

WHAT LITERATURE HAS TO SAY ABOUT HEMIBALLISM ASSOCIATED WITH HYPERGLYCEMIA: A SYSTEMATIC REVIEW

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Gabriela Ilias Bechara¹, Giovanna Lazzari², Laura Maria Diani³, Bruno Bedeschi Casagrande Fonseca⁴, Fernanda Cechinato Ferreira⁵, Aline Sobral Augusto⁶ and Paulo Diniz da Gama⁷

ABSTRACT

Background: Hyperosmolar Hemiballism (HH) is a rare and debilitating neurological condition characterized by involuntary, abrupt movements on one side of the body, often linked to lesions in the subthalamic nucleus. Objective: This review aims to synthesize the clinical, pathophysiological, and therapeutic aspects of HH, emphasizing recent scientific findings and diagnostic challenges. Methods: A literature review was conducted on PubMed and Cochrane databases using MeSH terms: "hemiballismus" and "hyperglycemia" or "hyperosmolarity," covering articles from the last 25 years in Portuguese, English, and Spanish. The PRISMA guidelines were followed for the selection of studies, focusing on article quality and relevance to the topic. Results: Most patients had the left putamen affected, with right-sided hemiballism being the most common movement. The prevalent comorbidity was pre-existing Type II Diabetes (80%). Blood glucose levels varied widely from 292 mg/dL to 1043 mg/dL, with most patients not presenting ketone bodies in their urine. Hyperglycemia correction was the primary treatment, leading to positive outcomes in all reported cases. Women represented 69.33% of the study population, and all patients were over 50 years old. Conclusion: Effective glycemic control markedly improves HH symptoms. Despite its rarity, HH is a critical differential diagnosis in elderly patients with Type II Diabetes, as appropriate diagnosis and treatment significantly influence clinical outcomes.

Keywords: Neurology. Hyperglycemia. Hemiballismus.

¹ Student at the PUC-SP School of Medicine and Health Sciences, Sorocaba, São Paulo, Brazil.
E-mail: gabrielaibechara@gmail.com

² Student at the PUC-SP School of Medicine and Health Sciences, Sorocaba, São Paulo, Brazil.

³ Student at the PUC-SP School of Medicine and Health Sciences, Sorocaba, São Paulo, Brazil.

⁴ Student at the PUC-SP School of Medicine and Health Sciences, Sorocaba, São Paulo, Brazil.

⁵ Student at the PUC-SP School of Medicine and Health Sciences, Sorocaba, São Paulo, Brazil.

⁶ Student at the PUC-SP School of Medicine and Health Sciences, Sorocaba, São Paulo, Brazil.

⁷ Professor, Faculty of Medicine and Health Sciences, PUC-SP, department of department, Sorocaba, São Paulo, Brazil

Responsible for: Conceptualization

ORCID: <https://orcid.org/0000-0003-2585-1074>

INTRODUCTION

Hyperosmolar Hemiballism (HH) is a rare and debilitating neurological condition characterized by involuntary and abrupt movements on one side of the body, caused by lesions in the subthalamic nucleus. This syndrome is an extremely rare form of dyskinesia, with only a few cases documented in the medical literature. Although the exact causes of HH are not yet fully understood, it is believed that changes in the regulation of blood glucose levels and dysfunction of the basal ganglia are involved in the development of this condition. Early and accurate diagnosis of HH is crucial to provide patients with appropriate treatment and improve their quality of life. In this article, we review the clinical, pathophysiological, and therapeutic aspects of HH, highlighting the latest scientific findings and the challenges in diagnosing and managing this rare syndrome.¹⁻³

Understanding Hyperosmolar Hemiballism remains a challenge due to its rarity and complexity. Advances in neuroimaging, especially functional magnetic resonance imaging and positron emission tomography, have contributed to a better characterization of the neuroanatomical changes associated with HH. Furthermore, recent studies have explored the role of neurotransmitters and metabolic regulation systems in the development of this condition, providing important insights for the development of more effective therapeutic strategies.⁴⁻⁶

Hyperglycemia is associated with long-term central and peripheral nerve damage; however, an increasingly documented cause in the literature is acute encephalic injury caused by a mostly non-ketogenic hyperglycemic state.^{4,5}

The clinical presentation of the disease is characterized by a previously non-diabetic elderly patient who begins with hemiballism or even unilateral chorea, along with glycemic peaks.⁵

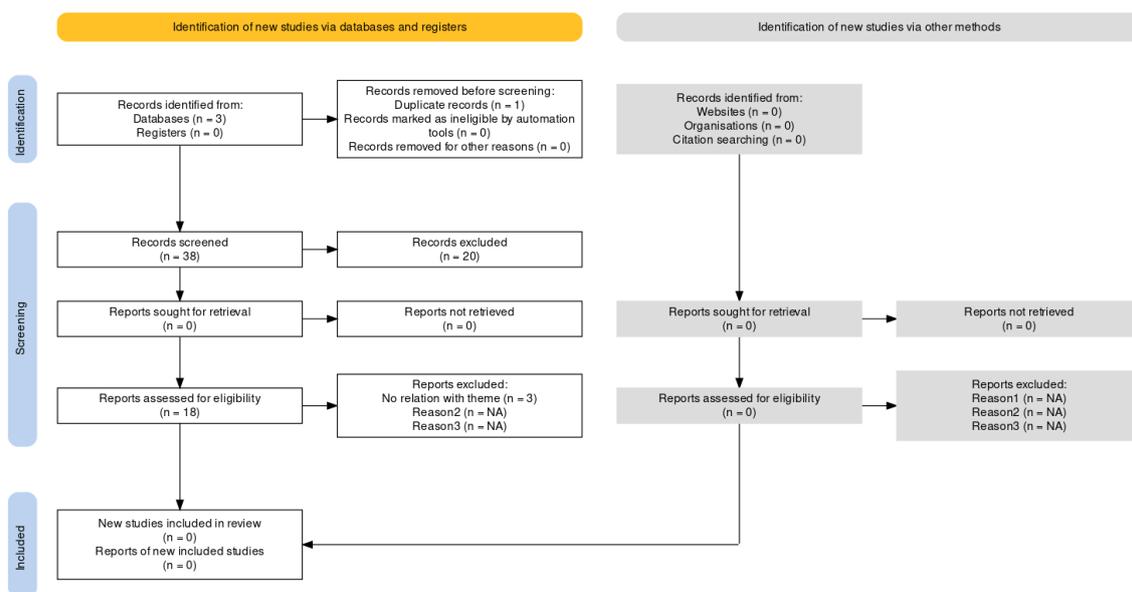
In imaging exams, there is unilateral hyper signal in the basal ganglion contralateral to the symptom.⁷⁻¹¹ However, diagnostic methods are still a point of discussion. The lack of uniform diagnostic criteria for HH can lead to delays in diagnosis and treatment initiation. It is crucial to establish clear guidelines for diagnosis, including clinical, neurological, and neuroimaging criteria, to improve diagnostic accuracy and facilitate early identification of patients.¹²⁻¹⁴ In summary, Hyperosmolar Hemiballism represents a significant clinical challenge due to its rarity and the lack of comprehensive understanding of its underlying mechanisms.

Progress in this area will not only improve the quality of life for patients with HH but also contribute to our overall understanding of movement disorders and rare neurological conditions. 7,15,16

METHOD

A literature review was conducted on the PubMed and Cochrane platforms using the MeSH terms: "hemiballismus" and "hyperglycemia" or "hyperosmolarity," covering articles from the last 25 years in Portuguese, English, and Spanish.

A PRISMA analysis was performed on the selected studies. The selection criteria were the quality of the article and its relevance to the topic of the work. In these studies, the following were evaluated and compared: age at symptom onset, treatment, outcome of the condition, previous diseases, sex, affected side clinically, and findings on imaging exams.



RESULTS

Most patients had the left side of the putamen affected, and the most common movement was right-sided hemiballism.

The most common comorbidity was pre-existing Type II Diabetes.

The lowest blood glucose level was 292 mg/dL and the highest was 1043 mg/dL.

Most patients did not have ketone bodies in their urine.

All patients had hyperglycemia correction as the main line of treatment, and all reported outcomes were positive.

The study included 69.33% women and 30.77% men.

All evaluated patients were over 50 years old.

Reference	Side affected (image)	Movement	Cetonic bodies	HB1aC	Glicemia (mg/dL)	Age	Sex	Previous diseases	Treatment	Outcome
Balasubramanyam N,2011	Left	Hemiballismus	-	11,5	432	60	M	T2DM	Glicemia control	Complete remission
Gomes MF,1992	Bilateral	Hemiballismus	NI	NI	462	80	M	T2DM, Hypertension	Glicemia control	Complete remission
Isayil I,2022	Left	Hemiballismus	+	NI	1043	58	M	T2DM, Hypertension, Acute renal injury	Glicemia control	Complete remission
Katija Knight A,2021	Right	Hemiballismus	NI	14,5	1035	85	F	NI	Glicemia control	Complete remission
Bhagwat NM,2013	Left	Hemiballismus	-	13,5	650	71	F	T2DM	Glicemia control	Complete remission
Abud LG,2016	Left	Hemiballismus	NI	NI	831	82	F	NI	Glicemia control	Complete remission
Shobha N,2006	Left	Hemiballismus	-	NI	292	51	F	T2DM	Glicemia control	Complete remission
Shobha N,2006	Left	Hemiballismus	NI	NI	543	61	F	T2DM	Glicemia control	Complete remission
Milburn-McNulty,2012	Bilateral	Seizures and hemiballismus	NI	NI	450	83	F	T2DM	Glicemia control	Complete remission
Valend R, 2012	Right	Ballismus	NI	13	NI	Elderly	F	T2DM	Glicemia control	Complete remission
Lin YC,2012	Bilateral	Hemiballismus	-	13,5	816	78	F	NONE	Glicemia control	Complete remission
Blaet J, 2014	Left	Hemiballismus	NI	12,2	984	66	F	T2DM	Glicemia control	Complete remission
Rodrigues RK, 2019	Left	Hemiballismus	NI	9,9	330	68	F	T2DM, Hypertension	Glicemia control, antipsychotics	Low residual hemiballismus
de Maria PMS, 2015	Right	Hemiballismus	NI	NI	600	61	F	T2DM	Glicemia control, antipsychotics	Parcial remission
Nunes RF, 2014	Right	Hemaballismus	NI	NI	586	75	F	T2DM, Hypertension	Glicemia control	Complete remission

DISCUSSION

It was highlighted that most patients had the left side of the putamen affected. This asymmetry may suggest a possible correlation between the location of the lesion and the observed symptoms, especially considering the more common right-sided hemiballismus. Pre-existing Type II diabetes was the most prevalent comorbidity among the reports (80%), emphasizing the importance of considering metabolic factors in patients with

movement disorders related to the nervous system.

The wide range in blood glucose levels, from 292 mg/dL to 1043 mg/dL, underscores the need for strict glycemic control in these patients. This aspect may also indicate a possible relationship between the severity of hyperglycemia and clinical presentation.

The fact that most patients did not have ketone bodies in their urine suggests that the observed hyperglycemia may be more associated with insulin resistance than with a ketoacidotic state. This may have important implications for the selection and adaptation of therapeutic strategies.

The uniformity in the choice of the main treatment line, focused on correcting hyperglycemia, is noteworthy. The positive outcomes reported indicate the effectiveness of this specific therapeutic approach in improving symptoms and managing the condition, highlighting the importance of appropriate treatment if hyperosmolar hemiballism is detected.

There was also an attempt to treat symptoms with antipsychotics, mainly haloperidol, without response. These are part of the treatment for non-hyperosmolar hemiballism and tics, major differential diagnoses of hyperosmolar hemiballism. (19,20). The predominance of women (80%) compared to men (20%) suggests a possible gender predisposition to this specific condition. Furthermore, the fact that all patients were over 60 years old indicates that the condition may be associated with aging.

CONCLUSION

The reduction and control of blood glucose levels completely improved the symptoms of the observed patients. Therefore, although a rare disease, it is a relevant condition and an important differential diagnosis, especially in elderly patients with pre-existing Type II diabetes, as its proper diagnosis and treatment alter the clinical outcome of the patient.

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