

## AN AETIOPATHOLOGICAL STUDY OF STHAULYA WITH SPECIAL REFERENCE TO ASHTADOSHA AND OBESITY- A LITERARY REVIEW

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Article Received on 15 Feb. 2026,  
Article Revised on 05 March 2026,  
Article Published on 16 March 2026,

<https://doi.org/10.5281/zenodo.19085564>

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**How to cite this Article:** <sup>1</sup>Dr. Anandana JR., <sup>2</sup>Dr. Shailendra Kumar Singh (2026). An Aetiopathological Study Of Sthaulya With Special Reference To Ashtadosha And Obesity- A Literary Review. World Journal of Pharmaceutical Research, 15(6), 1533-1545. This work is licensed under Creative Commons Attribution 4.0 International license.

### ABSTRACT

Obesity, defined by abnormal or excessive fat buildup that affects health, closely connects with Sthaulya, mentioned by *Acharya Charaka* under *Ashtanindita Purusha (Ch.Su.21)*. This condition predominantly involves *Medovaha Srotas* and manifests through the ancient *Ashtadosha, Ayushya-hrasa, Javoparodha, Krichchha-vyavayata, Daurbalya, Daurgandhya*, etc., which reflect modern clinical effects such as shorter lifespan, lethargy, sexual dysfunction, weakness, and body odour. The *Samprapti* of *Sthaulya* includes *Kapha-Medovaha sanga, Medodhatu-agnimandya*, and a *Tridoshic* pathological cycle, finally causing *Ashtadosha* and related comorbidities. Currently a global epidemic, obesity has tripled from 1975 to 2020, affecting over 2.6 billion people globally, with India experiencing significant increases due to urbanisation, expected to reach 450 million by 2050. The incidence in metropolitan areas higher than that in rural regions due to sedentary lifestyles and overnutrition.

**KEYWORDS:** *Sthaulya, Obesity, Santarpanjanya Vyadhi, Ashtadosha, Meda Dhatu, Kapha Dosh.*

## INTRODUCTION

*Sthaulya*, which is defined by excessive *Meda Dhatu* accumulation affecting body functions that is closely mirrors modern obesity. It is a chronic condition where adiposity negatively impacts health. This literary review explores its aetiopathology with special reference to *Ashtadosha*, focusing on *Nidana*, *Samprapti*, and difficulties as documented in traditional sources.

*Acharya Charaka* lists *Ati-Sthula* amongst *Ashtanindita Purusha* (*Cha.Su.21/4*), including eight defects (*Ashtadosha*) such *Ayushya Hrasa* and *Javoprodha* that aggravate its clinical severity. *Sushruta* relates *Sthaulya* to *Dhatvagni Mandya* causing *Medovaha Srotorodha* (*Su.Su.15*), and *Vagbhata* elaborates *Ama*-mediated *Dhatu Parinama* disruption resulting to disproportionate fat deposition. *Madhava Nidana* and *Yogaratanakara* emphasize *Medoroga* pathophysiology through *Kapha-Medovridhi* and *Tridoshic* vitiation. Considering the obesity epidemic in India, interpreting *Sthaulya* via its *Ashtadosha*-mediated *Samprapti* connects *Ayurvedic* principles with present-day metabolic science, and suggests appropriate therapeutic strategies.

## AIMS AND OBJECTIVES

- To study *Nidana Panchaka* and *Samprapti Ghataka* of *Sthaulya* from classical literature (*Brihatrayi*, *Madhava Nidana*) with specific reference to *Ashtadosha*.
- To correlate *Ashtadosha* (*Ayushya Hrasa*, *Javoprodha*, etc.) with modern obesity comorbidities (CVD, T2DM, metabolic syndrome) through clinico-pathological study.
- To study the disease mechanisms of *Medovaha Srotas* (*Dhatvagnimandya*, *Srotorodha*, *Kapha-Medovridhi*) and their relevance in contemporary clinical practice.

## MATERIAL AND METHODS

This literary review carefully examines classical *Ayurvedic Samhitas* (*Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya/Sangraha*, *Madhava Nidana*, and *Yogaratanakara*) alongside relevant recent literature on obesity epidemiology and comorbidities.

## AYURVEDA REVIEW

**Etymology-** The word *sthaulya* is derived from *Mula Dhatu* “*Sthu*” with suffix “*Ach*” *pratyaya* which stands probably for bulky or big or thick.

स्थूलस्य भाव स्थौल्यम्- (वाचस्पत्यम्) (6/5358)

स्थूलयति ते च अतः स्थौल्यम् (वाचस्पत्यम्) (6/5358)

Here the word *sthaulya* means heaviness of the body.

स्थूल पारेबृंहणे (अमरकोष नानार्थ वर्ग-204)

This definition emphasizes on excessive growth of the body.

स्थूलयति वर्धते उदरादि वृद्ध्या य स स्थूल :{B.P. 39}

A person who experiences heaviness and excessive bulkiness of the body, particularly due to increased growth in the abdominal region, is referred to as “*Sthula*”, and the condition itself is known as “*Sthaulya*.”

According to *Amarkosha*, the **synonyms** of *Sthula* include *Vipula*, *Pina*, *Pinvi*, and *Pivara*, all of which denote a state of over-nourishment or excessive bodily nutrition.

## DEFINITION

मेदोमांसातिवृद्धत्वाञ्चलस्फिगुदरस्तनः ।

अथोपचयोत्साहो नरोऽतिस्थूल उच्यते ॥(Ch. Su. 21/8-9)

A person exhibiting an excessive and abnormal accumulation of *Medodhatu* (fat tissue) along with *Mamsadhatu* (muscle tissue) develops a pendulous appearance of the buttocks, abdomen, and breasts. This increase in body bulk is disproportionate, as it is not accompanied by a corresponding rise in physical strength or energy.

**According to WHO**, Obesity is a chronic, complex disease characterized by abnormal or excessive fat accumulation that presents a risk to health. "WHO classifies overweight and obesity based on Body Mass Index (BMI).

- Overweight is defined as a BMI greater than or equal to 25.
- Obesity is defined as a BMI greater than or equal to 30.

## CLASSIFICATION

In the case of *Sthaulya* (obesity), the need for a proper classification is particularly significant to facilitate individualized management. However, a definite and systematic classification of *Sthaulya* is not explicitly described in the classical *Ayurvedic* texts. Despite this, authoritative compendiums such as the *Aṣṭanga Saṃgraha*, *Aṣṭanga Hṛdaya*, and *Sarngadhara Saṃhita* have provided limited insights into the classification of *Sthaulya*, which serve as the foundational references for understanding its gradations and clinical variations.

*Charaka* : 1. *Sthula*

2. *Atisthula*

*Sushruta* : 1. *Sthaulya*

2. *Medoroga*

*Vagbhata* : 1 . *Adhik*

2. *Madhya*

3. *Hina*

*Sharangadhara* : 1. *Medodosha*

## **NIDAN PANCHAK**

In *Ayurveda*, *Nidana Panchaka* refers to the five essential tools of diagnosis used to understand the nature, origin, and progression of any disease (*Vyadhi*). It helps the physician (*Vaidya*) in both disease identification and treatment planning.

The five components are.

*Nidana* (Causative Factors)

*Purvarupa* (Prodromal Symptoms)

*Rupa* (Cardinal Symptoms)

*Upashaya* (Relieving and Aggravating Factors)

*Samprāpti* (Pathogenesis)

## **NIDANA (ETIOLOGY)**

*Nidana* refers to the variables that cause a disease's manifestation. The *Acharyas* of *Ayurveda* elaborated on multiple etiological causes of *Sthaulya Roga* in the traditional *Samhitas*, spanning various areas of life that influence the body both outwardly and inside. According to the *Charaka Samhita*, inherited predisposition (*Beeja Dosha*), nutritional, lifestyle (regiminal), and psychological factors all have a part in the development of *Sthaulya*. The majority of these causes are deemed external in origin. Aside from these, any elements that cause vitiation of *Meda* (fat tissue) and *Shleshma* (*Kapha*) might be considered as causative agents of *Sthaulya*. *Acharya Sushruta* and *Vagbhata* have provided additional information about the endogenous causes of this illness.

According to the *Ashtanga Samgraha*, *Dhatvagni Mandya* (reduced metabolic activity of the tissue fire) is the key etiological cause in the aetiology of *Sthaulya*, along with various other contributing factors. In addition to other considerations, *Acharya Charaka* identified *Beeja*

*Dosha* (hereditary deficiency) as one of the major culprits. The subsequent texts have faithfully followed the explanations of the *Brihatrayi* regarding this concept.

In the context of *Sthaulya*, **exogenous causes** include *Meda*-potentiating diet and lifestyle practices, while **endogenous causes** encompass disturbances in *Dosha*, *Dhatu*, *Mala*, and *Srotas*.

A fundamental *Ayurvedic* principle states that any substance promotes those ***Bhavas*** (**qualities**) which it inherently possesses. These are classified into three types.

- ***Dravya Samanya*** – similarity in substance,
- ***Guna Samanya*** – similarity in qualities, and
- ***Karma Samanya*** – similarity in actions.

Based on this concept, ***Dravyas*** such as *Mamsa* (meat) possessing ***Sheeta*** (cold), ***Snigdha*** (unctuous), and ***Guru*** (heavy) *Gunas*, and ***Karmas*** such as *Divaswapna* (daytime sleep), *Avyayama* (lack of exercise), and *Sukhasana* (sedentary habits), all contribute to the increase of *Meda Dhatu* in the body.

The various *Nidanas* described by different *Acharyas* for *Medoroga* (obesity) can be broadly categorized into four groups.

#### **1-Aharatmaka** (dietary causes)

- *Atibhojan*
- *Guru Aharsevan*
- *Madhura Aharsevan*
- *Sheeta Aharsevan*
- *Snigdha Aharsevan*
- *Navanna sevan*
- *Atimamsa sevan*
- *Shleshma Aharsevan*

#### **2-Viharatmaka** (lifestyle-related causes)

- *Avyayam*
- *Diwaswapna*
- *Avyavay*

- *Sukhshaiyya*
- *Snan sewan Manas*

### **3-Manas Vyaparatomaka** (psychological causes)

- *Achintan*
- *Priyadarshan*
- *Manasonivrutti*
- *Saukhyena*
- *Harshaniyatvat*

### **4-Others**

- *Amarasa*
- *Snigdha Madhura Basti sewan*
- *Taila abhyanaga*
- *Beejadoshaswabhawat*

## **PURVARUPA OF STHAULYA**

The *Purvarupa* (premonitory symptoms) of *Sthaulya* have not been explicitly mentioned in any of the classical Ayurvedic texts. However, as suggested by *Acharya Charaka*, the *Medovaha Srotodushti Lakshanas*—which are also described as the *Purvarupa of Prameha* (*Ch. Su. 28/18*)—can be correlated and considered as the *Purvarupa* of *Sthaulya*. The rationale behind this correlation lies in the similarity of pathogenesis (*Samprapti*) between *Prameha* and *Sthaulya*.

In both conditions, *Bahudrava Shleshma* and *Abaddha Meda* are the key morbid factors involved (*Ch. Ni. 4/8*). Therefore, the *Shleshma Sanchaya* and *Medodusti Lakshanas* described in the context of *Prameha* and *Medovaha Srotodushti* may be interpreted as the *Purvarupa* of *Sthaulya*.

Hence, the clinical features indicative of *Meda Dushti*—such as *Atinidra* (excessive sleep), *Tandra* (drowsiness), *Alasya* (laziness), *Visra Shariragandha* (foul body odor), *Angagaurava* (heaviness of body), and *Shaithilya* (flaccidity of muscles)—can be considered as the probable *Purvarupa* of *Sthaulya*.

## ROOP AND ASHTADOSHA

The *Ashtadosha* are eight specific defects or complications described in *Ayurvedic* classics for *Sthaulya* (obesity), where "*dosha*" refers to a detrimental change or pathology, not the *tridosha* humors. These defects provide a clinical framework to assess the severity and prognosis of obesity. In modern medicine, many of these map onto complications of obesity such as cardiovascular risk, metabolic syndrome, decreased functional capacity, and associated psychosocial effects.

### The Eight Defects (*Ashtadosha*) of *Sthaulya*:

अतिस्थूलस्य तावदायुषो हासो ज्वोपरोधः [१] कृच्छ्रव्यवायता दौर्बल्यं दौर्गन्ध्यं स्वेदाबाधः क्षुदतिमात्रं पिपासातियोगश्चेति भवन्त्यष्टौ दोषाः | (Ch.Su. 21/4)

These include

- *Ayusya Hrasa* (reduced lifespan)
- *Javoprodha* (reduced agility or slow actions)
- *Kricha Vyavayata* (difficulty in sexual intercourse)
- *Daurbalya* (weakness)
- *Daurgandhya* (bad body odor)
- *Svedabadha* (excessive sweating)
- *Ksudha Atimatrata* (excessive hunger)
- *Pipasa Atiyoga* (increased thirst)

## UPASHAYA -ANUPASHAYA

In *Ayurvedic* literature, *Upashaya* and *Anupashaya* are not elaborated as independent topics but are **implied within the diagnostic principles**. *Upashaya* denotes measures that **alleviate disease symptoms**, whereas *Anupashaya* refers to factors that **exacerbate them**. These concepts serve as **clinical diagnostic aids**, helping to determine the **dosha predominance and nature of the disease** through the patient's response to specific *Ahara*, *Vihara*, or *Aushadha*.

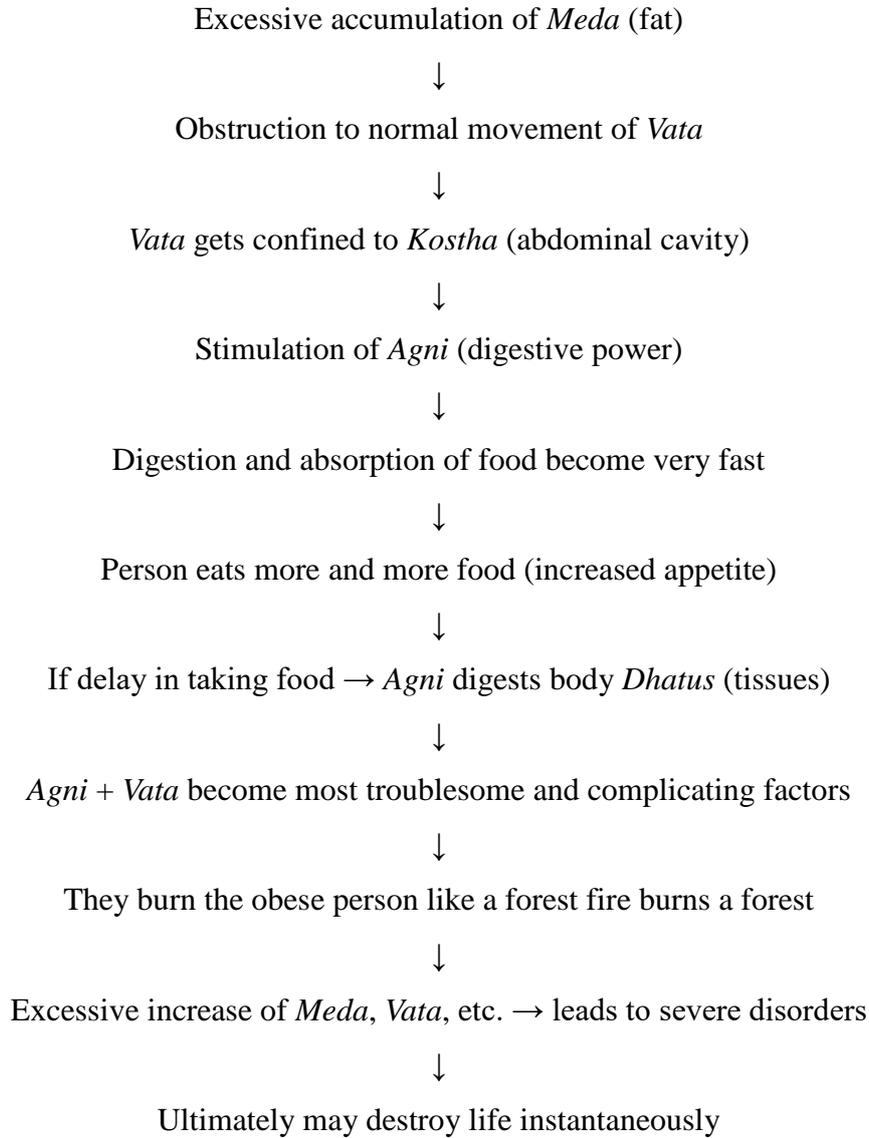
## SAMPRAPTI

मेदसाऽऽवृत्तमार्गत्वाद्वायुः कोष्ठे विशेषतः । चरन् संक्षुक्षयत्यग्निमाहारं शोषयत्यपि ॥५॥

तस्मात् स शीघ्रं जरयत्याहारं चातिकाङ्क्षति । विकारांश्चाश्रुतेघोरान् कांश्चित्कालव्यतिक्रमात् ॥६॥

एतावुपद्भवकरौ विशेषादग्निमारुतौ । एतौ हि दहतः स्थूलं वनदावो वनं यथा ॥७॥

मेदस्यतीव संवृद्धे सहसैवानिलादयः । विकारान्दारुणान् कृत्वा नाशयन्त्याशु जीवितम् ॥८॥  
(Ch.Su.21/5,6,7,8)



### Samprapti Ghataka

Udabhavasthana - Amasaya

Sanchar - Rasayani

Adhithana - Whole body specifically *udara*,  
*sphika*, *stana*

*Vyakti* - Whole body

*Dosha* - *Tridosha*, *Samanavayu*, *Apanavayu*,

*Vyanvayu*, *Pachak pitta*, *Kledakkapha*,

*Dushya* - *Rasa* and *Meda*

*Srotasa* - *Annavaha*, *Rasavaha*, *Mamsavaha*,

*Medovaha*

*Srotodushti - Sanga, Vimargagaman, Avarana*

*Agnimandya - Medodhatvagnimandya, Jatharagnimandya*

*Ama - Medodhatugata*

*Pradhanata - Dhatvagnimandya, Santarpanjanya*

*Swabhava - Chirakalin*

## **SADHYA-ASADHYATA**

Most *Acharyas* have described *Sthaulya* as having a bad prognosis, and *Sahaja Sthaulya* (hereditary obesity) is considered *Asadhya* (incurable). *Acharya Charaka* stated that treating *Sthaulya* is more difficult than *Karsya*. He mentions that if an obese person is not properly managed, he may die due to excessive hunger, thirst, and related complications (*Ch. Su. 21/8*). Moreover, *Charaka* also regards hereditary diseases (*Sahaja Vyadhi*) as *Asadhya* (*Ch. Chi. 6/57*); thus, *Sahaja Sthaulya* is considered incurable.

## **MODERN REVIEW**

### **DEFINITION**

Obesity / Overweight constitutes a chronic, relapsing disease characterized by excessive adiposity impairing health WHO defines overweight and obesity as “abnormal or excessive fat accumulation that presents a risk to health.” It is a chronic, relapsing progressive disease defined by excessive adiposity that may impair health.<sup>[17]</sup> The WHO defines overweight as a BMI greater than or equal to 25 kg/m<sup>2</sup>, while obesity is a BMI greater than or equal to 30 kg/m<sup>2</sup>.

### **EPIDEMIOLOGY**

Global incidence tripled between 1975-2020 (>2.6 billion afflicted) and predictions estimate 4 billion overweight/obese by 2035. India reflects the crisis and Lancet (2025) expects 218 million obese men, 231 million women by 2050.

Etiopathogenesis

Non-modifiable factors.

- Genetics: Leptin-melanocortin pathway defects (MC4R mutations), FTO gene polymorphisms, monogenic obesity (Prader-Willi).
- Hypothalamic obesity: Craniopharyngioma, gliomas disrupting ventromedial/arcuate nuclei.

- Ethnic predisposition: South Asians exhibit higher visceral fat at equivalent BMI.
- Modifiable factors:
- Energy imbalance: Hypercaloric intake (obesogenic diet), physical inactivity (28% global adults).
  - Sleep deprivation: Reduces leptin, elevates ghrelin/cortisol impairing glucose homeostasis.
  - Gut microbiome: Firmicutes: Bacteroidetes ratio shift enhances energy harvest.
  - Endocrine disruptors: Bisphenol A, phthalates disrupting adipocyte function.
  - Iatrogenic: Antipsychotics, glucocorticoids, insulin therapy.
  - Psychosocial: Chronic stress promoting abdominal fat deposition.

### CLASSIFICATION

- 1-Based on Fat Mass / Percent Body Fat -Measured by DEXA/BIA; mainly research-based.
- 2-Based on Body Mass Index (BMI) - Weight adjusted for height; most commonly used.
- $$\text{BMI} = \frac{\text{kilograms}}{\text{meters}^2}$$

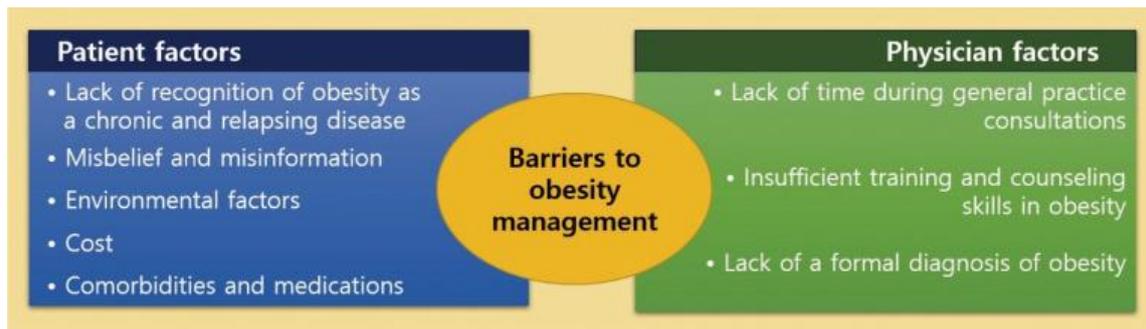
Category	BMI (kg/m <sup>2</sup> )
Underweight	< 18.5
Normal weight	18.5 – 24.9
Overweight	25.0 – 29.9
Obese (Class I)	30.0 – 34.9
Obese (Class II)	35.0 – 39.9
Obese (Class III)	≥ 40.0

- 3-Based on Fat Distribution (Central Obesity)- Assessed by waist circumference; best predictor of metabolic risk.

### Health consequences

Obesity can have a negative effect on one's health, like Type 2 diabetes, musculoskeletal diseases including osteoarthritis, endometrial, breast, and colon cancers, and cardiovascular disease (mainly heart disease and stroke) are all severe health implications of carrying excess fat. These illnesses result in significant impairment and early fatality.

## Challenges



## DISCUSSION

The aetiopathogenesis of *Sthaulya* reveals significant connections between classical *Ayurvedic* concepts and modern obesity understanding. *Nidana Panchaka* characteristics-*atibhojana* (overeating), *avyayama* (sedentary lifestyle), and *madhura-sheeta ahara* (heavy-sweet foods) are precisely align with modern modifiable risk factors causing India's urban obesity epidemic, where prevalence triples rural rates.

*Sthaulya*'s clinical significance are the *Ashtadosha*, functioning as both diagnostic markers and prognosis indicators. *Ayushya Hrasa* is closely associated with obesity's demonstrated 5-20 year death impact. *Javoprodha* and *Daurbalya* reflect degenerative obesity's functional deterioration, and *Kshudha Atimatrata* exhibits leptin resistance-induced hyperphagia. *Krichchha Vyavaya* correlates obese breathlessness and sexual dysfunction. *Daurgandhya* can be interpreted as the manifestation of altered metabolic processes leading to abnormal body odour. *Samprapti Ghataka* analysis reveals pathophysiological advanced: *Kapha pradhana Medovridhi* creates *Medovaha srotorodha*, trapping *vata* and hyperactivating *Jatharagni*. This causes the classic hunger-fatigue cycle reflecting metabolic syndrome's insulin resistance-hyperinsulinemia loop. *Dhatvagni mandya* at tissue level exactly reflects the usual abdominal fat accumulation characteristic of Asian Indians.

Classical-modern linkages further enhance the understanding of *Sthaulya* like *Sahaja Sthaulya* resembles monogenic obesity, gut microbiome imbalance matches *Ama* production and exposure to endocrine disruptors fits with the idea of *Beeja Dosha*. The description of *Ashtadosha* provides a more comprehensive clinical assessment beyond BMI alone, aiding in individualised therapeutic planning. This literary synthesis validates *Ayurveda's* systematic aetiopathological framework, offering practical insights into contemporary metabolic disorders through an *Ashtadosha*-guided approach.

## CONCLUSION

That literary review highlights the comprehensive aetiopathogenesis of *Sthaulya* as explained through the classical concepts of *Nidana Panchaka* and *Samprapti Ghataka*. The description of *Ashtadosha* serves as an important clinical guide, reflecting both disease severity and prognosis. Symptoms such as *Ayushya Hrasa*, *Javoprodha*, and *Kshudha Atimatrata* etc show meaningful correlations with the reduced life expectancy, functional limitation, and increased appetite observed in obesity. These parallels reinforce the clinical relevance of *Acharya Charaka's Ashtanindita Purusha* concept in understanding the systemic impact of obesity.

## REFERENCES

1. Charaka. (2016). *Charaka Samhita* (Dridhabala's edition, English translation, Vols. 1–4; P. V. Sharma, Trans.). Chaukhamba Orientalia. (Original work published ca. 100 BCE).
2. Sushruta Samhita Sutrasthana (24), Edited By Kaviraj Ambika Dutta Shastri, Chaukhamba Publication Varanasi.
3. *Ashtanga Hridaya*, (Kaviraj Atrideva Gupta, Ed.). Chaukhamba Sanskrit Sansthan.
4. *Ashtanga Sangraha*, (Kaviraj Atrideva Gupta, Ed.). Chaukhamba Sanskrit Sansthan.
5. Bhaishajya Ratnavali - Edited by Motilal Banarasidas, Delhi, 1976.
6. Bhavaprakasha Nighantu – Bapalal Vaidya.
7. COMPREHENSIVE REVIEW ON THE ROLE OF AGNI IN HEALTH DISEASE AND AYURVEDIC THERAPEUTICS, Dr. Satender Rathee.
8. Singh, A. K. (n.d.). *A comparative study of Vidangadi Churna and some indigenous drugs in the management of Sthaulya (obesity)*.
9. Madhava Nidana By Vijayarakshita Commentary, Chaukhamba Varanasi.
10. World Health Organization. Obesity and overweight. WHO Fact Sheets, May 2025.
11. Kumar V, Abbas AK, Aster JC. *Robbins and Cotran Pathologic Basis of Disease*. 10th ed. Elsevier, 2020.
12. Bray GA, Bouchard C, Katzmarzyk PT, et al. *Handbook of Obesity*. 5th ed. CRC Press; 2024.
13. [www.science.org](http://www.science.org)
14. Review on understanding of *Astha Sthoulya Doshas* and *Sthoulya Lakshanas* Vardhaman Iraj1, Mahesh Hirulal2.
15. Purnell J. Q., R. F. Kenneth, Definitions, classification, and epidemiology of obesity, *Endotext*. (2018) MDText.com, Inc, South Dartmouth, MA, USA.

16. Bray G. A., Kim K. K., and Wilding J. P. H., Obesity: a chronic relapsing progressive disease process. A position statement of the World Obesity Federation, *Obesity Reviews*, 2017; 18(7): 715–723, <https://doi.org/10.1111/obr.12551>, 2-s2.0-85019131529.
17. Misra A., Ethnic-specific criteria for classification of body mass index: a perspective for Asian Indians and American Diabetes Association Position Statement, *Diabetes Technology & Therapeutics*, 2015; 17(9): 667–671,
18. The Lancet Gastroenterology Hepatology, Obesity: another ongoing pandemic, *The lancet. gastroenterology and Hepatology*, 2021; 6(6).
19. Barriers to Obesity Management: Patient and Physician Factors Tae Nyun Kim<sup>1,\*</sup>
20. <https://pmc.ncbi.nlm.nih.gov/> Causes of obesity: a review Beenish Masood<sup>A</sup>, Myuri Moorthy<sup>B</sup>
21. Definitions, Classification, and Epidemiology of Obesity Jonathan Q. Purnell, MD. <https://www.ncbi.nlm.nih.gov/>
22. A CRITICAL REVIEW ON STHAULYA (OBESITY) Dr. Amir Khan\* 1 and Dr. Ajay Kumar Gupta2.