension of the sensorimotor interaction with the environment, being a complex behavioral state of physiological reduction of the level of consciousness, maintaining patterns of brain activity. On the other hand, wakefulness is a state in which there is a high potential for sensitivity and efficient receptivity to external stimuli, keeping the person in an alert state. For its interaction, the sleep-wake cycle works through a neurochemical mechanism of activation and inhibition in the brainstem and cerebral cortex, but a deregulation can lead to Sleep Disorders. Thus, these are described as sleep-wake disorders, in which the sleep-wake schedule or pattern is associated with the circadian rhythm, which affects the duration, timing, and/or rigidity of the sleep-wake cycle relative to the day/night cycle.^{3,4}

Based on the above scenario, the objective of this present study is to analyze the production on metabolic syndrome and sleep disorders in Brazil in the indexed scientific literature.

Methods

The selection of databases is an essential part of the search for evidence and was based on the recommendations of the reference manuals of synthesis studies. They recommend searching international databases, even when the objective is to review geographically, temporally or language-based, with the premise that scientific literature presupposes a reach beyond these parameters. Thus, our review, which has a predetermined geographic scope (Brazil), meets the criteria for inclusion of mandatory international and regional bases. Following the guidance of the JBI Manual for Evidence Synthesis,⁵ this search consisted of three steps: selection of information sources; conceptual mapping of the research subject; and construction of the search strategy. In the first one, we identified the relevant databases for this review, including the Medical Literature Analysis and Retrieval System Online - consultation via PubMed (MEDLINE/PubMed) a reference base for the world's biomedical literature (mandatory in the recommendations of systematic literature reviews in health area). The second base selected was the regional base Latin American and Caribbean Literature in Health Sciences – Virtual Health Library (LILACS - VHL), as they cover the technical-scientific literature of the Latin American and Caribbean region, including Brazil.

We performed the conceptual semantic mapping of the terms of interest, in natural and documentary language, in the controlled vocabularies of Descriptors in Health Sciences (DeCS) and Medical Subject Headings (Mesh). The identification of the most relevant and representative terms of the subject in question gave rise to the analysis of sensitivity and specificity, considering the relevance, pertinence and relevance of the terms in the selected databases according to the recommendation of the JBI Manual for Evidence Synthesis.

The sensitivity analysis of the terms identified in each database aimed to: assess their accuracy; check spelling variations, synonyms and permutation of compound terms; avoid “explosion” to non-relevant topics; identify the interpretation of terms by the different bases; balance the search strategy between sensitivity, broader,

and specificity, more restricted, where the proportion between the number of documents retrieved and their relevance to the search are considered. For the composition of the strategy, we used the logical operators OR and AND in the relationship between the terms listed in order to verify the precision and recall of records, the ability to retrieve the largest possible number of records on the researched topic, as well as the specificity of the items recovered.⁶

Following is the description of the final search strategy in the two bases listed for the study: 1- PubMed ((*Metabolic Syndrome*[MeSH Terms]) OR (*Metabolic Syndrome*[Title/Abstract]) OR (*Cardiometabolic Risk Factors*[MeSH Terms]) OR (*Cardiometabolic Risk Factors*[Title/Abstract])) AND (*Sleep Wake Disorders*[MeSH Terms]) OR (*Sleep Wake Disorders*[Title/Abstract]) AND (*Brazil*[Title/Abstract] OR *Brasil*[Title/Abstract])); 2- LILACS – BVS (tw: “*Síndrome Metabólica*” OR “*Metabolic Syndrome*” OR “*Cardiometabolic Risk Factors*” OR “*Fatores de Risco Cardiometabólico*”) AND (tw: “*Transtornos do Sono-Vigília*” OR “*Sleep Wake Disorders*” OR “*Distúrbios do Sono*” OR “*Sleep Disorders*” OR “*Sleep Disorder*”) AND (tw: “*Brasil*” OR “*Brazil*”).

In addition, a characterization of the indexed scientific production was performed, as well as a compilation of the respective abstracts with the analysis of textual corpus and similarity, built via Iramuteq Software.⁷

Results/Discussion

The search strategies in the scientific literature applied in PubMed and LILACS – VHL retrieved, respectively, 11 and 6 publications, with 1 of them duplicated in both bases. Thus, the search resulted in a total of 15 publications to be analyzed.

In Figure 1, there is a description of them in terms of: publication title; authors' names; journal title; country of the journal; original language of publication; year of publication; and central theme. In sequence, Figure 2 is presented, which refers to the similarity graph of the abstracts in English of the publications.

Figure 1 Synthesis of publications selected as sources of evidence in the PubMed, Lilacs/BVS electronic databases.

Publication title	Authors name	journal title	Country of the journal	Original language of publication	Year of publication	Central theme
Observational study on efficacy of negative expiratory pressure test proposed as screening for obstructive sleep apnea syndrome among commercial interstate bus drivers - protocol study	Raquel P Hirata, Isabella C Aguiar, Sergio R Nacif, Lilian C Giannasi, Fernando SS Leitão Filho, Israel R Santos, Salvatore Romano, Newton S Faria Jr, Paula N Nonaka, Luciana MM Sampaio, Claudia S Oliveira, Paulo TC Carvalho, Geraldo Lorenzi-Filho, Alberto Braghiroli, Adriana Salvaggio, Giuseppe Insalaco and Luis VF Oliveira	BMC Pulmonary Medicine	England	English	2011	Observational study on the effectiveness of the negative expiratory pressure test proposed as a screening for obstructive sleep apnea syndrome in commercial interstate bus drivers
Prevalence of metabolic syndrome and associated factors in women aged 35 to 65 years who were enrolled in a family health program in Brazil	Ana CB Schmitt, Maria RA Cardoso, Heno Lopes, Wendry M P Pereira, Elaine C Pereira, Debora AP de Rezende, Rubia G Guarizi, Mayra C Dellu, Jéssica de Moura Oliveira, Erika Flauzino, Juan E. Blu'mel, and José M Aldrighi	Menopause: The Journal of The North American Menopause Society	USA	English	2012	Estimate the prevalence of metabolic syndrome among women aged 35 to 65 years and to identify associated factors.
Consequences of Obstructive Sleep Apnea on Metabolic Profile: A Population-Based Survey	Sonia M. Togeiro, Gláucia Carneiro, Fernando F. Ribeiro Filho, Maria T. Zanella, Rogerio Santos-Silva, Jose A. Taddei, Lia R.A. Bittencourt I and Sergio Tufik	Wiley online Library	USA	English	2013	Evaluate the associations of Obstructive Sleep Apnea with metabolic abnormalities among the adult population of Sao Paulo, Brazil

Table Continued...

Publication title	Authors name	journal title	Country of the journal	Original language of publication	Year of publication	Central theme
Metabolic syndrome in fixed-shift workers	Raquel Canuto, Marcos P Pattussi, Jamile BA Macagnan, Ruth L Henn, Maria T A Olinto	Revista de Saúde Pública	Brazil	English	2015	Metabolic syndrome in fixed shift workers
Risk Factors for Cardiovascular Disease, Metabolic Syndrome and Drowsiness in Truck Drivers	Antonio de Padua Mansur, Marcos A. B. S. Rocha, Vilma Leyton, Julio Y Takada, Solange D Avakian, Alexandre J Santos, Gisele C Novo, Arledson L Nascimento, Daniel R Muñoz, Waldo J C Rohlf	Arquivos Brasileiros de Cardiologia	Brazil	Portuguese	2015	Risk Factors for Cardiovascular Disease, Metabolic Syndrome and Drowsiness in Truck Drivers
Profile of the obese patient with metabolic syndrome candidate for bariatric surgery in a private clinic from Porto Alegre, Rio Grande do Sul	Vilma Maria Junges, Jarbas Marinho Branco Cavaleiro, Eliana Franzoi Fam, Vera Elizabeth Closs, Maria Gabriela Valle Gottlieb	Scientia Medica	Brazil	Portuguese	2016	Profile of the obese patient with metabolic syndrome candidate for bariatric surgery
Sleep quality and metabolic syndrome in overweight or obese children and adolescents	Nathalia C Gonzaga, Aline S S Sena, Alexandro S Coura, Fábio G Dantas, Renata C Oliveira, Carla C M Medeiros	Brazilian Journal Of Nutrition	Brazil	Portuguese	2016	Sleep quality and metabolic syndrome in overweight or obese children and adolescents
Social jetlag and metabolic control in non-communicable chronic diseases: a study addressing different obesity statuses	Maria C Mota, Catarina M Silva, Laura C T Balieiro, Walid M Fahmy & Cibele A Crispim	Scientific Reports	England	English	2017	Metabolic controls and jetlag in chronic noncommunicable diseases
Obstructive sleep apnoea as a risk factor for incident metabolic syndrome: a joined Episono and Hypnolaus prospective cohorts study	Camila Hirotsu, Jose Haba-Rubio, Sonia M. Togeiro, Pedro Marques-Vidal, Luciano F Drager, Peter Vollenweider, Gérard Waeber, Lia Bittencourt, Sergio Tufik, Raphael Heinzer	European Respiratory Journal - Flagship Scientific Journal Of Ers	Denmark	English	2018	Investigate the effect of Obstructive Sleep Apnea on the risk of developing Metabolic Syndrome in the general population.
Metabolic syndrome and associated factors in quilombolas Bahia, Brazil	Ricardo F de Freitas Mussi, Edio L Petróski	Ciência & Saúde Coletiva	Brazil	Portuguese	2019	Risk factors for metabolic syndrome in a particular ethnicity
Poor sleep quality and lipid profile in a rural cohort (The Baependi Heart Study)	Glaucylara R Geovanini, Geraldo Lorenzi-Filho, Lilian K de Paula, Camila M Oliveira, Rafael de Oliveira Alvim, Felipe Beijamini, Andre B Negrão, Malcolm von Schantz, Kristen L Knutson, Jose E Krieger, Alexandre C Pereira	Science Direct	Netherlands	English	2019	Association between cardiometabolic risk factors and subjective sleep quality assessed by the Pittsburgh sleep quality index (PSQI), independent of obstructive sleep apnea (OSA) and sleep duration.
OSA, Short Sleep Duration, and Their Interactions With Sleepiness and Cardiometabolic Risk Factors in Adults The ELSA-Brazil Study	Luciano F Drager, Ronaldo B Santos, Wagner A Silva, Barbara K Parise, Soraya Giatti, Aline N Aielo, Silvana P Souza, Sofia F Furlan, Geraldo Lorenzi-Filho, Paulo A Lotufo, Isabela M Bensenor	CHEST Journal	USA	English	2019	Evaluate the association of Obstructive Sleep Apnea, Short Sleep Duration, and their interactions with sleepiness and cardiometabolic risk factors in a large cohort of adults.
Photobiomodulation by low-level laser therapy in patients with obstructive sleep apnea Study protocol clinical trial (SPIRIT compliant)	Fernanda CF de Camargo, José R De Moura, Felipe X Cepeda, Marília de Almeida Correia, Reginaldo C Nascimento, Lucas Fortes-Queiroz, Fabiana G Ferreira, Renata K da Palma, Maria F Hussid, Maria C Chavantes, Ivani C Trombetta	Medicine	USA	English	2020	Photobiomodulation by low-level laser therapy in patients with obstructive sleep apnea

Publication title	Authors name	journal title	Country of the journal	Original language of publication	Year of publication	Central theme
Cross-cultural adaptation of the Richards-Campbell Sleep Questionnaire for intensive care unit inpatients in Brazil: internal consistency, test-retest reliability, and measurement error	Natalia C Varella, Renato S Almeida, Leandro A C Nogueira, Arthur S Ferreira	Science Direct	Netherlands	English	2021	Cross-cultural adaptation of the Richards-Campbell Sleep Questionnaire for patients admitted to an intensive care unit in Brazil
Light therapy for the treatment of delayed sleep-wake phase disorder in adults: a systematic review	Jefferson N Gomes, Cristiane Dias, Renata S Brito, Juliana R Lopes, Igor A Oliveira, Alexandra N Silva, Cristina Salles	Sleep Science	Brazil	English	2021	Use of light therapy to treat delayed sleep-wake phase disorder



It is important to point out that, due to the small number of papers recovered by the search strategies, it was decided not to carry out the screenings by title, abstract and full text, a method usually performed in synthesis studies, which culminated in the analysis of all of them.

language. Regarding the central theme, 9 of them are related to the quantity and quality of sleep, focusing mostly on obstructive sleep apnea (OSA), with metabolic syndrome.⁸⁻¹⁶ In addition to these, 2 publications present the relationship between metabolic syndrome with ethnicity¹⁷ and chronic non-communicable diseases.¹⁸ And 4 publications have as their main theme sleep-related disorders only.¹⁹⁻²⁴

In Figure 2, it is possible to verify, through the analysis of similitude, that there is a relationship between the structure that circumscribes the term “sleep” with strong connective features, that

is, with greater width, between the aforementioned term and the following: “metabolic syndrome”; “index”; “risk factor”; “obstructive sleep apnea – OSA” and “association”. It is worth mentioning that similitude is a mathematical method that brings a simplification of reality and shows the correlations evidenced by the mathematical model.

Conclusion

This short review evidenced that the theme related to metabolic syndrome and sleep disorders in Brazil, based on the search strategies carried out, showed little literature, as well as indicating a high relationship perceived by the mathematical model of co-occurrences between the term “sleep” with “OSA”, “risk factor” and “metabolic syndrome”.

Our findings suggest the need for further studies that seek to better understand the relationship between metabolic syndrome and sleep disorders, expanding the view on what has already been produced on the subject in the world scientific literature.

Acknowledgments

None.

Conflicts of Interest

None.

References

- Institute for health metrics and evaluation (IHME). findings from the global burden of disease study 2017. Seattle, WA: IHME, 2018.
- Azambuja CR, Farinha JB, Rossi DS, et al. O diagnóstico da síndrome metabólica analisado sob diferentes critérios de definição. *Revista Baiana de Saúde Pública*. 2020;39(3):482–496.
- Monteiro C, Tavares E, Câmara A, et al. Regulação molecular do ritmo circadiano e transtornos psiquiátricos: uma revisão sistemática. *J Bras Psiquiatr*. 2020;69(1):57–72.
- Benoliel IF, Araújo GM, de Oliveira Freitas FM, et al. Chronobiology: an analysis on how the biological relationship can be an ally to lose weight and gain health. *Brazilian Journal of Development, Curitiba*. 2022;7(9):90646–90665.
- Aromataris E, Munn Z. (Editors) JBI Manual for evidence synthesis. JBI, 2020.
- Cunha MB, Cavalcanti CR de O. Dicionário de biblioteconomia e arquivologia. Brasília, DF: Briquet de Lemos, 2008.
- Lebart L, Salem A. Text Statistics. Paris: Dunod, 1994. Disponível em: Acesso em: 15 aug. 2022.
- Schmitt AC, Cardoso MR, Lopes H, et al. Prevalence of metabolic syndrome and associated factors in women aged 35 to 65 years who were enrolled in a family health program in Brazil. *Menopause*. 2013;20(4):470–476.
- Togeiro SM, Carneiro G, Ribeiro Filho FF, et al. Consequences of obstructive sleep apnea on metabolic profile: a Population-Based Survey. *Obesity (Silver Spring)*. 2013;21(4):847–851.
- Canuto R, Pattussi MP, Macagnan JB, et al. Metabolic syndrome in fixed-shift workers. *Rev Saude Publica*. 2015;49:30.
- Mansur AP, Rocha MA, Leyton V, et al. Risk factors for cardiovascular disease, metabolic syndrome and sleepiness in truck drivers. *Arq Bras Cardiol*. 2015;105(6):560–565.
- Junges, V. M., Cavaleiro, J. M. B., Fam, et al. Profile of obese patients with metabolic syndrome eligible for bariatric surgery at a private clinic in porto alegre, Rio Grande do Sul, Brazil. *Scientia Medica*. 2016;26(3):ID22898.
- GONZAGA NC, Santos Sena AS, Coura AS, et al. Sleep quality and metabolic syndrome in overweight or obese children and adolescents. *Revista de Nutrição*. 2016;29(3):377–389.
- Hirotsu C, Haba-Rubio J, Togeiro SM, et al. Obstructive sleep apnoea as a risk factor for incident metabolic syndrome: a joined Episono and HypnoLaus prospective cohorts study. *Eur Respir J*. 2018;52(5):1801150.
- Geovanini GR, Lorenzi-Filho G, de Paula LK, et al. Poor sleep quality and lipid profile in a rural cohort (The Baependi Heart Study). *Sleep Med*. 2019;57:30–35.
- Drager LF, Santos RB, Silva WA, et al. Short sleep duration, and their interactions with sleepiness and cardiometabolic risk factors in adults: The ELSA-brasil study. *Chest*. 2019;155(6):1190–1198.
- de Freitas Mussi RF, Petróski EL. Síndrome metabólica e fatores associados em quilombolas baianos, Brasil. *Ciência & Saúde Coletiva*. 2019;24(7):2481–2490.
- Mota MC, Silva CM, Balieiro LCT, et al. Social jetlag and metabolic control in non-communicable chronic diseases: a study addressing different obesity statuses. *Sci Rep*. 2017;7(1):6358.
- Gomes JN, Dias C, Brito RS, et al. Light therapy for the treatment of delayed sleep–wake phase disorder in adults: a systematic review. *Sleep Sci*. 2021;14(2):155–163.
- de Camargo FCF, DeMoura JR, Cepeda FX, et al. Photobiomodulation by low-level laser therapy in patients with obstructive sleep apnea: Study protocol clinical trial (SPIRIT compliant). *Medicine (Baltimore)*. 2020;99(12):e19547.
- Varella NC, Almeida RS, Nogueira LAC, et al. Cross-cultural adaptation of the Richards–Campbell Sleep Questionnaire for intensive care unit inpatients in Brazil: internal consistency, test–retest reliability, and measurement error. *Sleep Med*. 2021;85:38–44.
- Hirata RP, Aguiar IC, Nacif SR, et al. Observational study on efficacy of negative expiratory pressure test proposed as screening for obstructive sleep apnea syndrome among commercial interstate bus drivers—protocol study. *BMC Pulm Med*. 2011;11:57.
- American Diabetes Association. 8. Obesity management for the treatment of type 2 diabetes: Standards of Medical Care in Diabetes 2021. *Diabetes Care* 2021;44(Suppl. 1):S100–S110.
- ADA. Introduction: Standards of Medical Care in Diabetes—2022. *Diabetes Care*. 2022;45(Suppl.1):S1–S2.