सत्यमेव जयते
Ministry of Ayush
Government of India

STANDARD TREATMENT GUIDELINES
ON
MANAGEMENT OF METABOLIC DISORDERS
IN
SIDDHA SYSTEM OF MEDICINE

AYUSH VERTICAL
DIRECTORATE GENERAL OF HEALTH SERVICES
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राज्य मंत्री (स्वतंत्र प्रभार)
आयुष मंत्रालय और
राज्य मंत्री
स्वास्थ्य एवं परिवार कल्याण मंत्रालय
भारत सरकार

आज़ादी का अमृत काल

सत्यमेव जयते

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Government of India

देश का प्रकृति परीक्षण अभियान

स्वयं और समाज के लिए योग
Yoga for self and society

प्रतापराव जाधव
PRATAPRAO JADHAV

MESSAGE

India has a rich legacy of traditional healthcare systems that offer time-tested approaches to health and well-being. In recent years, there has been a growing recognition of the role Ayush can play in addressing contemporary health challenges through holistic approach.

The release of the Standard Treatment Guidelines (STGs) for Metabolic Disorders in respective Ayurveda, Siddha, Unani, and Homoeopathy (ASU&H) systems, with the inclusion of Yoga, marks another significant milestone in our efforts to mainstream Ayush systems within India's healthcare landscape. Building on the success of STGs for musculoskeletal disorders, this initiative underscores our commitment to integrating traditional wisdom with modern scientific validation, enhancing healthcare quality and accessibility.

These guidelines offer evidence-based recommendations for the prevention and management of prevalent conditions such as Diabetes Mellitus, Dyslipidaemia, Obesity, Gout and Non-Alcoholic Fatty Liver Diseases (NAFLD), thereby equipping healthcare practitioners with structured, holistic approaches to patient care.

I am confident that these STGs will help to improve clinical outcomes, promote integrative healthcare models, and reinforce the relevance of Ayush systems in addressing the growing burden of lifestyle-related disorders in our nation.

I heartily appreciate the efforts and congratulate all the experts, institutions, and stakeholders who have contributed to the development of these comprehensive guidelines.

(Prataprao Jadhav)

25 April,2025
New Delhi

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आज़ादी का अमृत महोत्सव

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FOREWORD

Metabolic disorders represent a growing public health concern in India, contributing significantly to the national burden of non-communicable diseases. Addressing these conditions calls for a comprehensive, patient-centric approach—one that not only addresses symptoms but also fosters long-term health and well-being. Ayush systems hold immense potential in the prevention and management of lifestyle-related disorders, including Diabetes Mellitus, Dyslipidemia, Obesity, Gout and Non-Alcoholic Fatty Liver Disease (NAFLD).

Recognizing this potential, the Ayush vertical under the Directorate General of Health Services (DGHS) has undertaken a commendable step in formulating Standard Treatment Guidelines (STGs) for metabolic disorders across Ayurveda, Siddha, Unani, and Homeopathy systems. These guidelines have been developed through an extensive process of expert consultations, critical review of classical texts, and incorporation of contemporary clinical evidence. The STGs aim to support practitioners in delivering consistent, safe, and effective care through Ayush systems, promoting standardization and quality assurance in clinical practice.

I hope these guidelines will not only lead to improved clinical outcomes but also contribute meaningfully to realizing the vision of integrative healthcare in India. By establishing uniform standards of practice, they pave the way for generating high-quality evidence. This, in turn, can support the global pursuit of wellbeing by addressing one of today's most pressing healthcare challenges—non-communicable diseases—through the holistic and time-tested approaches of Ayush. As we move ahead, such initiatives will continue to affirm the evolving and vital role of Ayush in tackling lifestyle-related health issues and in shaping a more holistic, inclusive, and sustainable healthcare system.

I congratulate the teams of experts, institutions, and stakeholders whose dedication and collaborative efforts have made this initiative possible.

(**Rajesh Kotecha**)

New Delhi.
23.04.2025

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स्वास्थ्य सेवा महानिदेशक
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स्वास्थ्य सेवा महानिदेशालय
Government of India
Ministry of Health & Family Welfare
Directorate General of Health Services

Foreword

In the past two decades, there has been a resurgence of traditional medicine globally, including the Ayush system in India. Advocates of the Ayush system of medicine, including practitioners and scientists, have consistently highlighted its personalized predictive approach and diversity of Ayush formulations and therapies. As we traverse the terrain of healthcare, necessity of a holistic treatment approach becomes increasingly important. Ayush system of medicine, with its centuries-old wisdom and emphasis on natural healing modalities, offers a distinct perspective on managing metabolic disorders. Its approach, centered on restoring an equilibrium of mind, body, and spirit, complements modem medicine, thereby widening the care available to patients

Publication of Standard Treatment Guidelines (STGs) on Metabolic Disorders by Ayush system of medicine represents a significant footstep towards our commitment to comprehensive healthcare for our citizens. These guidelines, curated by experts in the field, are a testament to efficacy and relevance of Ayush in addressing public health. In order to ensure clarity and accessibility for all stakeholders, conventional terminology has been seamlessly integrated throughout the document. Each disease condition is introduced alongside its corresponding ICD classification, providing a clear clinical narrative that enhances understanding for all stakeholders.

I appreciate the Ayush vertical of this directorate, as well as contributions of various experts from National Institutes and Research Councils under the Ministry of Ayush, in bringing forth this initiative. Additionally, my gratitude to experts from medicine department of LHMC for their invaluable support in incorporating modern perspective on metabolic disease conditions into the STGs. By bridging gaps between traditional and modern medicine, we attempt to foster inclusivity and collaboration between various systems of medicine for benefitting patients.

I sincerely hope that these guidelines will serve as a valuable resource for Ayush healthcare practitioners, empowering them to deliver optimal care to individuals afflicted with metabolic diseases.

(Atul Goel)

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ABBREVIATIONS

ACR	Albumin- to- Creatinine Ratio
ACR	American College of Rheumatology
ADA	Adenosine Deaminase Test
ALT	Alkaline Transaminase
Apo B	Apolipoprotein B
APRI	Aspartate Aminotransferase to Platelet Ratio Index
ASCVD	Atherosclerotic cardiovascular diseases
ASMD	Acid sphingomyelinase deficiency
AST	Aspartate Aminotransferase
BARD	Body Mass Index, Aspartate Aminotransferase/ Alkaline Transaminase(AST/ALT) ratio and Presence of Diabetes
BD	Twice a day
b-hCG	Beta-human chorionic gonadotropin
BMI	Body Mass Index
CAD	Coronary Artery Disease
CAP	Controlled Attenuation Parameter
CDT	Carbohydrate-deficient transferrin
CKD	Chronic Kidney Disease
CRP	C- Reactive Protein
CT scan	Computed Tomography
CVD	Cardiovascular disease
DALY	Disability-adjusted life year
DASH	Dietary Approaches to Stop Hypertension-style diet
DCS	Double contour sign
DECT	Dual-energy Computed Tomography
DIP	Distal Interphalangeal Joint
DXA	Dual Energy X-Ray absorptiometry
ECG	Electrocardiogram
ESR	Erythrocyte Sedimentation Rate
FAST	FibroScan- aspartate aminotransferase
FBS	Fasting blood glucose
FH	Follicle Stimulating Hormone
FPG	Fasting Plasma Glucose

FT4	Free Thyroxine
GFR	Glomerular Filtration Rate
HbA1c	Glycosylated Haemoglobin
HBsAg	Hepatitis B
HCC	Hepato cellular Carcinoma
HCG	Human Chorionic Gonadotropin
HDL	High Density Lipoprotein
HeFH	Heterozygous Familial Hypercholesterolemia
HELLP	Hemolysis, Elevated Liver enzymes and Low platelets
HLA-B27	Human Leucocyte Antigen B27
HOMA-IR	Homeostatic Model Assessment for Insulin Resistance
ICD	International Classification of Diseases
IFG	Impaired Fasting Glucose
IGT	Impaired Glucose Tolerence
kPa	Kilopascals
LAL	Lysosomal acid lipase
LDL	Low Density Lipoprotein
LDL-C	Low-density lipoprotein cholesterol
LFT	Liver Function Test
LH	Luteinizing Hormone
LSM	Liver Stiffness Measurement
MAFLD	Metabolic Dysfunction Associated Fatty Liver Disease
MEFIB	Magnetic Resonance Elastography plus Fibrosis - 4
MRCP	Magnetic Resonance Cholangiopancreatography
MRE	Magnetic Resonance Elastography
MRI	Magnetic Resonance Imaging
MS	Metabolic Syndrome
MSU	Monosodium Urate crystal
MTP	Metatarsophalangeal joint
MTTP	Microsomal Triglyceride Transfer Protein
MUFA	Monounsaturated Fatty Acid
NAFLD	Non-Alcoholic Fatty Liver Disease
NASH	Non-Alcoholic Steatohepatitis
NFHS	National Family Health Survey
NFS	BMI, diabetes status, AST/ALT ratio, platelet count, and albumin levels

Non-HDL-C	Non-High-Density Lipoprotein Cholesterol
OA	Osteoarthritis
OD	Once Daily
OGTT	Oral Glucose Tolerance Test
OHS	Obesity Hypoventilation Syndrome
OSA	Obstructive Sleep Apnea
PCOS	Polycystic Ovarian Syndrome
PUFA	Polyunsaturated Fatty Acid
RA factor	Rheumatoid Arthritis factor
RBSK	Rashtriya Bal Suraksha Karyakaram
RSSDI	Research Society for the Study of Diabetes in India
SF	Synovial Fluid
SM - S	Sphingomyelin
T2DM	Type 2 Diabetes Mellitus
TC	Total Cholesterol
TDS	To be taken three times a day
TG	Triglyceride
TSH	Thyroid Stimulating Hormone
USG	Ultrasonography
UTI	Urinary Tract Infection
VLDL	Very Low Density Lipoprotein
WAGR syndrome	Wilms tumor, Aniridia, Genitourinary malformations and a Range of developmental delays
WC	Waist Circumference
WHO	World Health Organisation
WHR	Waist-Hip Ratio
YLD	Years Lived with Disability
YLL	Years of Life Lost

GLOSSARY

1. ***Pūtam/ pañcapūtam /aimpūtam / añcupūtam* - Five primordial elements**

   Earth, water, fire, air and space are the primordial elements in the formation of every single material (living and nonliving) in the world; the entire universe, including the creatures in it, is constituted and influenced by these five elements

2. ***Pirutivi / pirutivi pūtam* (earth)**

   A primordial golden-coloured element formed from water element, with qualities such as heaviness, solidity, conglomeration, growth and development

3. ***Appu / calam / appu pūtam/ nīr* (water)**

   A primordial colourless element formed from fire element, with qualities such as coldness, greasiness, lightning, soddening, spreading with ease, wetting and oozing, collecting scattered things and enriching the mind

4. ***Vaṉṉicam / tēyu pūtam / tī* (fire)**

   A primordial red-coloured element formed from air element, with qualities like heat, sharpness, clarity, subtleness, burning, glowing, colouring, etc.; governs activities such as egoism, laziness, sexual intercourse, fear and sleep

5. ***Mārutam / vāyu / kāṟṟu /vaḷi / kāl* (air)**

   A primordial black-coloured element formed from ether element, with qualities like dryness, weightlessness and roughness, governing motor activities, inhalation and exhalation

6. ***Ākāya pūtam / ākāyam /Vicumpu* (ether)**

   The primordial element, whitish in colour, having qualities like subtleness, clarity, appeasing nature and occupying space and governing the activities of desire, vengeance, lust, etc.

7. ***Seevakini* (Basal Metabolic heat)**

   Heat required for sustenance of life, (also referred to as *Kukkiyanal*, *Uyiranal* and *Uyirakkini*).

8. ***Samanikini* (Optimal digestive fire)**

   It is constituted by *Samanan*, *Analam* and *Kilethakam*. It is the digestive fire which ensures proper and timely digestion of all the solid and liquid food materials taken by an individual. – Optimal digestive fire.

9. ***Vidamakini (Toxic digestive fire)***

   Delayed digestion due to deranged and displaced samanan leading to toxic digestion.

10. ***Deekashakini (Enhance fire of digestion/ Fiery digestion)***

    Due to increased digestive fire intake of even improperly cooked/under cooked food gets digested along with essence.

11. ***Manthakini (Sluggish/Delayed digestion)***

    Without digesting immediately, the food items taken eagerly, it produces rumbling noise (borborygmus) in the abdomen along with abdominal distension and heaviness of body

12. ***Vaḷi/ vātam / aṉilam/ vāyu (bio-energy movement):***

    One of the three humours/ *mukkuṟṟam* / *muttōṭam* or principles of functional constitution of the body, condensed from the elements air and space. *Vaḷi* is responsible for all movements in the body and controls the functions of the nervous system, circulatory system and elimination of wastes etc. *Vatham* predominates in the region below umbilicus and based on its function it

is classified into ten types. They are *Pranan*, *Abanan*, *Viyanan*, *Samanan*, *Udhanan*, *Naagan*, *Koorman*, *Kirugaran*, *Devathathan* and *Thananjeyan*. Roughness, dryness, lightness and mobility are certain attributes of *Vatham*. It also strengthens the five sensory organs, regulates respiration, maintain the functions of Udal *thathukkal* (physical constituents) and 14 *Vegangal* (physiological reflexes)

13. ***Uyirkkāl / pirāṇaṉ (vāyu for respiration and digestion)***

    Responsible for respiratory functions and controls its organs; originates from the center of skull, also nourishes the life force

14. ***Kīḻnōkku kāl/apāṉavāyu /apāṉaṉ (vāyu for downward biological movements)***

    Responsible for absorption and assimilation of essence, excretion of urine and faeces, ejection of semen and expulsion of contents of the uterus, contracting and relaxing the sphincters; originates from coccygeal region mūlātāram/

15. ***Mēlnōkku kāl/ utāṉaṉ (vāyu for upward biological movements)***

    Responsible for all upward movements; responsible for reflexes like cough, sneeze, hiccup and vomiting; also responsible for speech, stations the essence of foods at appropriate place (nutrition), thus helps in the digestion and assimilation of food; emanates from fire of stomach, resides in navel, neck, throat and nose

16. ***Naṭukkāl/ camāṉaṉ /camāṉavāyu (vāyu for homeostasis)***

    Balances the other components of vāyu and responsible for assimilation; balances the six tastes, water and foodstuffs during the process of digestion and gets them to their sites of action; originates from the navel region

17. ***Paravukāl/viyāṉaṉ (vāyu for circulation)***

    Disseminates throughout body via 72 000 vessels and nerves causing voluntary and involuntary functions; takes the essence of food to all parts of the body; responsible for touch sensation

18. ***Nākaṉ (vāyu for intellectual functions)***

    Responsible for higher intellectual functions, hearing, thinking, singing, etc.; causes blinking of the eyes, opening of eyelids and goosebumps. Nākaṉ (vāyu for intellectual functions) Responsible for higher intellectual functions, hearing, thinking, singing, etc.; causes blinking of the eyes, opening of eyelids and goosebumps.

19. ***Kūrmaṉ (vāyu for ophthalmic function)***

    Acts on the eyes, responsible for blinking, visual interpretation and lacrimation; responsible for the acts of yawning and closing of mouth

20. ***Kirukaraṉ (vāyu for secretion)***

    Responsible for oral and nasal secretion; causes thinking of one entity and produces much hunger, cough, sneeze, etc.

21. ***Tēvatattaṉ vāyu*** *for fatigue*

    Responsible for laziness and tiredness on waking, causes movement of eyeball, causes one to be engaged in coaxing, fighting, verbal dispute and bouts of intense anger

22. ***Taṉañceyaṉ*** *(**vāyu** for death)*

    During death, causes generalized swelling of the body and tinnitus; leaves the body through the head on the third day of death

23. ***Aẕal/pittam*** **(bio-energy fire)**

    One of the humours/ *mukkuṟṟam* or principles of constitution of the body, condensed from the elements water and earth; *aẕal* is responsible for normal metabolism and controls digestion,

movement of limbs, function of eyes to enhance vision, complexion of skin, sharpness of mind, etc. Azal dominates the chest and abdominal are and exhibits itself in five forms. They are *Anarpitham*, *Ranjaga pitham*, *Saathag pitham*, *Aalosaga pitham* and *Prasaga pitham*. It is eliminated from the bod through sweat.

24. *Ākkaṉal / aṉaṟpittam* (*aẕal /pittam* for digestion)

One of the five types of *aẕal*, exists in stomach and intestines; quality of increased fire, dries up water contents of foodstuffs, digests all ingested food

25. *Vaṇṇa eri/ irañcaka pittam* (*aẕal / pittam* for nourishment of blood)

One of the five types of *aẕal*, exists in stomach, responsible for nourishment of blood through conversion of chyle

26. *Ārṟalaṅki/ cātaka pittam* (*aẕal /pittam* for performing desired acts)

One of the five types of *aẕal*, exists in heart, performs desired acts with help of knowledge, intellect and affinity

27. *Oḻḻoḻi tī / pirācakam* (*aẕal /pittam* for Complexion)

One of the five types of *aẕal*, exists in skin and gives it lustre

28. *Nōkkaẕal/ ālōcakam* (*aẕal pittam* for vision)

One of the five types of *aẕal*, exists in eye and is responsible for vision

29. *Aiyam/kapam* (bio-energy water):

One of the three humors of body according to the humoral principles; is watery or frothy in general; a key influencer in all respiratory diseases. It dominates the head and neck region and exhibits itself into five forms. They are *Avalambagam*, *Kilaetham*, *Pothagam*

Tharpagam and *Santhigam*. It is eliminated from the body through the urine.

30. *Aḷi aiyam / avalampakam* (strengthening *aiyam*)

One of the five types of *aiyam*, exists in thoracic cavity, including heart; along with its innate potential and essence of food it strengthens the body

31. *Nīrppi aiyam / kilētakam* (*aiyam/ kapam* for digestive functions)

One of the five types of *aiyam*, exists in stomach, breaks down ingested foodstuffs and promotes digestion

32. *Cuvaikāṇ aiyam / pōtakam* (*aiyam/ kapam* for taste)

One of the five types of *aiyam*, exists in tongue, helps to experience taste of food

33. *Niṟaivaiyam / taṟpakam* (*aiyam/ kapam* for strengthening sense organs)

One of the five types of *aiyam*, exists in head, strengthens sense organs, keeps the eyes cool

34. *Oṉṟiyaiyam / cantikam* (*aiyam/ kapam* for lubrication)

One of the five types of *aiyam*, exists in joints and lubricates them

35. Seven *uṭaṟtātu* (physical constituents):

Seven *uṭaṟtātu*, namely plasma (*cāram*), blood (*cennīr*), muscle (*ūṉ*), adipose tissue *koẕuppu*), bone, (*eṉpu*), bone marrow (*mūḷai*) or male or female hormones, reproductive tissue (*cukkilam curōṇitam*).

36. *Eṇvakai tērvu / eṭṭuvakai pariṭcai* (eight types of diagnosis)

Naadi (Unique Siddha pulse reading method), *Sparisam* (Examination of Touch / palpation), *Naa* (Examination of Tongue), *Niram* (Examination of Colour/ Complexion), *Mozhi* (Examination of Speech), *Vizhi* (Examination of Eye), *Malam* (Examination of Stool) *Neer, Neerkuri* (Urine examination), *Neikuri* (Urine Sign – Oil Drop Test).

37. Internal Medicines:

37.1 *Cāṟu* (juice): Extract of leaves, root, bark, flowers and unripe fruit, obtained by pounding and filtering or by adding astringent substances or by means of a heating process; juice should be taken within three hours after preparation

37.2 *Kuṭinīr* decoction

Aqueous extract prepared at a ratio of one part of medicine to four parts of water (¼); decoctions are also prepared using other ratios, e.g., 1/8 or 1/16, as prescribed in Siddha texts; occasionally milk is also added; other methods of extraction are also described, including boiling and percolation. It is to be consumed within three hours of preparation

37.3 *Kaṟkam* (medicinal paste)

Paste of fresh or dried raw materials ground with water; should be consumed within three hours of preparation

37.4 *Cūraṇam* (medicinal powders)

Purified raw materials are pounded separately, sieved and mixed according to a given ratio; for certain preparations the purified raw materials are mixed as per the ratio prescribed, then powdered and sieved; shelf-life of three months

37.5 *Vaṭakam* (lozenges)

Medicinal powder mixed with sugar or jaggery is steam baked with vapours from a mixture of milk and water; the steamed flour is pounded when hot and rolled into pills of required size; shelf-life of three months

37.6 *Maṇappāku* (syrup)

Decoction or fruit juices boiled with sugar or jaggery until a sweet aromatic odour develops; powdered raw materials are sprinkled over this; shelf-life is six months

37.7 *Ney* (medicated ghee)

Ghee-based herbal preparation prepared by boiling a mixture of ghee with specified medicinal pastes, juices, decoctions and milk, according to composition of recipes; shelf life is six months

37.8 *Iracāyaṉam* semi-solid confection

Prepared by adding unrefined sugar and ghee to medicinal powders until a semi-solid consistency is attained; shelf-life is six months

37.9 *Iḷakam* (electuary)

This type of internal medicine is prepared by heating certain decoctions or juices or milk along with sugar or jaggery until sweet aromatic odour develops and volume is reduced; powdered raw drugs are added and mixed well; ghee and finally honey are added and mixed well; shelf-life is six months

37.10 *Eṇṇey* (medicinal oils)

Herbal juice, decoctions, powder or herbal paste is added with specific oils, boiled at specific heat level until definite consistency is reached and finally filtered and preserved; shelf-life is one year.

37.11 *Māttirai/ kuḷikai /uruṇṭai* (pills/tablets)

Certain drugs are ground well with herbal juices or decoctions, ginger juice, breast milk, etc. until the mixture becomes fine enough to be rolled to form pills and dried; size of pill depends on dose and method of preparation in classical texts; hours of grinding mixture vary with each medicine; usually round in appearance; shelf-life is one year.

37.12 *Tīnīr/ pukai nīr / Tirāvakam* (medicated liquid obtained by distillation)

Drugs are boiled with water in a distillation apparatus, vapour of medicated water is condensed and collected as a distillate. shelf-life is one year

37.13 *Meẕuku* (medicated wax)

Prepared by grinding raw drugs to waxy consistency; There are two types: 1. obtained by grinding certain mercurial compounds separately or with other raw drugs, adding herbal juices or honey to a perfect stage of waxy consistency. 2. obtained by heating mercurial drugs or arsenical compounds with added oily substances or juices and grinding well; shelf-life is five years

37.14 *Kuẕampu* (medicated viscous mixture)

Certain juices either mixed or separately taken in a pot along with jaggery, medicinal powders or fine powders of certain drugs, heated to semi-solid form. shelf-life is five years

37.15 *Pataṅkam* drugs obtained by sublimation

Heating of sublimating constituents either from organic or inorganic drugs. shelf-life is 10 years

37.16 *Centuram* (red calx)

Metallic/mineral substances are made into red microfine powder by burning or insolation or grinding with herbal juice or mineral distillates, or by incineration; shelf-life is 75 years

37.17 *Nīṟu / paṟpam* (white calx)

Metallic/mineral substances made into white powder by burning or frying or by grinding with juices or by incineration; an ancient method of calcination; different processes are employed with variation in duration of incineration, hours of grinding and/or hours of burning; shelf-life is 100 years

37.18 *Cuṇṇam* (calcine)

Metallic/mineral substances, ground well with leaf juices, pungent liquids, mineral distillates; dried, kept in crucible, incinerated to obtain calcine; become red when turmeric is added due to lime content; shelf-life is 100 years

37.19 *Kaṟpam* rejuvenating drugs

Certain leaves, roots, salts and mineral compounds are consumed in a specific dose for a specific period of time while following a prescribed dietary regimen

38. External Medicines

38.1 *Kaṭṭu* (compress or bandage)

External application in which raw drugs and medicines like leaves, bark, etc. are either ground or cooked; then tied or bandaged over affected part

38.2 *Paṟṟu* (poultice)

External application in which medicines in the form of pastes or juices are applied over inflammation, wounds and skin lesions, some time after spreading them on a piece of cloth

38.3 *Pūccu* (liniment / semi-solid application)

External application in which boiled leaf juices or medicated oil are applied on affected part

38.4 *Pacai* (medicated cream)

Raw materials are added to melted wax or castor oil and applied over affected areas

38.5 *Poṭi* dusting powder

Powdered and purified herbs/inorganic substances are applied over wounds and ulcers; usually, astringent substances are used

38.6 *Kaḻimpu* (ointment)

Used externally; certain mineral compounds / astringent materials are powdered, ground with butter and applied over wounds and ulcers

38.7 *Nīr* (medicated liquid)

Medicated water for washing wounds and ulcers; antiseptic solutions prepared by either soaking raw drugs in water and making a decoction or diluting caustic substances

38.8 *Naciyam* (nasal instillation)

Instilling nasal drops

38.9 *Poṭi timirtal* (powder massage)

Massage with herbal powders containing turmeric and horse gram, occasionally mixed with camphor

38.10 *Tokkaṇam* (manipulation techniques)

There are nine types. 1. pressing, 2. holding or grasping, 3. tight-hug manoeuvre, 4. pulling, 5. moving, 6. griping, 7. twisting, 8. laying or supinating, 9. striking with fist with or without applying oil

38.11 *Oṟṟaṭam* (fomentation)

Application of hot topically; substances such as lime powder, bran, brick powder, eggshell, leaves of medicinal plants such as Vitex negundo, Calotropis gigantea, Ricinus communis, Abutilon indicum, etc. are tied in a cloth as a bundle, which is heated and applied over affected area

38.12 *Vētu* (steam inhalation / steam exposure therapy)

Steam inhalation and steam application either to localized regions or the whole body; materials used are medicinal herbs such as Vitex negundo and Leucas aspera, turmeric powder, salt water, red brick and medicinal aromatic gums

38.13 *Poṭṭaṇam/ Kiḻi* (medicated pouch)

Raw drugs that are pounded or fried leaves of medicinal plants are tied in a piece of cloth as a bundle; this is dipped in a particular medicated oil and applied over an affected area.

38.14 *Pukai* (fumigation)

Using medicated fumes or smoke from any herbal/animal/ aromatic substance, such as cumin seeds, dried ginger, turmeric and flower of Datura metel.

38.15 *Cuṭṭikai* (cautery)

Application of heat using needle, broken earthen pots, piece of wood, heated air and insolation; usually on vertex, forehead, chest, back, hands and legs

38.16 *Kāram* (caustic ablation)

Application of drugs to parts to be excised or chronic ulcers, to remove unwanted growth, slough and debris and after healing process initiated

38.17 *Pīccu* (enema)

Medicated liquid substances injected into rectum to expel its contents; laxative solutions are administered through anal canal, leading to purgation

38.18 *Aṭṭai viṭal* (leech)

Medicinal leech therapy or hydrotherapy, a technique used for blood-letting to extract poisonous substances from affected areas and to purify blood

38.19 *Kīṟal* (incision)

A surgical procedure to remove accumulated pus, blood etc.

CHAPTER

1

DIABETES MELLITUS

DIABETES MELLITUS

ICD 11 - 5A11
ICD 10 – E11.0 TO E11.9

மதுமேகம் – *Matumēkam* (TYPE 2 DIABETES MELLITUS)

Name of the disease:

மதுமேகம்

- NSMC – XGB1.4
- WHO Code - ISMT-4.11.40[1]

TYPE 2 DIABETES MELLITUS[2]

CASE DEFINITION

Matumēkam is a disease characterized by frequency of urination, gradual deterioration of seven body constituents (*Uṭaltātu*) followed by emaciation.[3] The primary vitiation of Azhal humour slowly affects the other humours and eventually leads to the deterioration of seven body constituents one by one. The salient clinical features of Matumēkam are correlated with Type 2 Diabetes Mellitus (T2DM) in conventional biomedical system.

Diabetes Mellitus is a chronic disorder resulting from aberrations in insulin secretion, insulin action, or both. Long term damage, dysfunction and failure of different organs resulting in this condition is attributed to the persistent hyperglycaemia state.[4] T2DM previously referred as non-insulin-dependent diabetes accounts for approximately 90 – 95% of all diabetes cases. The condition also known as adult-onset diabetes is due to insulin resistance and relative insulin deficiency.[4,5]

INTRODUCTION

- Matumēkam is a progressive metabolic disorder which is due to deranged three humors and deteriorating seven fundamental tissues. Siddhar *Yūkimuṉi* classified this disease under *Aḻal* type of *Nīriṉai Perukkal Nōykaḷ* (Clinical conditions with polyuria) in the classical text of *Yūki Vaittiya Cintāmaṇi*. This is synonymously known as *Iṉippu Nīr* and *Nīriḻivu*.[3,6]
- Diabetes is the eighth-leading cause of mortality and has a prevalence of 529 million cases worldwide in 2021 with a global age standardised prevalence of 6.1%. International Diabetes Federation report indicated an expenditure of US$ 996 billion globally due to the disease.[7,8]
- Diabetes is also contributing to two-fold excess risk for ischemic heart disease and stroke, which attributes to the first and second leading cause of death worldwide.[7]
- A report published by the Lancet commission in 2020 highlights that the majority of disease burden (80%) is from Low- and Middle-income countries (LMICs).[9]
- Globally, the disease attributed to 37.8 million Years of Life Lost (YLL), 41.4 million Years of healthy life lost due to disability (YLD) and 79.2 million Disability-adjusted life year (DALY) in 2021.
- Between 2021-2050, the global age-standardised total diabetes prevalence is expected to increase by 59·7% resulting in 1.31 billion cases in 2050.[7]

- The NFHS-5 survey reported prevalence of diabetes of 4.90% among Indian individuals aged 15-49 years with 24.82% of individuals with undiagnosed diabetes.[10]
- The ICMR-INDIAB survey conducted reported 26.6% of Indians above 20 years having dysglycaemia with 11.4% suffering from diabetes and 15.3% suffering from a pre-diabetic state.[11]
- Several non-modifiable risk factors like age, ethnicity, genetic predisposition, family history of diabetes and modifiable factors like sedentary lifestyle, obesity, unhealthy diet, stress, intrauterine environment, environmental pollutants, etc. are associated with the incidence of the disease.
- The COVID-19 pandemic has resulted in a significant rise of new-onset of T2DM in all age groups especially during the post-acute phase of the disease.[12] The pandemic shows an increase of 14.4% of new onset of diabetes mellitus including T2DM among the hospitalized patients.[13]

CLINICAL PRESENTATION AND EXAMINATION

According to the Siddha system of medicine, the common symptoms are frequent and excessive passage of brownish yellow coloured urine producing white sediments, which invite ants and flies; emaciation, polydipsia, xerostomia, polyphagia, general debility even after sufficient food intake. The uncontrolled disease condition over some time gradually deteriorates the seven body constituents causing *Matumēka Avataikaḷ* (Sequelae of T2DM) which is described as complications of T2DM. Ten stages of *Avataikaḷ* describe the complications of T2DM are as under:[3]

- Obesity and Bladder dysfunction
- Polyuria, Spermatorrhoea and UTI
- Xerostomia and Gastroparesis
- Polydipsia and Delirium due to Diabetic ketoacidosis
- Debility due to deterioration of seven body constituents
- Orthopnea
- Syncope
- Glandular swelling and Carbuncle
- Diarrhoea due to autonomic neuropathy, Parasitic infestations (maggots)
- Cachexia and death

The presentation of T2DM to the clinician is quite varied. A majority is discovered incidentally during regular blood testing for routine, pre-surgery, dental care, or any medical procedure. The classical presentation of T2DM like polyuria, polydipsia and fatigue is observed mainly in older individuals. Often recurring bacterial and fungal infections, blurred vision and delayed wound healing are classically observed in patients, especially older individuals.

With a majority of the cases being asymptomatic, the patient may present to the clinician with a macrovascular complication of coronary heart disease, peripheral vascular disease, cerebrovascular disease or a microvascular one of diabetic nephropathy, retinopathy, Neuropathy, or diabetic foot ulcer. In the recent years cancers (hepatocellular, pancreatic, colorectal, etc.), infections, Non-Alcoholic Fatty Liver Disease including steatohepatitis and cirrhosis, obstructive sleep apnoea, affective disorders, dementia, erectile dysfunction and functional disability at workplace is also considered as emerging complications of T2DM. In severe cases especially in older individuals, hyperosmolar coma is observed especially during medications for major events like myocardial infraction and stroke.[14]

The assessment of a patient with T2DM shall first involve the diagnosis and confirmation of the type of diabetes by blood glucose and HbA1c evaluation. Additional evaluation includes the assessment of the diabetes complications, presence of co-morbidities and overall health status. The clinician must explore behavioural factors (eating patterns, calorie counting, physical activities, sleep behaviour, addictions), medications and vaccinations, technology use and social life assessment. A comprehensive physical examination of the patient must be conducted with special emphasis on fundoscopic examination, skin examination, foot examination, cognitive function, mental state examination and bone health assessment.[15]

DIFFERENTIAL DIAGNOSIS

Table 1

Condition	Differential features
Type 1 Diabetes Mellitus[16]	• Associated with autoimmune β cell destruction of the pancreas • Onset in a younger age group • Family history of auto-immunogenicity • Serum insulin levels are diminished • C-peptide levels are diminished <200 pmol/L • Detection of antibodies in serum
Maturity onset of diabetes in Young/ Monogenic diabetes[16]	• Onset at an age before 25 years of age • Impaired serum insulin levels • Usually, obesity is not co-existent
Diseases of the exocrine pancreas[16]	• Associated with conditions like pancreatitis (acute or chronic), trauma/ pancreatectomy, neoplasia, cystic fibrosis, hemochromatosis, etc. • Demonstration of pancreatic injury by blood parameters like amylase, lipase, faecal elastase and imaging studies.
Stress induced hyperglycaemia[15]	• Usually noted in persons within 48 hours of hospital admission • Blood levels 180 mg/dl and above • Increased levels of cytokines, cortisol, glucagon, catecholamines in blood.
Medications like steroids[17]	• Develops due to side effects of glucocorticoids used as anti-inflammatory or immunosuppressive purposes • Mostly observed with oral and injected glucocorticoids
Acromegaly[18]	• Increased secretion of Growth Hormone and Insulin like Growth Factor-1 results in gluconeogenesis, impairs insulin sensitivity • Characteristic physical appearance • Often surgery for pituitary tumour causing reversal of diabetes
Cushing's Disease	• Circulating glucocorticoids results in increased glucose levels in the blood. • Cortisol levels after dexamethasone suppression test aids in the diagnosis.

SUPPORTIVE INVESTIGATIONS

i Essential Investigations:

- Blood Sugar Profile:
- Fasting Blood sugar (FBS) ≥ 126 mg/dL
- Post-prandial Blood sugar (PPBS) ≥ 200 mg/dL

- Glycated Haemoglobin HbA1c ≥ 6.5%
- Complete haemogram.
- Urine examination for glucose, proteins, ketone bodies and microscopic examination for pus cells.

ii Advanced Investigations:

- Blood for serum creatinine, lipid profile and liver function tests
- Serum electrolytes, Blood urea, Urine microalbumin
- Creatinine clearance and ACR

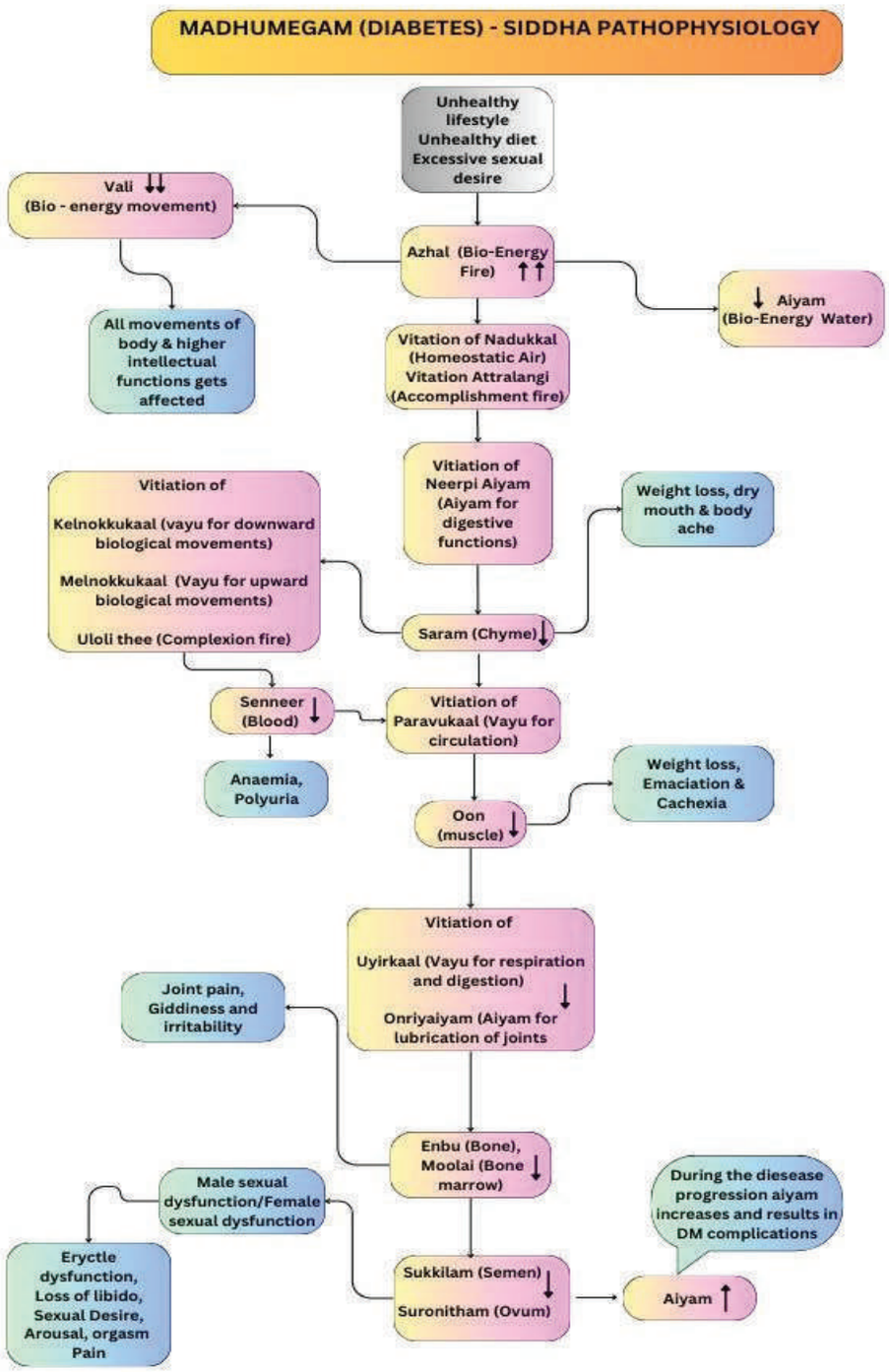


Fig. 1 Diabetes Pathophysiology Siddha

DIAGNOSTIC CRITERIA

The diagnosis of Diabetes Mellitus among non-pregnant individuals has been defined by the American Diabetes Association (ADA) and Research Society for the Study of Diabetes In India (RSSDI) as per the following criteria:[16]

Table 2

Criteria of diagnosis of Diabetes among non-pregnant individuals
HbA1c ≥ 6.5%. The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay*
Or
FPG ≥ 126 mg/dL. Fasting is defined as no caloric intake for at least 8h*
Or
In an individual with classic symptoms of hyperglycaemia or hyperglycaemic crisis, a random plasma glucose ≥ 200 mg/dL. Random is any time of the day without regard to time since previous meal.

*In the absence of unequivocal hyperglycaemia, diagnosis requires two abnormal test results obtained at the same time (e.g., HbA1c and FPG) or at two different time points.

The criterion for specific detection of T2DM is difficult and diagnosis is often mistaken especially in ~40% of adults with new onset of Type 1 diabetes mellitus and maturity-onset diabetes in young.

Pre-diabetes:

Pre-diabetes is defined as a clinical condition where the levels of glucose and HbA1c do not meet the criteria for diabetes, but yet the individual suffers from abnormal carbohydrate metabolism. The condition poses significant risk for the progression to overt Diabetes, cardiovascular diseases and several other cardio-metabolic outcomes.

The criteria for diagnosis of prediabetes have been defined by the American Diabetes Association and RSSDI as follows:

Table 3

Impaired fasting glucose (IFG): FPG 110 mg/dL to 125 mg/dL
Or
HbA1c ≥5.7%-6.4%

Siddha Assessment

***Eṉvakai Tērvu* (Eightfold examination)**[3,19]

- *Nāṭi* (Pulse) – *Vali aḻal/Ayya vali/Vali Aiyam*/Rapidly pulsating *aḻal naadi/ Aḻal naadi* like worm
- *Sparisam* (Touch) – Warmth/ dryness/ light brown or red scaly patches
- *Nā* (Tongue) – Pallor/dryness/ fissured/ sweet taste
- *Niṟam* (Colour) – Pallor/dark
- *Moḻi* (Speech) – Normal/low pitched
- *Viḻi* (Eye) – Red/pallor, dryness/reduced touch sensation, visual impairment/ distorting vision/floaters

- *Malam* (Stool) – Normal / constipated, Yellowish
- *Mūttiram* (Urine)
- a) *Nīrkuṟi* (Uro-macroscopy)
  - *Niṟam* (Colour) – Ghee/Cow's urine/ meat/ toddy colour urine represent *Vitiated vali,* Dark yellow colour- *Vitiated aḻal*
  - *Aṭartti* (Specific gravity) – Crystal clear urine –*Vitiated aiy*am, Dense
  - *Maṉam* (Odour) – Smells like honey/ghee/cow's urine/ toddy/meat Increased in later stages
  - *Nuṟai* (Froth) – Small deposit in urine
  - *Eñcal* (Deposit) –

  b) *Neykuṟi* (Oleo uro-macroscopy) – Oil may spread in the form of sieve / ring/ fast dispersal / irregular margin. If the oil is immersed in the urine it denotes *Aiya neer.*

PRINCIPLES OF MANAGEMENT

Red Flag signs:

These conditions are addressed by modern medicine, hence they should be assessed before initiating the Siddha treatment.

- Hypoglycaemia
- Hyponatremia
- Severe cardiovascular disease including valvular and ischemic heart disease
- Cerebro vascular accident
- Severe associated infective morbidity like pneumonia, tuberculosis, sepsis, etc
- Advanced stages of malignancy
- Visual loss due to diabetic retinopathy
- Severe motor or autonomic dysfunction
- Severe renal dysfunction with severely reduced GFR
- Diabetic ketoacidosis
- Hyperosmolar nonketotic coma

A) Preventive management[20]

Prevention of diabetes includes primary, secondary and tertiary management of the condition. The primary measures shall target persons with obesity/increased BMI. A targeted 7% weight loss and moderate physical exercise may be useful for prevention or reversal of the disease. Trials also suggest that individualized low- calorie diet plans and lifestyle/ behavioural therapy result in the prevention or delay of T2DM and related cardiovascular morbidity. Opportunistic screening must be conducted for the following criteria.

Table 4

Persons with age of 18 years and above
Persons with a high BMI (≥ 25 kg/m^2)
Women with a history of gestational diabetes
First- or second-degree relative with diabetes

Hypertensive individuals
Sedentary lifestyle
Signs of insulin resistance or conditions associated with insulin resistance (acanthosis nigricans, hypertension, dyslipidemia, polycystic ovarian syndrome, small-for-gestational age birth weight)
If results are normal, testing should be repeated at a minimum of 3-year intervals, with consideration of more frequent testing depending on initial results and risk status.

***Yogam* and *Pranayamam* Adherence to practices of *yoga* and physical exercises on a regular basis will help regulate the eating patterns and aid physical fitness thereby facilitating good glycaemic control.**

The general guidelines of ***Yogasanam*** recommended for T2DM **patients**

Table 5

Criteria	Yoga Techniques	Approximate duration	Effects
Asanas (*Yoga* postures)	*Trikonasana* (Triangle pose)	Recommended to hold the final pose for 15 seconds, gradually increasing the duration up to 1 minute	Enhances insulin receptor expression in the muscles, causing increased glucose uptake by muscles. Have positive effects on glucose utilization and fat redistribution in T2DM
	Tadasana (Palm tree pose)		
	Vakrasana (Spinal twist)		
	Paschimottasana (Seated forward bend)		
	Bhujangasana (Cobra pose)		
	Naukasana (Boat pose)		
	Pavanamuktasana (Wind releasing pose),		
	Setubandhasana (Bridge pose)		
	Sarvangasana (Shoulder stand)		
	Surya namaskara	Slow speed, 3–7 rounds according to an individual's capacity	Stimulates insulin production through brain signaling Significantly decreases hip circumference, exerting beneficial effects on glycaemic outcomes
Pranayama (*Yogic* breathing)	*Anuloma viloma* (Alternate nostril breathing)	5–10 minutes	Improves components of health- related fitness, i.e., cardiorespiratory endurance, flexibility, and body fat percentage
	Chandra bhedana (Left nostril breathing)	5 minutes	Parasympathetic stimulation

Criteria	Yoga Techniques	Approximate duration	Effects
	Surya bhedana (Right nostril breathing)	5 minutes	Sympathetic stimulating effect; may be recommended in people with diabetes.
	Bhastrika (Bellows breath)	3–5 minute	Regulation of pineal, pituitary, and adrenaline glands, important role in the regulation of metabolism
	Bhramari (Humming bee breath)	3–5 minutes	Soothing and calming effect on the mind, improves mental and physical health
	Sheetali/Sitkari (Cooling breath)	5 rounds	Lowers blood pressure, cooling effect
Bandha (Lock)	*Uddiyan bandha* (Abdominal lock)	5 rounds	Negative pressure created in the abdominal cavity may improve pancreatic function
Mudras (Hand gestures)	*Linga mudra, surya mudra, prana mudra, apana mudra, gyana mudra*	15–45 minutes	Promote deep relaxation and eliminate stress. Boost metabolic rates, promote weight loss, and reduce sugar levels.
Shuddhi kriya (Cleansing processes)	*Kapalbhati* (Frontal brain purification)	5 rounds, 120 strokes	Abdominal pressure created during exhalation improves the efficiency of β-cells of the pancreas Helps in the production of insulin and controlling glucose levels in the blood
	Agnisara kriya (Stimulating the digestive fire)	5 rounds	The 'vacuum' effect of this action massages the internal organs and increase blood flow to the area Boosts metabolism and facilitates proper functioning of the abdominal organs
	Vaman dhauti (Stomach cleansing)	Once a week	Increases glucose uptake, minimizes insulin resistance, and promotes the function of insulin by reducing levels of circulating free fatty acids in the body
	Full *shankhaprakshalana* (Intestine cleansing)	Once a year	Significantly reduces blood glucose levels, Increases insulin production
	Laghu shankhaprakshalana (Short cleansing)	Every 40 day	
Dhyana (Meditation)	Meditation	10 minutes or more	Beneficial psychological effects, such as faster reactions to stimuli and being less prone to various forms of stress

**Yoga* and exercise should be performed as per the advice of qualified *yoga* instructor or physiotherapist

ICMR guidelines explain four stages of opportunities for the prevention of diabetes.

a) Primordial prevention attempts to reduce the risk factors for diabetes, e.g., reducing or preventing obesity to reduce the future risk of diabetes.

b) Primary prevention targets people who are in the stage of pre-diabetes to prevent the onset of diabetes.

c) Secondary prevention is to prevent the onset of complications in those who are already diagnosed with diabetes.

d) Tertiary prevention of diabetes is aimed at limiting physical disability and rehabilitation measures in those who have already developed diabetic complications and preventing them from going into end-stage complications of diabetes.

Siddha System of Medicine emphasis adhering to *Tēraiyar piṇi aṇukā viti* for prevention of disease and lead to healthy life. Thus, personalized daily and seasonal regimens of food and lifestyle are the key advantages of the Siddha medical system to prevent T2DM.

Table 6

Dietary Habits (*Uṇavu Muṟaikaḷ*)	
Do's - *Pattiyam*	**Don'ts - *Apattiyam***
• Eat consistently at an interval of 3 - 5 hrs. daily • Include traditional rice varieties like Pūṅkār, kāṭṭu yāṇam karuppu kavuṇi, māppiḷai campā, iluppai campā, kuḷḷakkār • Millet diet advised 3 days/week • Include mostly whole grains, legumes, greens and mostly vegetables • Prefer sea fish varieties • Increase fiber rich food • Include non-starchy vegetables • Include lean proteins and low fat dairy in diet	• Avoid skipping meals • Food should never be consumed during excessive hunger, anger or grief • Avoid root tubers except yam – *Typhonium trilobatum (L.) Schott* • Avoid highly processed refined carbohydrate diet and advised to take complex carbohydrates • Limit added sugars and refined grains • Strictly avoid sweets, carbonated drinks • Avoid saturated food and trans fats • Avoid heavy meals late at night • Avoid Cold, Stale, and Heavy Foods
Lifestyle Practices (*Vāḻviyal Muṟaikaḷ*)	
Do's	**Don'ts**
• Practice post meal walk • Practice at least 30 minutes of moderate activity (eg: walking) 5 days a week • Prefer left lateral position for sleeping • Better balance of mood and sleep • Practice regular meditation • Consume food to the level of hunger • Undergo therapeutic purgation once in four months	• Avoid daytime sleep • Avoid excessive sexual indulgence • Don't suppress any natural urge • Avoid sedentary life style • Avoid stress • Don't Self-Medicate

CURATIVE INTERVENTIONS

At every level of care, if the patient is already under standard care, the physician may advise continuing the same along with add-on Siddha and can be assessed for the same in the follow-ups for tapering or discontinuing the treatment in consultation with a conventional physician.

- **Clinical Diagnosis**

  Type 2 Diabetes mellitus presents at the clinic in an adult with either the classical presentation of polydipsia, polyuria, fatigue, or often as an incidental discovery of raised blood glucose levels during a routine health check-up. There may be an increase in occurrences of bacterial and fungal infections and pruritus vulva in women. In many cases, any disease complication may be the initial presenting symptom of the disease. Patients may also present with levels of prediabetes on incidental discovery. The diagnosis will be made by using the following investigations:

- Blood Sugar Profile: Fasting Blood sugar (FBS) ≥ 126 mg/dL, Post-prandial Blood sugar (PPBS) ≥ 200 mg/dL, Glycated Haemoglobin HbA1C ≥ 6.5%.
- Urine examination for glucose, proteins, ketone bodies, and microscopic examination for pus cells.
- Serum creatinine, lipid profile and liver function tests.

Management:

Patients may seek Siddha management for different stages of T2DM i.e., pre-diabetic/ newly detected/diabetic with various complications and the line of treatment may vary accordingly. The first line of treatment is to normalize the altered or deranged humours and revitalization of seven fundamental tissues through detoxification methods followed by internal medications.

The application of detoxification methods like therapeutic oilbath and purgation therapies may be decided by the Siddha physician.

Day 1

i. *Eṇṇey kuḷiyal* (Therapeutic oilbath):[19]

Eṇṇey kuḷiyal is a preparatory procedure in which medicated oil massage with a bath of lukewarm water. It will strengthen the five sensory organs. According to disease severity, *eṇṇey kuḷiyal* can be advised for one day to three days.

- *Keezhanelli Thylam* – Quantity sufficient (External use)
- *Arakku Thylam* – Quantity sufficient (External use)

Note: Anyone of the *Thylam* may be used

Rules to be followed during *Eṇṇey kuḷiyal*:

Apply oil before 7 am. Instil one drop in each eye, two drops in each nostril and three drops in each ear. Spread over the medicated oil from head to foot and give a gentle massage. After application, leave it for 45 minutes and bathe with lukewarm water using herbal hair wash powder.

Take tender vegetables and easily digestible food. Avoid daytime sleep, intercourse and exposure to sunlight and cold items on the day of the oil bath.

Day 2

ii. *Kaḻiccal maruttuvam* (Therapeutic Purgation):

- *Agathiyar Kuzhambu*-100-130 mg with *Chukku Karkam (Zingiber officinalis)*, OD, in the early morning on an empty stomach.[19]

Rules to be followed during Therapeutic Purgation:

- The medication should be taken in the early morning 5 to 6 AM
- After the average number (5-6 times) of bowel evacuations, watery diarrhoea commences. In this stage, the patient is advised to take buttermilk/ lemon juice/fried cumin seeds decoction/Ash of sweet flag (*Vacampu).*
- After purgation, the patient may have symptoms like tiredness, slimness, lightness of the body and tiredness of sense organs which is a good sign.
- Dietary regimen during purgation:
    - Mōr (Butter milk)
    - Kañci (Rice porridge)
    - Irumuṟaivaṭitta kañci (Double boiled porridge)
    - Kāyntāṟiya vennīr (Lukewarm water)
- Precautions:
    - Avoid daytime sleep during purgation therapy
    - Should not take heavy meals before or during the procedure
    - Avoid intercourse

Day 3 onwards

A. **Internal medicine**

(**Note:** Administration of medicine, dosage, drug holiday and treatment duration may vary according to the condition of patient, disease severity. This solely depends upon the discretion of the treating Siddha Physician).

Table 7: Single herbs

S. No.	Single herbs	Dosage form	Dose	Time	Duration and Frequency	Adjuvants/ *Aṉupāṉam*
1.	*Aavarai (Cassia auriculata)* flower decoction[21]	Decoction	30-60ml	BD	40 days	Nil
2.	*Kovai (Coccinia grandis)* tuber juice[21]	Juice	10-15ml	BD after food with diuretic drugs	--	Nil
3.	*Nilappanai Ver Chooranam*[21]	Root powder	8g	BD after food	--	Water
4.	*Kalyaṇa murukku (Erythrina variegata)* root decoction[21]	Decoction	80-90ml	BD after food	--	*Vasantha kusumakara Maathirai*
5.	*Thottarsurungi (Mimosa pudica) Chooranam* [21]	Leaf and root Powder	4-8g	BD after food	--	Milk
6.	*Peerkku (Luffa Acutangula)*[21]	Leaf juice	5ml	BD after food	--	Nil

Table 8: Compound formulations

S.No.	Compound formulations	Dosage form	Dose	Time	Duration and Frequency	Adjuvants/ *Anupaanam*
***Kudineer* / Decoction**						
1.	*Aavarai Kudineer* [22]	Decoction	60- 80ml	BD before food	40 days	--
2.	*Vilva ilai Kudineer* [19]	Decoction	30- 60ml	BD before food	-	--
3.	*Vilvathy Kudineer* [23]	Decoction	40- 80ml	BD before food	-	-
4.	*Seenthil kodi Kudineer*[24]	Decoction	30-60ml	BD before food	--	--
***Chooranam* / Medicinal Powder**						
1	*Aavaraiyathi pattai Chooranam*[19]	Medicinal Powder	1-2 g	BD after food	--	Lukewarm water
2	*D5 Chooranam*[25]	Medicinal Powder	1-2 g	BD after food	--	Lukewarm water
3.	*Veppampisin Chooranam*[23]	Medicinal Powder	1-2 g	BD after food	--	Lukewarm water
4.	*Kadal Azhingil Chooranam*[19]	Medicinal Powder	1-2 g	BD after food	--	Lukewarm water
5.	*Mathumega Chooranam*[26]	Medicinal Powder	1-2 g	TDS before food	--	Lukewarm water
6.	*Seenthil Chooranam*[3]	Medicinal Powder	1-2 g	BD after food	--	Lukewarm water
7.	*Naaval Chooranam*[3]	Medicinal Powder	1-2 g	BD after food	--	Lukewarm water
8.	*Santhana Chooranam*[3]	Medicinal Powder	1-2 g	BD after food	--	Lukewarm water
9.	*Thiripala Chooranam*[27]	Medicinal Powder	1-2 g	BD after food	--	Lukewarm water
10.	*Sanjeevi Chooranam*[28]	Medicinal Powder	1-2 g	BD after food	--	Lukewarm water
***Maathirai* / Tablet**						
1.	*Naaval kottai Maathirai*[29]	Tablet	1	BD after food	-	Water
***Ilakam* / Electuary**						
1.	*Lavanga Ilakam*[3]	Electuary	2-3 g	BD afterfood	-	-

Recommended diet and lifestyle

Diet

The diet is responsible for promoting weight loss, improving glycaemic control and reducing of cardiovascular complications.[30] Carbohydrates in the diet (50-60% of total caloric intake) should include grains with low glycaemic index and low glycaemic load. Complex

carbohydrates must be preferred over refined products. Total fiber consumption should be 25-40 g/day. Protein intake must be 15% of the total caloric intake depending on the age, sarcopenia, and renal function. Oils rich in MUFA and PUFA must be advised.

Dietary habits

- A diet rich in fruits, nuts, leafy vegetables, fiber, whole grains and unsaturated fat is preferred. The plate must also include pulses, legumes, unprocessed vegetables and low-fat dairy.
- Change in eating patterns like early dinner must be advised.
- Extreme diets like low-carbohydrate ketogenic diet must be planned and executed in consultation with a physician and trained nutritionist, and for a short period.
- Intermittent fasting reduces body weight and reduces diabetes parameters such as fasting glucose, fasting insulin, insulin resistance (HOMA-IR) index, and glycated hemoglobin (HbA1c).[31]

Siddha Culinary Medicine [3,19,24]

- Advice to take food after sunrise and before sunset.
- Millet diet may be advised 3 days/ week.

Table 9: Preferred food according to Siddha

Rice	• Hand pounded boiled rice • *Maṇicampā* rice *(Oryza sativa)* • *Kēḻvaraku/Raagi (Eleusine coracana)* • *Kambu*/Pearl Millet *(Pennisetum typhoides)* • *Tiṉai*/Foxtail millet *(Setaria italica)* • *Saamai (Panicum sumatrense)* • *Mūṅkil* rice *(Bambusa arundinaceae),*
• Any one of the above items can be consumed per day. • They can be taken in various forms like *Kichadi, Upma, Pongal, and Poha* except as porridge • Avoid dishes made from batter	
Tender vegetables	• *Pākal /* Bitter guard *(Momordica charantia)* • *Sūrai/* Bottle guard *(Lagenaria siceraria)* • *Veṇṭai*/Ladies' finger *(Abelmoschus esculentus)* • *Avarai*/Broad beans *(Lablab purpureus)* • *Muruṅkai /*Drumstick *(Moringa oleifera)* • *Ciṉṉa veṅkāyam/*Shallots *(Allium cepa)* • *Suṇṭai/* Turkey berry *(Solanum torvum)* • *Kōvai*/Coccinia *(Coccinia grandis)* • *Vāḻaipiñcu (Musa paradisiaca),* • *Pālā piñcu (Artocarpus heterophyllus)* Any one or more vegetables can be included in the daily diet in the forms of soup, salad, veg curry, etc.
Greens	• *Muruṅkai (Moringa oleifera)* • *Maṇattakkāḷi (Solanum nigrum)* • *Kīrai taṇṭu (Amaranthus gangeticus)* • *Kottumalli*/Coriander *(Coriandrum sativum)*

	• *Putiṉā /*Mentha *(Mentha arvensis)* • *Karuvēppiḷai/*Curry leaves *(Murraya koenigii)* • *Puliyārai/* Creeping wood sorrel *(Oxalis corniculata)* • *Vacalai/* Chickenweed *(Portulaca quadrifida)* • *Arukīrai/*Amaranthus *(Amaranthus tristis)* • *Tāḷi kīrai (Ipomoea marginata)* • *Ventaya kīrai /* Methi leaves *(Trigonella foenumgraecum)* • *Koṭivācalai/ Climbing spinach(Basella alba)* • *Puḷiyarai/* Creeping wood sorrel*(Oxalis corniculata)* • *Tūttuvaḷai (Solanum trilobatum)* • *Vallaik koṭi (Convolvulus repens)* Traditional recipes like *kūṭṭu, poṟiyal, and racam* of madeup of the greens can be included in the daily diet
Fruits	• *Atti/*Fig *(Ficus racemosa)* • *Koyyā/*Guava *(Psidium guajava)* • *Mātuḷaii/*Pomegranate *(Punica granatum)* • *Pappāḷi/*Papaya *(Carica papaya)* • *Nāval/*Jamun fruit *(Syzygium cumini)* • *Nelli/*Indian gooseberry *(Phyllanthus emblica)* • *Vāḻai/ Musa textilis (Banana – peyan type)* A small bowel of fruit salad of the above fruits can be included daily
Pulses	• *Uḻuntu/*Urad dal *(Vigna mungo)* • *Pācipparuppu/*Moong dal *(Vigna radiata)* • *Koṇṭai kaṭalai/*Channa dal *(Cicer arietinum)* • *Thuvarai/*Toor dal *(Cajanus cajan)* • *Kollu/*Horse gram *(V.unguiculeta)* These pulses can be used as sprouts and in the form of various culinary preparations like *Sāmpār, Vaṭai, Dōcai, Aṭai*, Variety rice etc.
Nuts	• *Vātumai (Prunus dulcis)* • *Muntiri (Cashew)*
Dairy products	• *Mōr/*Buttermilk 1-2 glass of buttermilk can be consumed in the afternoon to enhance gut microbiota
Non-vegetarian diet	• *Ayirai mīṉ/*Spined Loaches *(Cobitis taenia)* • *Kāṭai/*Quail *(Coturnix coturnix)* • *Kautāri/ Grey francolin (Francolinus pondicerianus)* • *Veḷḷāṭu/*Goat *(Capra aegagrus hircus)* Any of the above non-vegetarian items can be consumed once a week

Physical exercise

- Physical activity must be included on the basis of patient's willingness and ability.
- ≥ 30 minutes of moderate-intensity aerobic exercise each day including, swimming, walking, cycling, running, jogging, and rowing.
- 15-30 minutes of work-related activity.
- 15 minutes of muscle-strengthening exercise (at least 3 times a week), which includes

lifting weights, working with resistance bands, hill climbing/ inclined walking, sit-ups, and squats.

- At least 5000 steps per day
- A minimum of 150 minutes/week of exercise is recommended for healthy Indian individual considering the high risk of T2DM and CVD.
- Use of smart watch or fitness bands for monitoring of physical activity must be encouraged.

Varma Maruttuvam[32]

- *Koṇṭai kolli varmam*
- *Vāyu kalam*
- *Nāṅkāṉa poṭṭu*
- *Āmaikālam*
- *Uṟumikālam*
- *Tummi kālam*
- *Aṭappā kālam*
- *Muṉṭellu varmam*
- *Aṉṉa varmam*

Precautions and contraindications for *Siddhar Varmam*[32]

- *Varmam* should be done by Siddha physician
- The better posture for *Varmam* is sitting and analyse *Nāṭi* before performing *Varmam*
- Beginners should avoid extreme practices
- Monitor carefully for any reactions to any new fitness activity

1) Restricted diet (*Pathiyam*) and lifestyle

- Consumption of processed grains should be avoided.
- Intake of red meat must be limited. Fats should be < 30% of the total caloric intake especially from nuts and seeds.
- Saturated fats like butter, ghee, margarine, coconut oil must be limited to <10% of caloric intake. Use of hydrogenated vegetable oils and recooking or refrying of oil must be avoided.
- Sugar intake must be reduced to 6 teaspoons (25g) daily. Salt intake must be restricted to <5 g/day. Artificial sweeteners must be avoided as it alters the gut microbiota and increases insulin resistance.
- Sweetened beverages must be avoided.
- Avoid smoking and alcohol.

2) Follow-up: At an interval of 7 days or as per the need.

3) Reviews should include:

- Monitoring the person's symptoms and the ongoing impact of the condition on their everyday activities and quality of life.
- Management of T2DM in terms of diet, exercise, and other interventions.

- Discussing the person's knowledge of the condition, any concerns they have, their personal preferences, and their ability to access services.
- Reviewing the effectiveness and tolerability of all treatments.
- Self-management support.
- Monitoring the long-term course of the condition with periodic review.

4) Referral criteria

- Nonresponse to treatment
- Target organ involvement and investigations
- Complications of diabetes mellitus including all macrovascular, microvascular, and emerging complications
- Complications related to glycaemic control including uncontrolled hyperglycaemia and frequent hypoglycaemic episode.
- Substantial impact on their quality of life and activities of daily living
- Diagnostic uncertainty

At Level 2 (CHC/Small hospitals (10-20 bedded hospitals with basic facilities such as routine, investigation, X-ray)

Clinical Diagnosis: Same as Level 1. Any fresh case or referred case from Level 1 shall be evaluated thoroughly for confirmation of diagnosis and complications.

Investigations: Same as Level 1.

Supportive investigations to assess organ involvement include:

1. Serum electrolytes
2. Blood urea
3. Urine microalbumin, creatinine clearance, ACR
4. Electro-cardiography
5. Chest skiagram- Postero-anterior view
6. Ophthalmoscopic examination

Management: Same as Level 1. For the patients referred from Level-1, treatment given in Level-1 may be continued if appropriate for the presenting condition or the case may be reassessed for the totality of symptoms and treatment may be given accordingly. For new cases at this level, the medications mentioned for Level-1 may also be considered; however, the totality of symptoms presented by the patient is the sole indicative and guide for treating each patient. Complications of the disease are the important clinical presentations at this stage of care especially the early signs and symptoms of such complications. Conditions like diabetic foot ulcers may require surgical debridement of the lesion and antiseptic dressing along with integrative management for glycaemic control. Hypoglycaemia state requires acute management by fast-acting glucose and long-term management with constitutional treatment. In case of hypoglycaemia, patients on oral hypoglycaemic agents and/or insulin therapy may require a review of the dosage of conventional medications.[33,34] Other complaints of neurological, ophthalmological, hepatic, cardiovascular, and nephrological involvement may be managed by integrative management of Siddha and Modern Medicine.

Management: (Along with level 1 medications)

(**Note**: Administration of medicine, dosage, drug holiday and treatment duration may vary according to the condition of patient, disease severity. This solely depends upon the discretion of the treating Siddha Physician).

Table 10: Compound formulations

S.No	Compound formulations	Dosage form	Dose	Time	Duration and Frequency	Adjuvant (*Anubanam*)
***Chooranam* / Medicinal Powder**						
1.	*Pungampoo Chooranam* [28]	Medicinal Powder	1-2 g	OD	45 days	Lukewarm water
2.	*Keezhanelli Chooranam*[19]	Medicinal Powder	1-2 g	BD, after food	--	Lukewarm water
3.	*Aavaraiyathi pattai Chooranam*[19]	Medicinal Powder	1-2 g	BD, after food	--	Lukewarm water
4.	*Kadalazhinjil Chooranam* [19]	Medicinal Powder	1-2 g	BD, after food	--	Lukewarm water
***Nei* / Medicated Ghee**						
1.	*Naval pattai Nei*[(28)]	Medicated Ghee	2-5ml	BD, after food	---	--
2.	*Perichangai Nei*[(28)]	Medicated Ghee	5-10ml	BD, after food	-	--
***Iracāyaṇam* / Semi-solid confection**						
1.	*Kathali poo rasayanam*[(28)]	Semi-solid confection	5-10 g	BD, after food	--	--
***Eṇṇey* / Medicinal oils**						
1.	*Kannaththennai*[(28)]	Medicinal oils	1-5 ml	OD	--	Till the disease gets cured
***Parpam* / White Calx**						
1.	*Velvanga Parpam* (27)	White Calx	65 -130 mg	BD, after food	--	Ghee
2.	*Aya Parpam* [19]	White Calx	30-65mg	BD, after food	--	water/ milk
3.	*Velli Parpam*[19]	White Calx	65-130 mg	BD, after food	--	*Nīrmuḷḷi flower (Hygrophila auriculata)* juice
***Chenduram* / Red Calx**						
1.	*Aya Chenduram*[19]	Red Calx	65-130 mg	BD, after food	--	*Aracampiñcu powder (Ficus religiosa) / Athimathura Chooranam*/ honey / ghee / Ālam *piñcu powder (Ficus benghalensis),*
2.	*Kaantha Chenduram*[19]	Red Calx	100 - 130 mg	BD, after food	--	Honey

Recommended Diet & Lifestyle

Restricted Diet & Lifestyle

same as in level 1

Follow-up: At an interval of 7 days or as per the need.

Referral criteria:

Same as level 1 and nonresponsive to treatment

At Level 3 (Ayush hospitals attached with teaching institution, District Level/Integrated/ State Ayush Hospitals, Tertiary care allopathic hospitals having Ayush facilities), multiple departments/facilities for diagnosis and interventions.

- **Clinical Diagnosis:** Same as Level 1 and 2. Confirmatory diagnosis with advanced biochemistry and serological tests. Evaluation and assessment of complications.

Investigations: Same as Levels 1 and 2. Additional Investigations may be done as follows:

- Ultrasonography with colour doppler for upper and lower extremity arteries
- Nerve conduction velocity tests
- Electroencephalogram
- Serum C-peptide, Insulin autoantibodies, and Fasting insulin levels
- Genetic testing (INSR Single Gene Test)
- Psychological assessment with a trained psychiatrist

Management: Same as Levels 1& 2. For the patients referred from Level-1 or 2, treatment given in Level-1 &/or 2 may be continued if appropriate for the presenting condition or the case may be reassessed for the totality of symptoms and treatment may be given accordingly. For new cases at this level, the totality of symptoms presented by the patient is the sole indicative and guide for treating each patient.

The treatment strategy includes single herbs with Herbo-mineral formulations and other supportive medicines to prevent T2DM complications. Along with stage I& II medicines, the following medicines can be advised according to the discretion of the physician.

(**Note:** Administration of medicine, dosage and treatment duration may vary according to the condition of patient and disease severity. Administration of mineralo-metallic medicines shall be prescribed with a drug holiday as ascertained by the treating Siddha Physician).

Table 11

S.No.	Compound formulations	Dose form	Dose	Time	Duration and Frequency	Adjuvants/ *Aṉupāṉam*
***Maathirai*/ Tablet**						
1	*Maha elathy Maathirai* [27]	Tablet	(50 mg) -1-2 pills	BD	--	Lukewarm water
***Parpam* / White calx**						
1.	*Abraka Parpam* [27]	White calx	30-60 mg	BD	45 days	*Ney/Ghee, Vetrilai charu/* betel leaves juice

S.No.	Compound formulations	Dose form	Dose	Time	Duration and Frequency	Adjuvants/ *Aṉupāṉam*
2.	*Gandaga Parpam*[19]	White calx	*25-50 mg*	BD	-	*Ghee/* butter
***Chenduram*/Red calx**						
1.	*Abraka Chenduram* 28	Red calx	130 mg	BD after food	16 days /10 days drug free then 16 days	Ghee for V*atha thaegi* Honey for *Pittha thaegi*
2.	*Abraka Chenduram* 19	Red calx	100-150mg	BD after food	45 days	Ghee or betel leaves juice
3.	*Gowri chinthamani Chenduram*[27]	Red calx	60-130 mg	BD after food	40 days	*Avarai Kuli Thylam*
4.	*Naga Chenduram*[19]	Red calx	100 - 200 mg	BD, after food	--	*Thirikadugu Chenduram* along with ghee/ honey/ milk,
5.	*Sornabiraka Chenduram*[19]	Red calx	30 - 60 mg	BD, after food	--	*Seenthilathi Ilakam*
6.	*Poorna Chandrothayam*[19]	Red calx	30-65 mg	BD, after food	--	*Karpoorathi Chooranam* and leaf juice of *ver̲rilai (Piper betel)*,
***Mezhugu* / Medicated wax**						
1.	*Van Mezhugu or Indu varna Mezhugu*	Medicated wax	50-100 mg	BD	3 or 5 days	*Panai vellam*/Palm jaggery

Recommended diet and lifestyle: Same as Levels 1 and 2

Restricted diet and lifestyle: Same as Levels 1 and 2

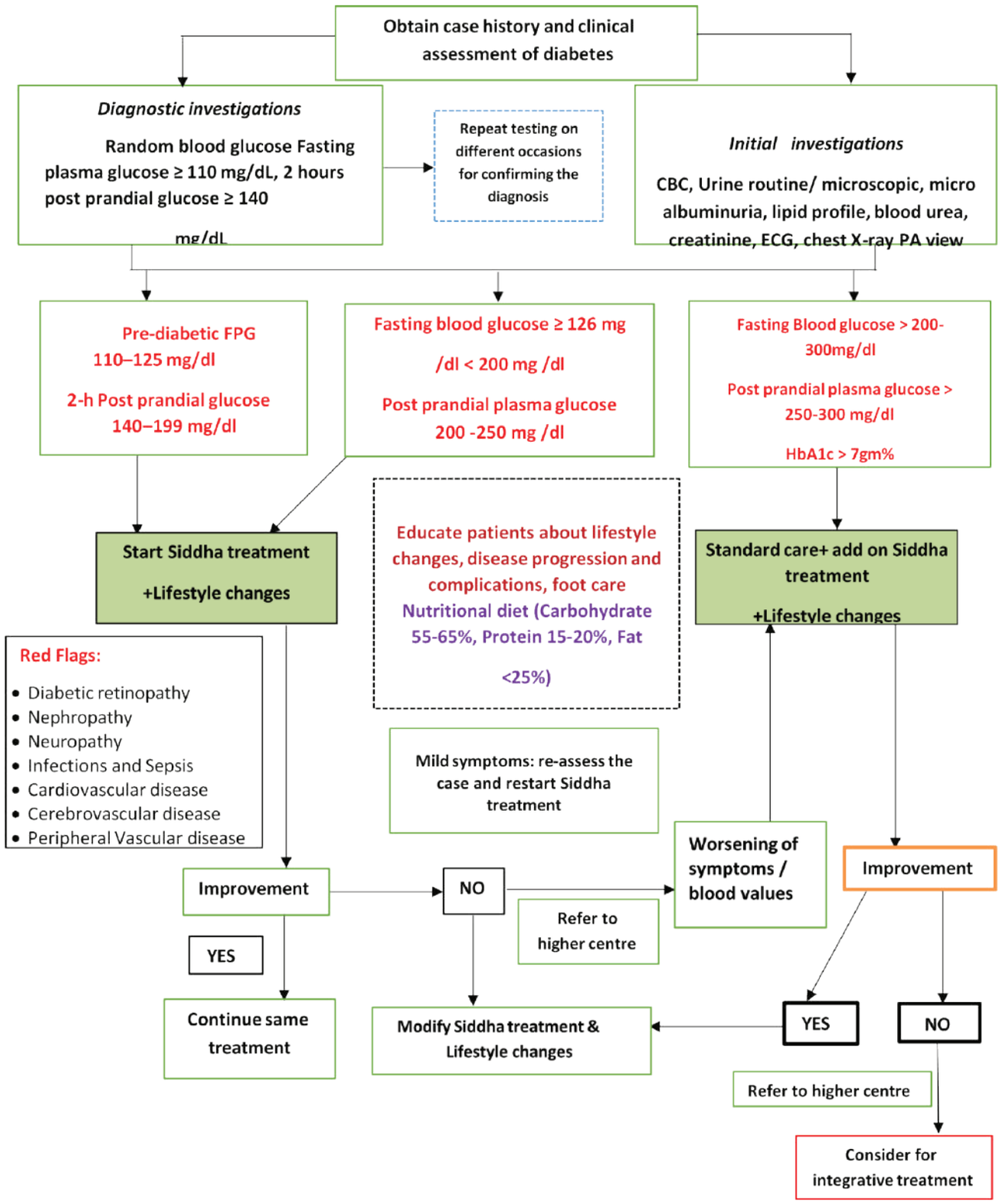
Follow-up: At an interval of 7 days or as per the need

Referral criteria

Same as Level 1, 2 and any condition or serious complication not responding to treatment

ANNEXURE I

ALGORITHM OF TREATMENT PROCESS FOR TYPE 2 DIABETES MELLITUS



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CHAPTER

2

DYSLIPIDEMIA

DYSLIPIDEMIA

(ICD) 11-5C8Z [1]

International Classification of Diseases
Unspecified disorders of lipoprotein metabolism or lipidemias 5C8Z[1]
Koḻuppu Piṟaḻvu Nōy

CASE DEFINITION

- Dyslipidemia are the disorders of lipoprotein metabolism resulting in High total cholesterol (TC), High low-density lipoprotein cholesterol (LDL-C), High non-high-density lipoprotein cholesterol (non-HDL-C), High triglycerides.[2]
- The clinical features seen in Dyslipidaemia are varyingly learnt from the signs and symptoms as described in *Koḻuppu Miku kuṇam* (a condition of excess fat) such as increased fatty tissue resulting in symptoms similar to that of muscle excess, along with fatigue, dyspnoea on exertion, associated with excess muscle formation in buttocks, genitals, chest, abdomen and thighs[3].

INTRODUCTION

- The global prevalence of hypercholesterolemia among adults was 39% (males 37% & females 40%) as per the WHO 2008 report. Further WHO estimates showed that the prevalence of hypercholesterolemia in adults was (53.7%) in Europe, (47.7%) in America, (30.3%) in Southeast Asia and (23.1%) in Africa.[4] In India specific, the prevalence of hypercholesterolemia varies from 10 to 15 % in rural to 25–30 % in urban populations.[5]
- Dyslipidemia is one of the established risk factors for cardiovascular disease. In-depth reviews concluded that elevated LDL-c is a significant contributor to atherosclerotic cardiovascular disease (CVD) [6-9] while some studies had shown that non-HDL-c predicts CV risk better than LDL-C.[10]
- Epidemiological studies have reported variable prevalence rates of important dyslipidemias in India. The prevalence of total cholesterol 200 mg/dl ranges from 25 to 30 %, non-HDL cholesterol 160 mg/dl 25-30 %, LDL cholesterol 130 mg/dl: 25-30 %, non-HDL cholesterol 130 mg/dl: 50-55 %, LDL cholesterol >100 mg/dl: 50-55 %, triglycerides >150 mg/dl: 30-40 % and low HDL cholesterol: 60-70 %. Most national studies have reported higher prevalence of hypercholesterolemia in most Southern and a few North Indian states, more in urban than rural areas, whereas the prevalence of high triglycerides and low HDL cholesterol is similar throughout the country.[11]

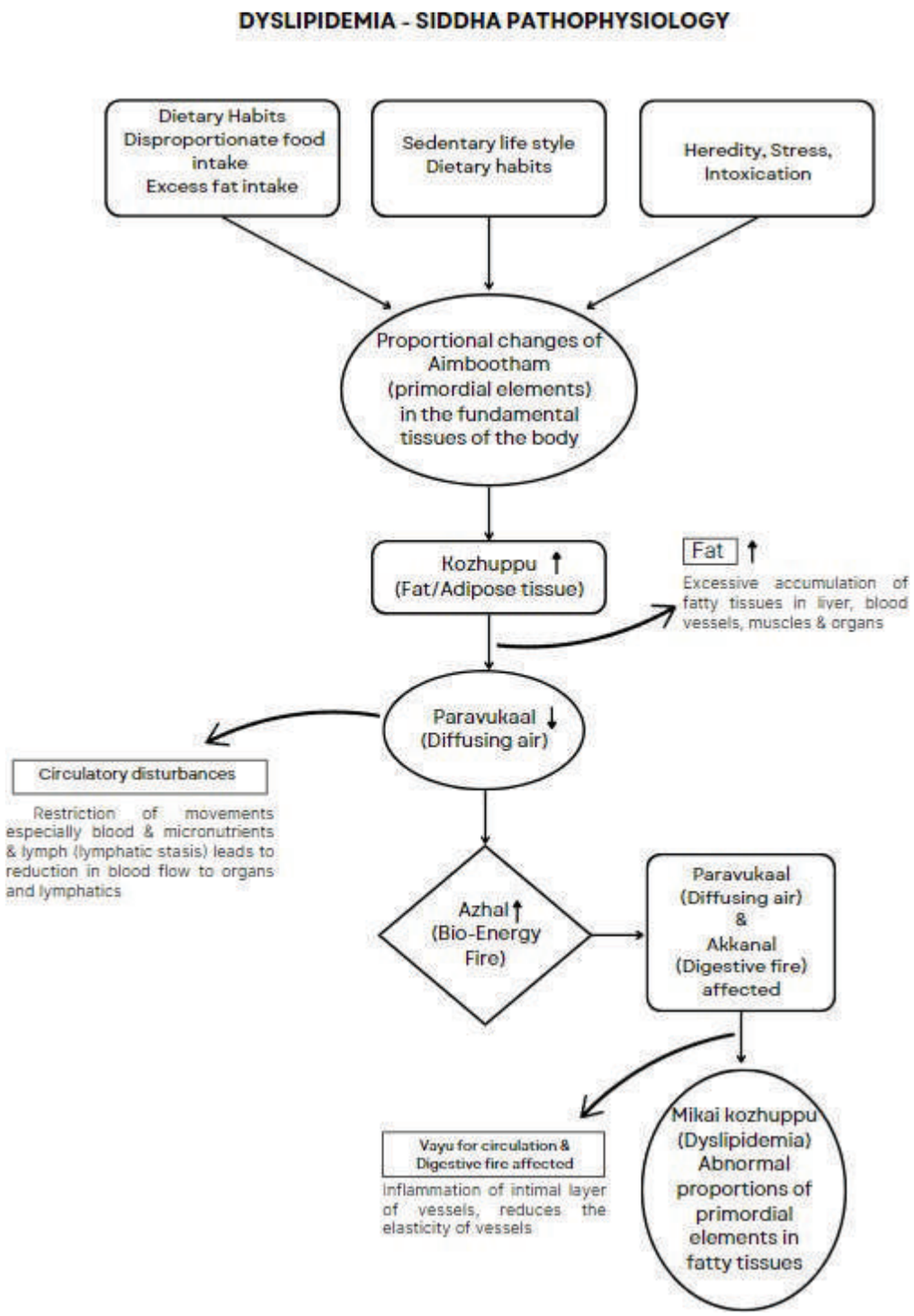
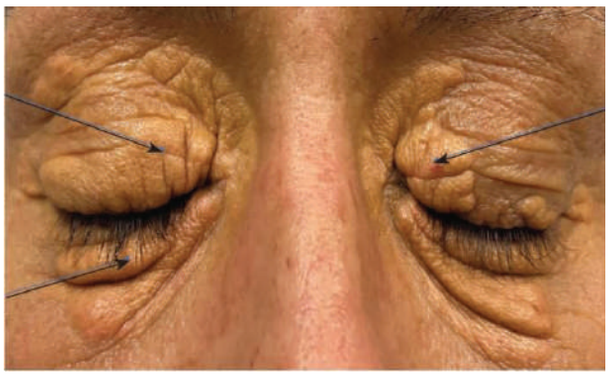


Figure 1. Dyslipidemia Siddha Pathophysiology

CLINICAL PRESENTATION AND EXAMINATION[12,13]

Dyslipidemia majority of the times are asymptomatic and are accidentally diagnosed on routine blood tests. Few patients with severe or untreated dyslipidemia may present with signs and symptoms related to the complications of dyslipidemia, such as coronary artery disease, peripheral arterial disease, stroke, atherosclerosis and heart failure. Some of the possible presentations (signs & symptoms) of dyslipidemia are as below:

1. Xanthomas (yellowish fat deposits visible on the skin).



2. Arcus senilis (Gray or white ring around the eye's cornea that is caused by cholesterol depositing in the corneal margin).
3. Lipemia retinal is (milky appearance in the retinal vessels due to high blood triglyceride levels with blurred vision).
4. Lower limb ischemia (common symptom of peripheral artery disease, caused by the narrowing or blockage of the arteries that supply blood to the legs due to atherosclerosis; this condition is usually characterized by pain or cramping during physical activity and improves with rest).
5. Angina (caused by the narrowing or blockage of the arteries that supply blood to the heart due to atherosclerosis. The uncomfortable pressure, fullness, squeezing or pain in the centre of the chest usually occurs when the heart needs more oxygen, such as during physical or emotional stress and may radiate to the neck, jaw, shoulders, left arm or back).
6. Transient ischemic attacks and strokes (atherosclerosis in cerebral arteries, contributing to sudden interruption of blood flow to the brain due to a clot or a bleed in weakened blood vessel walls. Symptoms may include sudden weakness, slurred speech, transient loss of consciousness or visual disturbances).
7. Non- Alcoholic Fatty liver disease.

DIFFERENTIAL DIAGNOSIS[14-16]

Several disease conditions remain as secondary causes for dyslipidemia. They are as follows:

Table 1

Sl. No.	Disease condition	Findings
1.	Hypothyroidism	Fatigue, increased sensitivity to cold, dryness of skin, constipation, hair loss, dyspnea, hoarse voice, irregular menses, paresthesia, peripheral edema and elevated TSH levels.
2.	Nephrotic syndrome	Swelling in legs, feet, ankles, face and hands. Weight gain, fatigue, foamy or bubbly urine, anorexia, high protein levels in urine, low levels of protein in blood and kidney biopsy to confirm exact cause.
3.	Biliary obstruction, Hepatoma	Right upper quadrant abdominal pain, fever, nausea, vomiting and weight loss. Jaundice with clay colored or acholic stools, dark urine and pruritis, elevated bilirubin levels, Endoscopic ultrasound (EUS), Magnetic Resonance Cholangiopancreatography (MRCP), or direct cholangiography.

Sl. No.	Disease condition	Findings
4.	Pregnancy	Elevated HCG levels, USG abdomen.
5.	Drugs (oral estrogens, glucocorticoids, tamoxifen, thiazides)	Past history of drugs intake, elevated levels of estrogen, cortisol etc., in Blood tests.
6.	Alcohol abuse	Past history of excess alcohol intake.
7.	Obesity	Weight gain, breathlessness, swellings, joint pains and skin changes.
8.	Niemann Pick Disease Type C	Lipidosis due to intracellular cholesterol transport defect (Acid Sphingomyelinase Deficiency) (ASMD), that catalyzes the hydrolysis of sphingomyelin (SM) to ceramide and phosphocholine. Due to this, SM and its precursor lipids begin to accumulate in lysosomes, mainly in macrophages.
9.	Wolman's Disease	It is an autosomal recessive storage condition characterized by extremely low (or nonexistent) lysosomal acid lipase (LAL) activity. This enzyme deficiency results in significant intracellular buildup of cholesteryl esters and triglycerides.
10.	Cerebrotendinous xanthomatosis	A rare autosomal recessive genetic condition caused by a mutation in the CYP27A1 gene, resulting in a lack of the mitochondrial enzyme sterol 27-hydroxylase. This enzyme is required to convert cholesterol into chenodeoxycholic acid, a bile acid.

In Siddha medicine:

- *Atitūlam*
- *Aiyam miku kuṇam*[3]
- *Vaḷarccitai mā̲r̲ra nōykaḷ*[17]

1) Supportive Investigations[18 - 20]

i. Essential investigations:

- **Fasting lipid profile:** The National Cholesterol Education Program provides the Adult Treatment Panel III—widely acknowledged guidelines for dyslipidemia screening. Guidelines recommend a fasting lipid panel every 5 years for adults 20 years and older.
- **Body Mass Index**: Measuring Body Mass Index as follows:

Table 2: WHO's Classification of Adults according to BMI

Classification	BMI	Risk of comorbidities
Underweight	<18.50	Low (but risk of other clinical problems increased)
Normal range	18.50-24.99	Average
Overweight: Preobese	≥25.00	
Obese class I	25.00-29.99	Increased
Obese class II	30.00-34.99	Moderate
Obese class Ill	35.00-39.99	Severe
	≥40.00	Very severe

Table 3: Classification of weight by BMI in adult Asians:[21]

Classification	BMI (kg/m^2)	Risk of co- morbidities
Underweight	<18.5	Low (but increased risk of other clinical problems)
Normal range	18.5-22.9	Average
Overweight	23-24.9	Increased
Obese I	25-29.9	Moderate
Obese II	<30	Severe

ii. Advanced Investigations:

As per the need and symptomatology, the following may be done:

- Apolipoprotein B (ApoB), apolipoprotein A1
- Lipoprotein (a)
- Treadmill Test
- High sensitivity C-reactive protein
- Glycosylated haemoglobin (HbA1c)
- Fasting blood glucose (FBS)
- Thyroid stimulating hormone level (TSH)
- Liver function tests
- Serum creatinine
- Creatine kinase
- Urine analysis
- Homocysteine levels
- Fundoscopy
- Waist hip ratio, waist circumference, skin fold thickness
- Plasma leptin
- Upper Abdominal Ultrasound

DIAGNOSTIC CRITERIA:

Dyslipidemia is often diagnosed with routine screening tests. Dyslipidemia is diagnosed by measuring serum lipids. Routine measurements (lipid profile) include total cholesterol (TC), TGs, HDL-C and LDL-C; these results are used to calculate LDL-C and VLDL-C. A modern updated clinical algorithm for the diagnosis of dyslipidemia is as below:

Table 4: Diagnostic biochemical parameters for dyslipidemia in adults[18,22,24]

	TC	LDL-C	TG	HDL-C
Mild-to-moderate risk				
Levels	200-239 mg/dL	130-194 mg/dL	175-499 mg/dL	25-35 mg/dL
Severe risk				
Levels	≥ 240 mg/dL	≥ 194 mg/dL	≥ 449 mg/dL	< 25 mg/dL

Abbreviations: TC, Total Cholesterol; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; TG, triglyceride.

Classification [12,18,22,23]

Dyslipidemia are mainly classified into two types:

Primary:

Primary dyslipidemia is caused by genetic mutations and can be inherited as an autosomal dominant, autosomal recessive, or X-linked.

Secondary:

Secondary dyslipidemia is caused by improper lifestyle such as lack of physical activity, unhealthy food habits, alcohol intake, smoking etc., and by some health conditions such as obesity, hypothyroidism. Diabetes, CKD, liver disease etc.

International Classification of dyslipidemia gives 5 categories, according to Frederickson phenotype (World Health Organization):[12]

- Phenotype I is an abnormality of chylomicrons and will result in triglycerides greater than 99 percentiles.
- Phenotype IIa consists mainly of LDL cholesterol abnormality and will have a total cholesterol concentration greater than 90 percentile and possibly apolipoprotein B greater than 90 percentile.
- Phenotype IIb consists of abnormality in LDL and VLDL cholesterol. This type will result in total cholesterol or triglycerides greater than the 90 percentile and apolipoprotein greater than the 90 percentile.
- Phenotype III is an abnormality in VLDL remnants and chylomicrons, which results in elevated total cholesterol and triglycerides greater than 90 percentile.
- Phenotype IV is mainly when VLDL is abnormal and results in total cholesterol greater than 90 percentile. This type can also present with triglycerides greater than 90 percentile and low HDL.
- Phenotype V is when chylomicrons and VLDL are abnormal and triglycerides are greater than 99 percentiles.

Eṉvakai Tērvu **(Eightfold examination)** [24,25]

- *Nāṭi* (Pulse) – *Azhal aiyam/ Aliya azhal*
- *Sparicam* (Touch)– Cool
- *Nā* (Tongue) -Pallor and Shiny / coated
- *Niram (Colour)* – Pallor
- *Moḻi (Speech)* – Low pitched Voice
- *Viḻi (Eye)* – Pallor
- *Malam (Stool)* - Colour-White Consistency – *Ilakal* or *Malakkaṭṭu*

- *Mūttiram (Urine)*-Oil stands like a Pearl and disappears as a ring

PRINCIPLES OF MANAGEMENT:

The principles of management include assessment of signs and symptoms before initiating treatment and the need for management through conventional treatment for associated co-morbidities. If the patient is already under standard care, the physician may advice to continue the same along with add-on homoeopathy and can be assessed for the same in the follow ups for tapering or discontinue the treatment in consultation with the conventional physician.

Red Flag Signs[26-27]

- Early age of onset for coronary artery disease in self or in family (includes heart attack, stent, bypass)
- Recurrent vascular events and Atherosclerotic cardiovascular diseases (ASCVD) with genetic dyslipidemia (FH& High Lp (a))
- Clinical evidence of atherosclerotic CAD
- Atherosclerotic disease in other vascular beds
- Heterozygous Familial Hypercholesterolemia (HeFH) with ASCVD, or coronary imaging showing >50 % lesion in 2 coronary vessels
- Total cholesterol ≥ 220 mg/dL or LDL cholesterol ≥ 190 mg/dL in individual
- Tendon Xanthomas
- Uncontrolled co-morbidities

(A) Prevention Management[24]

Preventing dyslipidemia is essential to reduce the risk of cardiovascular complications and improve the quality of life. The prevention strategies include:

- Screening for dyslipidemia regularly, especially for people with a family history or other risk factors. The frequency and type of screening depend on the individual's age, sex and health status, but generally, a lipid profile test is recommended every 4 to 6 years for adults and every 2 years for children and adolescents.
- Adopting a healthy lifestyle by eating a balanced diet with plenty of fruits, vegetables, whole grains, lean proteins and healthy fats, such as omega-3 fatty acids from fish, nuts and seeds. Avoid foods high in cholesterol, saturated fats, transfats, added sugars and salt. If possible, engage in physical activity for at least 150 minutes weekly.
- Maintaining a healthy weight and body mass index, quitting smoking and limiting alcohol intake are all recommended.
- Comorbidities such as diabetes, hypertension, hypothyroidism, chronic kidney disease, or liver disease can affect lipid levels or increase the risk of cardiovascular disease; therefore, it is important to remain compliant with any medications.

Table 5: Common Yoga Protocol

S. No.	Name of Posture/Procedure	
Invocation/Prayer		
Chalana Kriyas (Loosening Practices/Warmups)		
1.	Neck Movements	Forward/Backward Bending
		Right/Left Bending
		Right/Left Twisting
		CW/ACW Rotation
2.	Shoulder Movements	Stretching
		CW/ACW Rotation
3.	Trunk Movements	Right/Left Twisting
4.	Knee Movements	Squats
Standing Yoga Positions		
5.	*Samasthiti*	Standing Alert Posture
6.	*Tadasana*	Palm Tree Posture
7.	*Vrksasana*	Tree Posture
8.	*Uttanasanan*	Standing Forward Bend
9.	*Pada-Hastasana*	Hand to Feet Posture
10.	*Ardha Chakrasana*	Half Wheel Pose
11.	*Trikonasana*	Triangle Pose
Sitting Yoga Positions		
12.	*Visramasana*	Long Sitting Posture
13.	*Sukhasana*	Easy Pose
14.	*Padmasana*	Lotus Pose
15.	*Dandasana*	Stick/Staff Pose
16.	*Bhadrasan*	Gracious Pose or Butterfly Pose
17.	*Vajrasana*	Thunderbolt Pose
18.	*Ushtrasana*	Camel Pose
19.	*Ardha-Ushtrasana*	Half Camel Pose
20.	*Sasankasana*	Hare Posture
21.	*Balasana*	Child Pose
22.	*Uttana Mandukasana*	Stretched Up Frog Posture
23.	*Vakrasana*	Spinal Twist Posture
24.	*Paschimottanasana*	Seated Forward Bend
25.	*Simhasana*	Lion Pose

S. No.	Name of Posture/Procedure		
26.	*Marjarasana*	Cat Pose	
Prone Positions			
27.	*Makarasana*	Crocodile Posture	
28.	*Bhujangasana*	Cobra Pose	
29.	*Salabhasana*	Locust Posture	
30.	*Dhanurasana*	Bow Pose	
Supine Positions			
31.	*Chatuspadasana Setubandhaasana*	Bridge Posture	
32.	*Uttanapadasana*	Raised Leg Posture	
33.	*Matsyasana*	Fish Pose	
34.	*Ardhahalasana*	Half Plough Pose	
35.	*Pavanmuktasana*	Wind Releasing Posture	
36.	*Markatasana*	Monkey Pose	
37.	*Shavasan*	Corpse Body Posture	
38.	*Kapalbhati*	Forceful Rapid Exhalations	Sukhasana/Padmasana/V ajrasana 1 inhalation :20-30 exhalation
Breathing Exercises			
39.	Anuloma-Viloma/ Nadishodhana Pranayam/ *Suryabhedan*	Alternate Nostril Breathing	Left Palm on Left Knee (Jnana Mudra) Right palm in Nasagra Mudra Without Kumbhaka With Kumbhaka (Kumbhaka means retention of breath)
40.	*Shitali Pranayam*	Cooling breath	*Jnana Mudra or Dhyan Mudra or Anjali Mudra (Namaste Pose)* Inhale through Tongue Tube and exhale through nostrils
41.	*Bhramari Pranayam*	Humming bee breath	*Sanmukhi Mudra* *IMRL Thumb-Eye Nose Mouth Ear*
42.	*Dhyana*	Meditation	*Jnana Mudra or Dhyan Mudra or Anjali Mudra* *Tip of thumb to Tip of index finger* *Other fingers straight/relaxed*

Primordial Prevention

Table 6: Vegetables to be Added:

Tamil Name	Common English Name	Botanical Name	Part Used	Consumption Advice
Veḷḷari [28]	Cucumber	*Cucumis sativus*	Fruit	Consume raw as salads or juice
Pācipparuppu[28]	Pumpkin	*Cucurbita pepo*	Fruit	Consume as curry or soups

Tamil Name	Common English Name	Botanical Name	Part Used	Consumption Advice
Curai [28]	Bottle gourd	*Lagenaria siceraria*	Fruit	Consume as curry, soup, or stir-fry
Vāḻai [28]	Banana stem	*Musa paradisiaca*	Stem	Consume as curry/salad
Muruṅkaii[28]	Drumstick	*Moringa oleifera*	Pods	Consume as curry/salad/stir fry
Pīṉs [28]	Beans	*Phaseolus vulgaris*	Pods	Consume as curry, soup, or stir-fry
Veṇṭakkāy [28]	Ladies finger	*Abelmoschus esculentus*	Fruit	Consume as curry, soup, or stir- fry
Kīraikāl[28]	Green leafy vegetables	*Various species*	Leaves	Include one variety in the salads, soups and curries.
Iṉji [28]	Ginger	*Zingiber officinale*	Rhizome	Consume as tea or include it in cooking as one of the ingredients for digestive benefits
Pūṇṭu [28]	Garlic	*Allium sativum*	Bulb	Can be used in cooking
Ciṉṉa vēṅkayam[28]	Small onion	*Allium parvum*	Bulb	Use for making curries
Elumiccai [28]	Lemon	*Citrus limon*	Fruit	Use for salads, juice, or cooking for flavouring dishes
Kōvai [28]	Ivy gourd	*Coccinia grandis*	Fruit	Consume as stir-fries or curries
Kudampuli	Malabar tamarind	*Garcinia cambogia*	Fruit Pulp	For cooking purpose instead of tamarind

Others: [29]

- Whole grains (brown rice, Millets etc.)
- Plant oils (vegetable oils)
- Regular exercises for at least 30 minutes.
- Brisk walking for 30-45 minutes
- Oil bath - weekly twice
- Steam bath - weekly once

To be avoided:

- Oily foods, fried items
- Tubers like potato (*Solanum tuberosum*), *Tapioca* (*Manihot esculenta*), etc.
- Excessive intake of coconut (*Cocos nucifera*)
- Ground nut (*Arachis hypogaea*)
- Sesame seeds (*Sesamum indicum*)
- Milk and milk products
- High glycaemic index foods (rice, corn, sugar, white bread, white pasta).

Levels of Prevention for Dyslipidemia

a) Primordial Prevention: Prevent the development of risk factors that lead to dyslipidemia (such as unhealthy diet, physical inactivity, obesity, and smoking).

b) Primary Prevention: Target individuals with borderline or elevated lipid levels who have not yet developed cardiovascular disease.

c) Secondary Prevention: Manage dyslipidemia in individuals with established cardiovascular disease (CVD) (e.g., past heart attack, stroke, angina).

d) Tertiary Prevention: Prevent or limit disability and complications in individuals with advanced cardiovascular consequences of long-standing dyslipidemia.

Siddha System of Medicine emphasis adhering to *Tēraiyar piṇi aṇukā viti* for prevention of disease and lead to healthy life.

Table 7:

Dietary Habits (*Uṇavu Muṟaikaḷ*)	
Do's - *Pattiyam*	**Don'ts - *Apattiyam***
• Drink warm water • Add *Trithoda sama porutgal* inclusive of turmeric, pepper, cumin seeds, asafoetida, dry ginger, cardamom, fenugreek and garlic in diet • Consume low fat, low-calorie & high fiber diet, fresh vegetables, whole grains, legumes, greens & citrus fruits • Easily digestible foods should be taken such as rice gruel /double boiled rice gruel, buttermilk, Tender coconut water • Include moderate intake of nuts • Include lean proteins and low fat dairy in diet	• Always avoid fatty meals and late-night snacking • Avoid highly processed refined carbohydrate diet and advised to take complex carbohydrates • Limit added sugars, trans fat and refined grains • Avoid deep fried food and junk foods • Avoid Overeating or Skipping Meals
Lifestyle Practices (*Vāḻviyal Muṟaikaḷ*)	
Do's	**Don'ts**
• Practice Siddha *kāyakaṟpam* – take ginger, dried ginger and chebulic myrobalan in the morning, afternoon and evening respectively • Follow intermittent fasting (*Oru poḻutu, Iru poḻutu*) • Practice at least 45 minutes of moderate physical activity (like walking) 5 days a week and *Cilampāṭṭam, Uppukuṇṭam, Mālyutam* • Consume food to the level of hunger • Consume food only half of stomach, liquid quarter of stomach and always leave quarter stomach empty • Better balance of mood and sleep • Powder massage (*Poṭi Timirtal*) with *Panja Karpa Kuliyal Podi* or *Kollu Chooranam* or *Thiripala Chooranam*	• Avoid daytime sleep or oversleeping • Avoid sedentary life style • Avoid stress • Avoid nap after food • Avoid high sodium diet • Avoid alcohol and smoking

(B) **Curative Interventions**

At Level 1:

(Solo Siddha Physician Clinic/Health & Health Clinic/PHC (Optimal Standard of treatment in a situation where technology and resources are limited)

Clinical diagnosis:

Understanding the signs and symptoms of dyslipidemia is crucial for timely intervention and preventing associated complications. Clinicians should consider the broader clinical context, including family history and risk factors, to guide appropriate interventions and reduce the burden of cardiovascular diseases associated with dyslipidemia. Pertinent social history would include tobacco use or specific details about diet. Diagnosis of dyslipidemia is primarily arrived at with the help of investigations as fasting lipid profile. However other investigations may be advised based on the presentation.

Management

The treatment plan (*Marutuvā vaḻimuṟai*) for managing *Koḻuppu piṟaḻvu nōy* in Siddha focuses on addressing the root causes of the imbalance.

The first line of treatment is to normalize the altered or deranged humours and revitalization of seven fundamental tissues through detoxification methods followed by internal medications. The application of detoxification methods like therapeutic oilbath and purgation therapies may be decided by the Siddha physician.

Fasting and dietary modifications are also advised, including practices like *Pattiṉi* (complete fasting), *Viratam* (intermittent fasting) and *Oru poḻutu* (restricting meals to one specific time a day). *Kāyakaṟpam* drugs are prescribed to enhance immunity and vitality. Additionally, medicines with pungent and bitter tastes are recommended to increase *Aḻal*, improve digestion, reduce excess *Aiyam* and balance metabolism. This comprehensive approach targets both internal and external factors to restore balance and promote overall health[2,11].

Day 1

***Eṇṇey muḻukku* (Therapeutic oil bath):** [(3)]

Eṇṇey muḻukku is a preparatory procedure in which medicated oil massage with a bath of lukewarm water. It will strengthen the five sensory organs. According to disease severity, *eṇṇey kuḷiyal* can be advised for one day to three days.

- *Arakku Thylam* – Quantity sufficient (External use)[30]

Rules to be followed during Therapeutic oil bath:

Apply oil before 7 am. Instil 2 drops of medicated oil in each nostril, ear and eye. Spread over the medicated oil from head to foot and give a gentle massage. After application, leave it for 15 to 45 minutes and bathe with lukewarm water.

Take tender vegetables and easily digestible food. Avoid daytime sleep, intercourse and exposure to sunlight and cold items on the day of the oil bath.

Day 2

Therapeutic Purgation *(Kaḷiccal maruttuvam*):

- *Akathiyar Kuzhambu* -100-130 mg with *Ginger Juice (Zingiber officinalis)*, weekly once for 2 weeks on an empty stomach.[30]

Rules to be followed during Therapeutic Purgation

- The medication should be taken in the early morning 5 to 6 AM
- After the average number (5-6 times) of bowel evacuations, watery diarrhoea commences. In this stage, the patient is advised to take buttermilk/ lemon juice/tea decoction/ fried cumin seeds decoction.
- After purgation, the patient may have symptoms like tiredness, slimness, lightness of the body and tiredness of sense organs which is a good sign.
- Dietary regimen during purgation:
    - Buttermilk
    - Rice porridge
    - Double-boiled porridge
    - Luke-warm water
- Precautions
    - Avoid daytime sleep on the day of purgation therapy
    - Should not take heavy meals before or during the procedure

Day 3 onwards

Treatment:

- Selection of drug, dosage form dose, time, choice of adjuvant and its dose duration will depend upon the disease severity, chronicity, body constitution and age. These criteria solely depend upon the discretion of the treating physician.

Table 8: Single Herbs

Sl. No	Herbs	Dosage form	Dose	Time	Duration and Frequency	Adjuvants/ Aṉupāṉam
Kudineer – Decoction / Powder/ juice						
1.	*Neermuli (Hygrophila auriculata)*[31]	Decoction or powder	30ml/1-2g	BD	30 days	Water
2.	*Nerunjil (Tribulus terrestris)*[31]	Decoction or powder	30ml/1-2g	BD	30 days	Water
3.	*Sirukanpeelai (Aerva Lanata)*[31]	Decoction or powder	30ml/1-2g	BD	30 days	Water
4.	*Brahmi (Bacopa monnieri)*[31]	Decoction or powder	30ml/1-2g	BD	30 days	Water

Sl. No	Herbs	Dosage form	Dose	Time	Duration and Frequency	Adjuvants/ Aṉupāṉam
5.	*Seenthil (Tinospora cordifolia)*[31, 32]	Decoction or powder	1-2 g	BD	30 days	Water
6.	*Kattrazhai (Aloe vera)*[31]	Juice; avoid excessive use.	30ml	BD	30 days	--
7.	*Korai kizhangu (Cyperus rotundus.)*[31]	Decoction or powder	30ml/1-2g	BD	30 days	Water
8.	*Kungilyam (Shorea Robusta)*[31]	Powder	1-2g	BD	30 days	Water
9.	*Mantharai (Bauhinia purpurea)*[31]	Powder	1-2 g	BD	30 days	Water
10.	*Ashoka (Saraca asoca)*[30]	Decoction or powder	30ml/1-2g	BD	30 days	Water
11.	*Kazharchi (Caesalpinia crista)*[31]	Powder	1-2 g	BD	30 days	Water
12.	*Kodam puli (Garcinia cambogia)*[31]	Dried fruit juice	30ml	BD	30 days	--
13.	*Nathaisoori (Spermacoce hispida)*[31]	Decoction or powder	1-2 g	BD	30 days	Water
14.	*Vellulli (Allium sativum)*[33]	Decoction	30ml	BD	30 days	--
15.	*Karunjeergam (Nigella sativa)*[34]	Powder	1-2 g	BD	30 days	Water
16.	*Kadukkai (Terminalia chebula)*[35]	Powder	1-2 g	BD	30 days	Water
17.	*Chukku (Zingiber officinale)*[36]	Decoction or powder	1-2 g	BD	30 days	Water
18.	*Alisividhai (Linum usitatissimum)*[37]	Powder	1-2 g	BD	30 days	Water
19.	*Kothamalli (Coriandrum sativum)*[38]	Decoction or powder	130ml/1-2 g	BD	30 days	Water
20.	*Nelli (Phyllanthus emblica)*[39]	Juice or Powder	30ml/1-2 g	BD	30 days	Water
21.	*Manjal (Curcuma longa)*[40]	Powder	1-2 g	BD	30 days	Water

Table 9: Compound formulations

Sl. No	Drugs	Dosage Form	Dose	Time	Duration and Frequency	Adjuvants/ Aṉupāṉam
***Kudineer* - Decoction**						
1.	*Neermulli Kudineer* [30]	Decoction	30-60 mls	Twice a day, Before food	60 days	-
2.	*Mandurathi Kudineer*[30]	Decoction	30-60 ml	Twice a day, Before food	21 days	-

Sl. No	Drugs	Dosage Form	Dose	Time	Duration and Frequency	Adjuvants/ Aṉupāṉam
3.	*Venthamarai Kudineer*[30]	Decoction	60 ml	Twice a day, Before food	60 days	-
***Chooranam* - Medicinal powder**						
4.	*Karisalankanni Chooranam* [30]	Medicinal powder	1-2 g	Twice a day, Before food	60 days	-
5.	*Seeraga Chooranam*[30]	Medicinal powder	1-2 g	Twice a day, After food	60 days	Honey or Milk
6.	*Thiripala Chooranam*[30]	Medicinal powder	1-2 g	Twice a day, After food	60 days	Honey or Milk
7.	*Thirikadugu Chooranam*[30]	Medicinal powder	1-2 g	Twice a day, After food	60 days	Honey or Milk
8.	*Nilavagai Chooranam*[30]	Medicinal powder	1-2 g	Twice a day, After food	60 days	Honey or Milk
9.	*Elathi Chooranam*[30]	Medicinal powder	1-2 g	Twice a day, After food	60 days	Honey or Milk
10.	*Venthamarai Chooranam*[30]	Medicinal powder	1-2 g	Twice a day, After food	60 days	Warm water
***Maathirai*- Tablet**						
11.	*Veppampoo Maathirai*[41]	Tablet	1-2 Nos	Twice a day, After food	60 days	Honey
12.	*Kasthuri Maathirai*[42]	Tablet	1-2 Nos	Twice a day, After food	60 days	Honey

Varma maruttuvam [43,44]

- *Tīvalai kālam*
- *Puruva varmam*
- *Kaikāvuḷi varmam*
- *Mūttira kālam*
- *Uḷkuttu varmam*
- *Taṭciṇai kālam*

1. **Recommended Diet & Lifestyle:**

- Healthy Diet regimens - Mediterranean diet, Dietary Approaches to Stop Hypertension [DASH]).[45]
- Systematic physical activity such as aerobics enhances cardiorespiratory fitness and ameliorates dyslipidemia. High-intensity intermittent aerobic training can reduce myocardial oxygen demand and help control exercise intensity and increase HDL-C levels vs. moderate- intensity continuous aerobic training. Aerobic training can bring about an approximate 30– 40% reduction in TG and 20% increase in HDL-C levels in patients with moderate hypertriglyceridemia.[46]

Integrative treatment approach:

If a case of dyslipidemia is associated with other co-morbid conditions (diabetes, hypothyroidism, etc.), a multidisciplinary integrative approach with other medical experts such as diabetologists, endocrinologists and registered nutritionists is essential to achieve a sustained improvement and benefit to the patient.[47]

2. **Restricted Diet and Lifestyle** [48-51]

- Avoid high carbohydrate diet.
- Avoid consumption of red and processed meat.
- Avoid consumption of alcohol and smoking.
- Avoid strenuous physical exercises which may trigger cardiac events.
- Avoid diet rich in trans fats such as fried food.

3. **Follow Up:** Every 14 days or as per need[52]

Reviews should include:

- Monitoring the person's symptoms and the ongoing impact of the condition on their everyday activities and quality of life.
- Monitoring the long-term course of the condition.
- Management of dyslipidemia in terms of lifestyle modifications.
- Discussing the person's knowledge of the condition, concerns, personal preferences and ability to access services.
- Review the effectiveness and tolerability of ongoing treatment. If the patient is improving, continue treatment and if not, review the totality for further prescription.
- Self-management support.

4. **Referral criteria**

- Non-response to treatment.
- Evidence of an increase in severity/complications
- Substantial impact on their quality of life and activities of daily living
- Diagnostic uncertainty
- Uncontrolled co-morbidities, such as diabetes, hypertension or associated cardiac disease.

At Level 2:

(CHC/Small hospitals (10-20 bedded hospitals with basic facilities such as routine, investigation, X-ray).

Clinical Diagnosis: Same as level 1. The case referred from Level 1, or a fresh case, must be evaluated thoroughly for any complications.

Investigations:

The diagnosis would be primarily clinical. However, investigations may be necessary to investigate complications or exclude other differential diagnoses as follows:

- High sensitivity C-reactive protein.
- Apolipoprotein B (ApoB), apolipoprotein A1.
- Lipoprotein(a).
- Glycosylated hemoglobin (HbA1c).
- Fasting blood glucose (FBS).
- Thyroid stimulating hormone level (TSH).
- Transaminase (ALT).
- Serum creatinine.
- Creatine kinase.
- Urine analysis.
- Homocysteine levels.
- Fundoscopy.

Management

Along with level 1 medications including detoxification treatment any of the following medicines can be used.

(**Note**: Administration of medicine, dosage, drug holiday and treatment duration may vary according to the condition of patient, disease severity. This solely depends upon the discretion of the treating Siddha Physician).

Table 10

Sl. No	Drugs	Dosage Form	Dose	Time	Duration and Frequency	Adjuvants/ Aṉupāṉam
***Chooranam* - Medicinal powder**						
1.	*Thiratchathi Chooranam*[42]	Medicinal powder	1-2 g	Twice a day, After meals	90 days	Honey or Milk
***Parpam* - White calx**						
2.	*Nandukal Parpam*[30]	White Calx	200- 400 mg	Twice a day	90 days	*Neermulli Kudineer*
3.	*Silasathu Parpam*[30]	White Calx	100- 300 mg	Twice a day	90 days	Ghee
4.	*Kungiliya Parpam*[30]	White Calx	100- 300 mg	Twice a day	90 days	Ghee
5.	*Vengara Parpam*[30]	White Calx	65- 125 mg	Twice a day	90 days	Ghee

Varma maruttuvam [42,43]

- *Tīvalai kālam*
- *Puruva varmam*
- *Kaikāvuḷi varmam*
- *Mūttira kālam*
- *Uḷkuttu varmam*
- *Taṭciṇai kālam*

1. **Recommended Diet & Lifestyle As per level 1**
2. **Restricted Diet & Lifestyle**
3. **Follow Up** every 14 days or as per the need
4. **Referral Criteria**

Same as mentioned in Level 1 and any of these

- Psychological imbalance
- Any red flag signs.
- Signs of CVD as stroke, transient ischaemic attack and angina.

At Level 3:

(Ayush hospitals attached with teaching Institution, District Level/Integrated/State Ayush Hospitals, Allopathic hospitals also having tertiary care facilities either standalone or integrative management facilities.

- ➢ Multiple departments/facilities for diagnosis and interventions
- ➢ Must provide additional facilities like dieticians, counselling, Physiotherapy unit and sophisticated procedures. (as applicable)

Clinical Diagnosis: Same as levels 1 & 2. Confirm diagnosis and severity with the help of the following investigations:

- Plasma Leptin
- Treadmill Test or Exercise stress Test to evaluate the efficacy of functioning of heart during exercises

Management

Along with level 1 medications including detoxification treatment any of the following medicines can be used.

(**Note**: Administration of medicine, dosage, drug holiday and treatment duration may vary according to the condition of patient, disease severity. This solely depends upon the discretion of the treating Siddha Physician).

Table 11

Sl. No	Drugs	Dosage Form	Dose	Time	Duration and Frequency	Adjuvants/ Aṉupāṉam
***Maathirai* - Tablet**						
1.	*Maha vasantha Kusumagaram*[30]	Tablet	65-130 mg	Twice a day	90 days	Honey
***Parpam* - White calx**						
2.	*Thanga Parpam*[30]	White calx	30-65 mg	Twice a day	90 days	Honey
***Chenduram* - Red calx**						
3.	*Annabedhi Chenduram*[30]	Red calx	500-200 mg	Twice a day	90 days	Honey

Sl. No	Drugs	Dosage Form	Dose	Time	Duration and Frequency	Adjuvants/ Aṉupāṉam
4.	*Ayakantham Chenduram*[30]	Red calx	65-130 mg	Twice a day	90 days	Honey
5.	*Aya Chenduram*[30]	Red calx	60-130 mg	Twice a day	90 days	Honey
6.	*Vedi Annabedhi Chenduram*[30]	Red calx	65-130 mg	Twice a day	90 days	Honey
7.	*Vediyuppu Chenduram*[30]	Red calx	65-130 mg	Twice a day	90 days	Honey
8.	*Rasa Chenduram* [30]	Red calx	130 mg	Twice a day	90 days	Honey
9.	*Mandura Chenduram*[30]	Red calx	65-130 mg	Twice a day	90 days	Honey
10.	*Gowri Chinthamani Chenduram*[30]	Red calx	65-130 mg	Twice a day	90 days	Honey
11.	*Padikara Chenduram*[30]	Red calx	65-130 mg	Twice a day	90 days	Honey
12.	*Purna Chandrothayam* [30]	Red calx	30-65 mg	Twice a day	90 days	Honey

***Varma maruthuvam*[43,44]**

- *Tīvalai kālam*
- *Puruva varmam*
- *Kaikāvuḷi varmam*
- *Mūttira kālam*
- *Uḷkuttu varmam*
- *Taṭciṇai kālam*

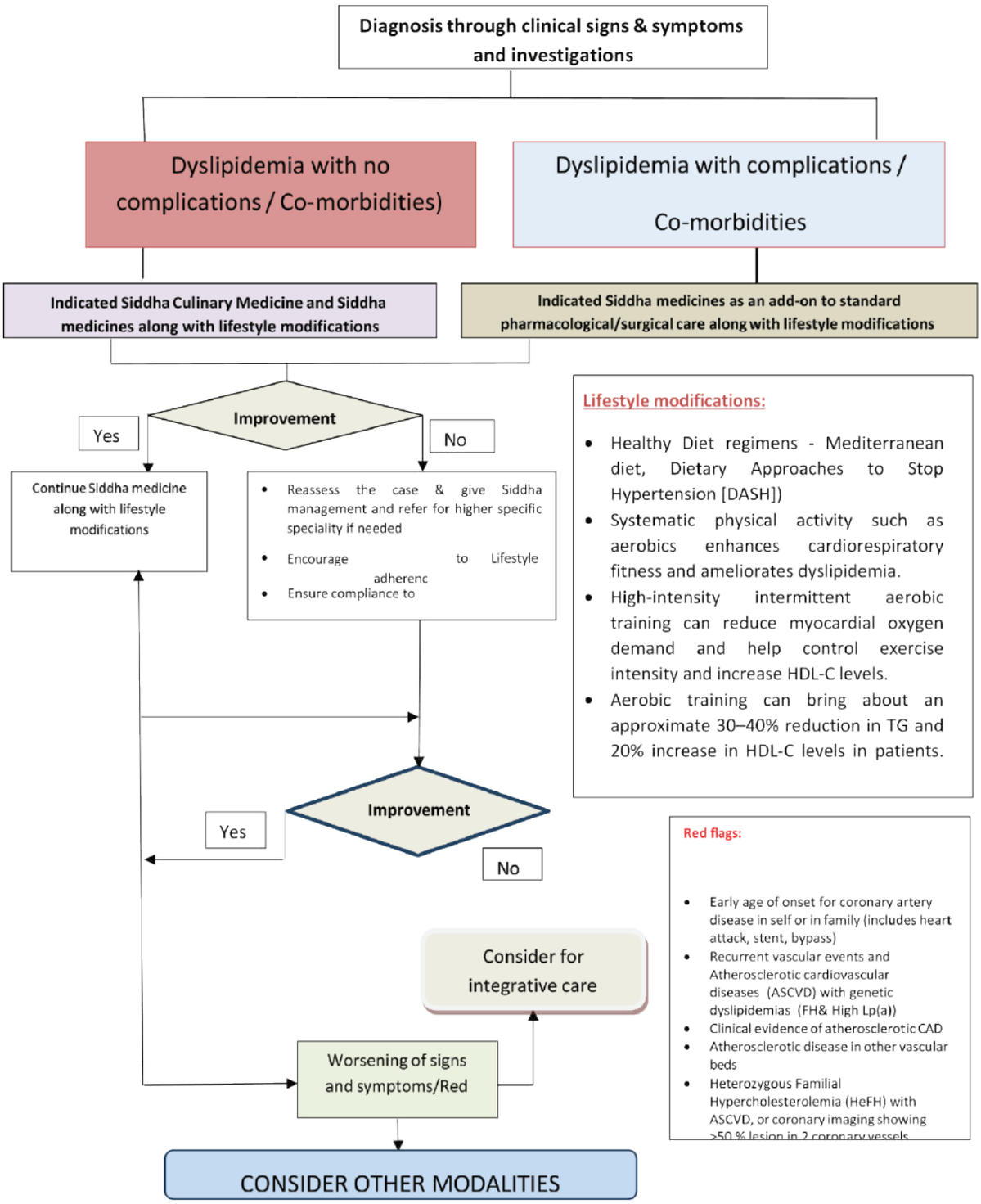
1. **Recommended Diet & Lifestyle As per level 1**
2. **Restricted Diet & Lifestyle**
3. **Follow Up** every 14 days or as per need
4. **Referral Criteria**[53]

Same as mentioned in Level 1 and any of these

- Morbid obesity not responding to treatment
- Uncontrolled hypertension
- Worsening Hypertriglyceridemia
- Worsening insulin resistance and hyperglycaemia
- Suspected Cardiac arrythmias
- Recurrent vascular events and ASCVD with genetic dyslipidemia (FH& High Lp(a))
- Suspected Polycythaemia
- Other modalities can be considered depending on the case and to rehabilitate properly.

ANNEXURE I

ALGORITHM OF TREATMENT PROCESS FOR DYSLIPIDEMIA



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CHAPTER

3

GOUT

GOUT

(ICD) 10- M10.9 [1]
(ICD) 11- FA25.2Z

Peruviral vātam (பெருவிரல் வாதம்)
Viral vātam (விரல் வாதம்)[2]
WHO International Standard Terminologies on Siddha medicine: ISMT-4.24.218
Amuri amila Paṭital (அமுரி அமில படிதல்)

CASE DEFINITION

Gout is a chronic disease of deposition of monosodium urate crystals (crystal-induced arthritis), which form in the presence of increased urate concentrations. It is characterized by severe pain, redness, tenderness in joints which occur due to too much uric acid crystal deposits in the joints. [3-5]

INTRODUCTION

- It is the most common inflammatory arthritis in men and in older women.
- Globally, the Gout is prevalent in a range of <1% to 6.8% and an incidence of 0.58-2.89 per 1,000 person-years. Gout is more prevalent in men than in women with increasing age and in some ethnic groups.
- In India, approximately 0.12-0.19% population is affected by gout with male preponderance. The reported male to female ratio is approximately 7:1 to 9:1 but in people over the age of 65 this ratio is reduced to 3:1. Polyarticular gout is more frequent in the elderly and females.
- Initial presentation is predominantly monoarticular with the ankle joint being the commonest to be involved. But overall, the first metatarsophalangeal (MTP) joint is the commonest joint affected with > 90% having this joint involvement at some point of the disease. [6-8]
- Risk factors include hyperuricemia, genetic factors, dietary factors like intake of meat, seafood, sugar-sweetened soft drinks and foods high in fructose, alcohol consumption, especially beer and hard liquor, obesity, hypertriglyceridemia, metabolic syndrome, increased diuretic use, chronic renal disease and recent surgery or trauma, hypertension, diabetes and menopause.[9-12]

CLINICAL EXAMINATION

The signs and symptoms of gout almost always occur suddenly and often at night. They include:

- **Intense joint pain**: Gout usually affects the large joint of your big toe, but it can occur in any joint. Other commonly affected joints include the ankles, knees, elbows, wrists and fingers. The pain is likely to be most severe within the first four to 12 hours after it begins.

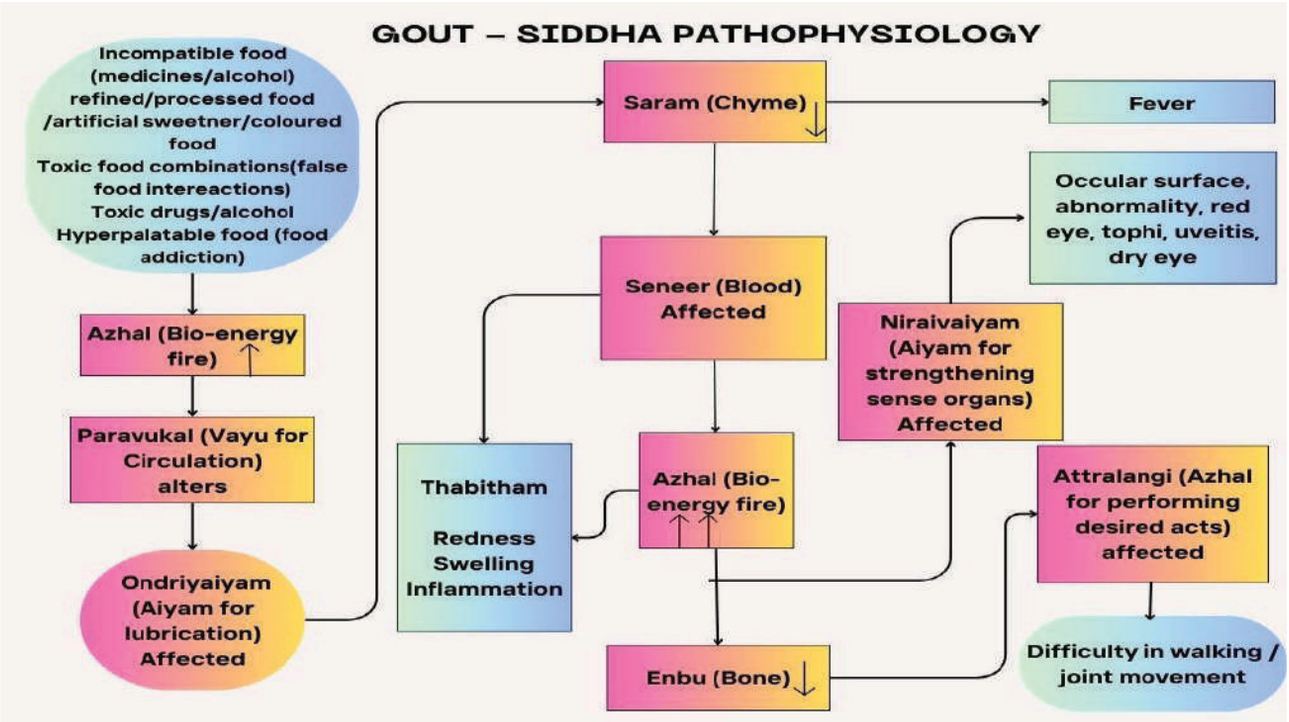


Fig. 1 Gout Siddha Pathophysiplogy

- **Lingering discomfort:** After the most severe pain subsides, some joint discomfort may last from a few days to a few weeks. Later attacks are likely to last longer and affect more joints.
- **Inflammation and redness:** The affected joint or joints become swollen, tender, warm and red.
- **Limited range of motion:** As gout progresses, patients may not be able to move joints normally.

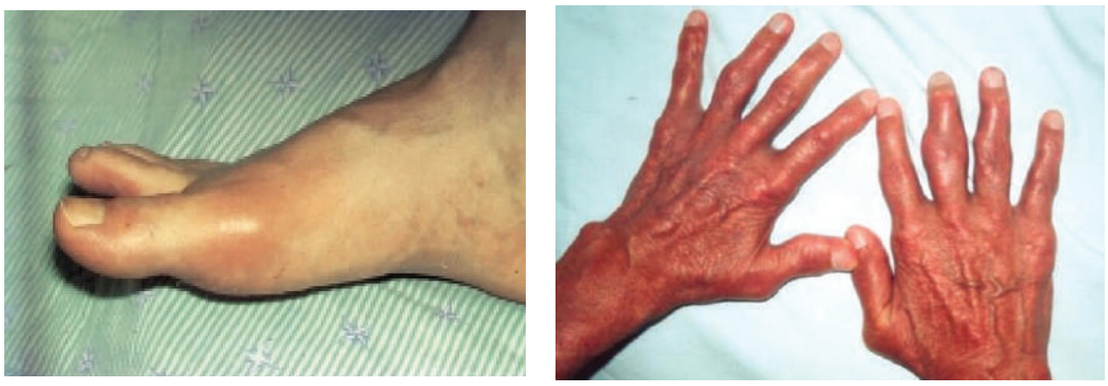


Fig. 2: (a) Acute gout. Note the swelling and erythema of the first metatarsal phalangeal joint. (b) Diffuse swelling of the dorsum of the left hand is evident in this patient with acute gouty arthritis (left panel).[13]

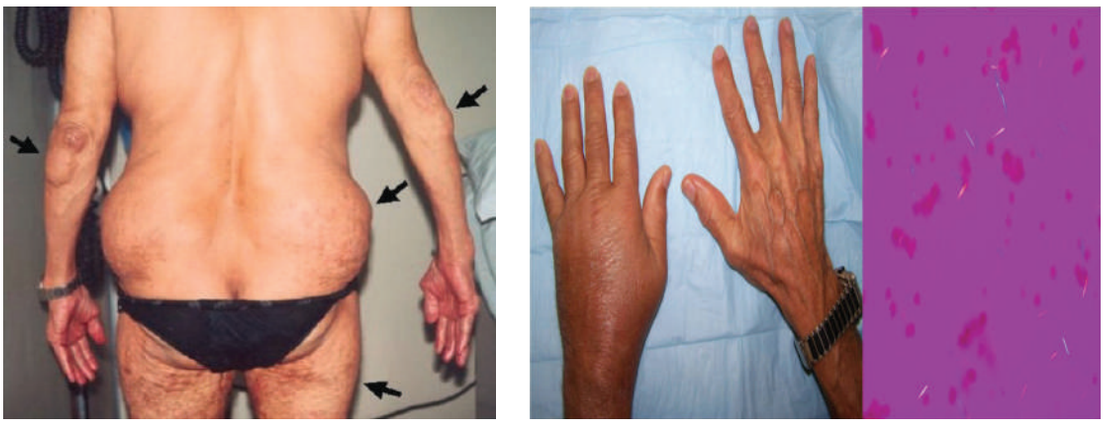


Fig. 3: Generalized chronic tophaceous Gout (a) Nodules located in the hands, elbows, legs, buttocks and abdominal wall (arrows) (b) Nodules in periarticular structures and arthritis only in few joints.[14]

DIFFERENTIAL DIAGNOSIS

The following diseases must be considered in differential diagnosis of acute gout:

Table 1

Condition	Differential Features

Septic arthritis	• Knee is most commonly involved (may be any joint distribution)
	• Synovial fluid findings:
	  ○ WBC Count > 50,000 per mm^3
	  ○ Culture positive
	  ○ Synovial fluid crystals absent
	  ○ Radiography findings- Joint effusion; radiography results otherwise normal early in the disease

Trauma	History of injury will be present.

Pseudogout	• Knee, wrist, or first metatarsophalangeal joints are commonly involved.
	• Synovial fluid findings:
	  ○ WBC Count 2,000 to 50,000 per mm^3
	  ○ Culture negative
	  ○ Synovial fluid crystals-Rhomboid shaped, weak positive birefringence
	  ○ Radiography findings-soft tissue swelling, chondrocalcinosis (calcification of cartilage)

Rheumatoid arthritis	• Arthritis of three or more joint areas • Symmetrical arthritis • Morning stiffness (> 1 hour) • Positive rheumatoid factor • Positive anti-CCP antibody • Elevated ESR and CRP
Psoriatic arthritis	• Onset usually between 25 and 40 years of age • Most commonly in patients with current or previous skin psoriasis (70%) • Affection of the DIP joints of the hands. However, unlike hand OA, psoriatic arthritis may target just one finger, often as dactylitis and characteristic nail changes are usually present. • HLA-B27 Positive.

Condition	Differential Features
Reactive arthritis	• Monoarthritis or oligoarthritis following a recent infection (e.g., urethritis, enteric). • Asymmetric pattern of joint involvement • Symptoms or signs of enthesopathy, Keratoderma blennorrhagica or circinate balanitis • Radiologic evidence of sacroiliitis and/or spondylitis • The presence of human leukocyte antigen (HLA) B27
Monoarthritis	• Inflammation of single joint. Laboratory tests (blood chemistries, urinalysis) and diagnostic modalities (X-rays, CT scans, MRI) should be considered to confirm clinical impression.
Acute bursitis	• Gout can mimic bursitis as well, especially at the olecranon, prepatellar and infrapatellar bursa, as these joints are common locations for the formation of gouty tophi or pain from pseudogout. • Imaging can be helpful to narrow down the differential diagnosis. MRI can be used to evaluate the deeper bursa. Aspiration of the inflamed bursa can be helpful when there is a question of septic bursitis.
Tenosynovitis	• Centesis of the tenosynovial sheath and microscopic examination should be encouraged in acute tenosynovitis as gout flares may mimic infectious tenosynovitis.

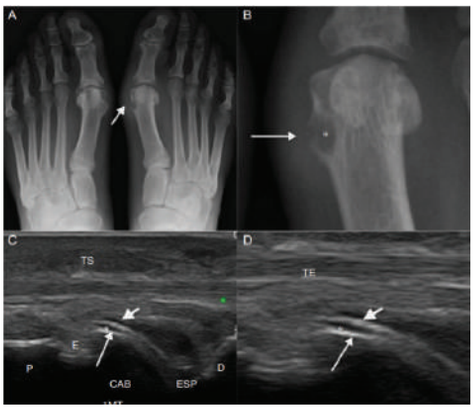
- In Siddha Medicine: [15,16]
- *Vātacurōṇitam*
- *Narittalai Vātam*
- *Karastampam*
- *Vātakarṣaṇam*
- *Pēy Vātam*

SUPPORTIVE INVESTIGATIONS [17-19]

Identification of urate crystals in fluid from an affected joint is the definitive diagnostic test for the diagnosis of gout. In practice, this test is applied to only a minority of patients. Guidelines exist for clinical diagnosis without joint aspiration. Other tests which may be considered are:

Table 2

Test	Comment
Essential investigations	
Serum urate concentration	Level may go down in few cases during an acute attack (serum uric acid levels ≤6 mg/dL)
Advanced investigations	
X ray	X-ray has low sensitivity for diagnosis of Gout. In the initial presentation only an increased soft tissue volume and density can be seen. In chronic tophaceous gout, radiographic signs include visualizing tophi as soft tissue or intraosseous masses, whether or not containing calcifications; and the presence of a non- demineralizing arthropathy accompanied by erosions presenting margins which may be sclerotic or protruding. The Martel's sign (Fig. 3) consists in the presence of a protruding, salient bone edge separated from a tophus and leaning on it.

Test	Comment
	 Fig. 4
Ultrasonography (USG)	Characteristic for the diagnosis of gout is the "double contour signal", which is characterized by an irregular linear hyper echoic layer on the superficial margin of the anechoic hyaline cartilage and parallel to the bone cortex, without a posterior acoustic shade.
Dual Energy Computed tomography (DECT)	CT allows the visualization of tophi in both the subcutaneous tissue and in intra-articular areas. This method also helps to identify bone erosion.
Complete blood count /ESR	To exclude myeloproliferative disorders; raised white cell count may indicate septic arthritis
Renal function	Hyperuricemia can occur in renal failure
Fasting lipids, glucose and thyroid functions	Hyperlipidaemia, diabetes mellitus, hypothyroidism and possibly hyperthyroidism are associated with gout
Urinary urate excretion	Some authorities advise measuring this if the serum urate concentration is >0.8 mmol/l because of risk of renal stone formation
CRP	High levels of CRP are expected in patients experiencing acute gout attacks.
RA factor	To rule out Rheumatoid arthritis.

DIAGNOSTIC CRITERIA[7,20]

The diagnosis of Gout is primarily clinical and made after a complete medical history and physical examination. Gout undergoes four phases during its course, which are stated below:

- **Asymptomatic hyperuricaemia:** In this stage, patients have no symptoms or signs and are usually accidentally discovered when measuring serum uric acid (serum level greater than 7 mg/dL). This condition should not be treated with any medication.
- **Acute gouty attack:** Classically, there is no hyper uricemia. It produces an acute monoarthritis of rapid onset, often waking patients from sleep, reaching a peak within 24 to 48 hours. The pain is intense and patients often cannot wear socks or touch bed sheets during flare-ups with marked exacerbation of pain even at the simple touch. The affected joints become red, shiny and tender in a few hours. The most affected joints are big toe also

known as podagra (50% of initial attacks), foot, ankle, mid tarsal, knee, wrist, finger and elbow. Acute flares also occur in periarticular structures, including bursae and tendons.

- **Inter-critical period:** During the period between acute attacks the patient is asymptomatic even if monosodium Urate (MSU) deposition may continue to increase silently.
- **Chronic tophaceous gout:** It is characterized by the deposition of solid MSU crystal aggregates in various locations including joints, bursae and tendons as tophi. Tophaceous gout may lead to significant morbidity and, if untreated, can cause prominent joint damage and marked functional impairment.

The ACR/EULAR gout classification criteria 2015 [21]

STEP 1: Entry Criterion: If yes, Classification criteria required for positive diagnosis ε 1 episode of swelling, pain or tenderness in a peripheral joint/ bursa

STEP 2: Sufficient Criterion: If yes, diagnosis is positive Presence of Monosodium Urate (MSU) crystals in a symptomatic joint, bursa or tophus

STEP 3: Classification Criteria:

Table 3

Criteria	Categories		Score
Clinical	Pattern of joint/bursa involvement Characteristics of the episode(s) ever (erythema overlying joint, cannot bear touch/pressure to the affected joint, walking difficulty) Time-course of episode(s) ever Clinical evidence of tophus	Ankle or midfoot (mono-/oligo-) MTP1 (mono-/oligo-) One characteristic Two characteristics Three characteristics One typical episode Recurrent typical episode Present	1 2 1 2 3 1 2 4
Laboratory	Serum uric acid level (SU)	6 to <8 mg/dL 8 to <10 mg/dL >10 mg/dL	2 3 4
Imaging	Imaging evidence of urate deposition Imaging evidence of gout-related joint damage	Present (US: DCS or DECT) Present (X-ray gouty erosion)	4 4
		Maximum score	23
If SU <4 mg/dL: take -4 points; if MSU is negative take -2 points			

* MTP1: the first metacarpophalangeal joint, US: ultrasonography, DCS: double contour sign DECT: dual-energy computed tomography, MSU: monosodium urate.

According to the diagnostic criteria, gout is considered when the sum of scores from domains such as the presence of clinical symptoms, level of serum urate and radiographic imaging (plain X-ray and ultrasound) is **greater than 8 points**.

PRINCIPLES OF MANAGEMENT

Red Flag signs:

These signs should be assessed before initiating treatment for need for management consultation through modern medicine.

- Uncontrollable pain
- Joint destruction
- Constitutional features such as fever, weight loss and malaise
- Renal failure

Patients should be educated on their diagnosis. They should be educated about the natural history of disease with possible complications. Therapeutic options need to be discussed along with dietary restrictions and lifestyle changes such as exercise and weight control that might be helpful.

A. Prevention Management

Levels of Prevention for GOUT

a) Primordial Prevention: Prevent development of risk factors like high uric acid, poor diet, or metabolic syndrome.

b) Primary Prevention: Prevent the onset of gout in high-risk individuals (e.g., family history, hyperuricemia).

c) Secondary Prevention: Prevent recurrence of gout attacks and development of chronic gout.

d) Tertiary Prevention: Manage chronic tophaceous gout and prevent joint damage or disability.

Siddha System of Medicine emphasis adhering to *Tēraiyar piṇi aṇukā viti* for prevention of disease and lead to healthy life.

Table 4

Dietary Habits (*Uṇavu Muṟaikaḷ*)	
Do's - *Pattiyam*	**Don'ts - *Apattiyam***
• Drink warm water • Add *Trithoda sama porutgal* inclusive of turmeric, pepper, cumin seeds, asafoetida, dry ginger, cardamom, fenugreek and garlic in diet • Include moderate intake of nuts • Include lean proteins and low fat dairy in diet • Follow Dietary Approaches to Stop Hypertension (DASH)-style diet and to avoid use of diuretics [22]	• Avoid deep fried food and junk foods • Avoid overeating or skipping meals • Avoid of triggering foods such as red meats, seafood and fermented items • Avoid carbonated drinks, ice creams and chocolate

Lifestyle Practices (*Vāḻviyal Muṟaikaḷ*)	
Do's	**Don'ts**
• Meditation and Physical activity • Better balance of mood and sleep • Advised therapeutic purgation once in every four month • Regular stress management • Maintain ideal weight[22]	• Avoid daytime sleep or oversleeping • Avoid sedentary life style • Avoid stress • Avoid nap or sleep after food • Avoid purine rich diet like sea food, red meat, lentils, chickpeas, kidney beans etc., • Avoid alcohol and smoking • Avoid extreme weather exposures • Avoid vigorous exercise

Yoga: Various Yoga practices are helpful for the management of Gout. These include Pranayama like Bhastrika, Kapalabhati and Anuloma-Viloma; various relaxation techniques viz. twisting movement of the body; yogasanas like Vajrasana, Trikonasana, Dhanurasana, Naukasana, Ardha Matsyendrasana, Pavana Muktasana and Surya namaskara.

B. Curative Interventions

At Level 1: (Solo Siddha Physician Clinic/Health & Health Clinic/PHC (Optimal Standard of treatment in a situation where technology and resources are limited)

- **Clinical Diagnosis:** The diagnosis of Gout is primarily clinical and made after a complete medical history and physical examination. However, some investigations, like a complete hemogram, urine routine/microscopic and serum uric acid level, RA factor, CRP may be done.

Management

The first line of treatment is to normalize the altered or deranged humours and revitalization of seven fundamental tissues through detoxification methods followed by internal medications. The application of detoxification methods like therapeutic oilbath and purgation therapies may be decided by the Siddha physician.

***Eṇṇey kuḷiyal* (Therapeutic oil bath):[23]**

Eṇṇey kuḷiyal is a preparatory procedure in which consists medicated oil massage with a bath of lukewarm water. It will strengthen the five sensory organs. According to disease severity, *eṇṇey kuḷiyal* can be advised. The days of *ennai kuliyal* are decided according to the discretion of the physician.

- *Arakku Thylam* – Quantity sufficient (External use)
- Santhanathi Thylam – Quantity sufficient

Rules to be followed during *Eṇṇey kuḷiyal*

Apply oil before 7 am. Instil 1 drop of medicated oil in each eye, 2 drops in each nostril and 3 drops in each ear. Spread over the medicated oil from head to foot and give a gentle massage. After application, allow it for 45 minutes and bathe with lukewarm water with herbal hair wash powder.

Take tender vegetables and easily digestible food. Avoid daytime sleep, intercourse and exposure to sunlight and cold items on the day of oil bath.

***Kaḻiccal maruttuvam* (Therapeutic purgation)[24]**

Table 5

S. No.	Drugs	Dose form	Dose	Time	Duration and Frequency	Adjuvants/ *Aṉupāṉam*
1.	*Kumari Ennai*[25]	Internal oil	30 ml	Once in a Day Morning in an empty stomach	Once a week for 2 weeks	Milk
2.	*Siddhathi Ennai* [25]	Internal oil	5-10 ml	Once in a Day (OD) - Morning in an empty stomach	Once a week for 2 weeks	Milk

*Any of the medicine can be used

Rules to be followed during *Kaḻiccal Maruttuvam*

- The medication should be taken in the early morning 5 to 6 AM
- After the average number (5-6 times) of bowel evacuations, the patient is advised to take buttermilk/ lemon juice/fried cumin seeds decoction/Ash of sweet flag (*Vacampu*).
- At the end of proper purgation, watery diarrhoea commences. This indicates that the purgation therapy has been completed properly.
- After purgation, the patient may have symptoms like tiredness, slimness, lightness of the body and tiredness of sense organs which is a good sign.
- Dietary regimen during purgation:
    - Buttermilk
    - Rice porridge
    - Double-boiled porridge
    - Luke warm water
- Precautions:
    - Avoid daytime sleep on the day of purgation therapy
    - Should not take heavy meals before or during the procedure
    - Avoid intercourse

Compound formulation

(**Note**: Administration of medicine, dosage, drug holiday and treatment duration may vary according to the condition of patient, disease severity. This solely depends upon the discretion of the treating Siddha Physician).

Table 6

S. No	Drugs	Dosage form	Dose	Time	Duration & Frequency	Adjuvants/ *Aṉupāṉam*
***Kudineer* /Decoction**						
1.	*Neermulli Kudineer* [24]	Decoction	60 ml	BD Before food	15 days	-
2.	*Vatha Sura Kudineer* [25] (if fever persists)	Decoction	60 ml	BD Before food	15 days	-
3.	*Kurunthotti Kudineer* [26]	Decoction	60 ml	BD Before food	15 days	-
***Chooranam*/medicinal powder**						
1.	*Parangipattai Chooranam* [25]	Medicinal powder	1-2 g	BDAfter food	15 days	Ghee/Palm Jaggery
2.	*Seenthil Chooranam* [25]	Medicinal powder	1-2 g	BDAfter food	15 days	Ghee/Palm Jaggery
3.	*Thirikaduku Chooranam*[25]	Medicinal powder	1-2 g	BDAfter food	15 days	Honey
***Maathirai* /Tablet**						
1.	*Vatha Ratchasan Maathirai* [23]	Tablet (100 mg)	1-2 Nos	BD After food	15 days	Honey/Hot Water/ suitable herbal decoction
2.	*Karuppu Vishnu chakkaram*[23]	Tablet (100 mg)	1-2 Nos	OD After food	7-14 days	Honey/Hot Water/ suitable herbal decoction
External application						
1.	*Sivappu kukkil Thylam* [27]	External Oil	q.s	BD	15 days	-
2.	*Vathakesari Thylam* [23]	External Oil	q,s	BD	15 days	-

Varmam Maruttuvam [28,29]

- *Muṭiccu varmam*
- *Moḻi piṟalkai*
- *Cavvukālam*
- *Kavulikālam*
- *Kaimūṭṭu varmam*

1) Recommended Diet & Lifestyle [30-34]

Lifestyle and dietary recommendations for gout patients should consider overall health benefits and risk since gout is often associated with metabolic syndrome and an increased future risk of cardiovascular disease (CVD) and mortality. Some of the measures are:

- Exercise: Apparently in healthy, vigorously active men, the prevention of weight gain through the promotion of vigorous physical activity may help to prevent gout.
- Overweight patients should aim for a normal weight but should not crash-diet or follow protein rich diet.

- Patients known to suffer from gout and kidney stones should be instructed to consume sufficient fluids (>2 L /day).
- Adherence to Dietary Approaches to Stop Hypertension (DASH)-style diet.
- Encourage low fat or non-dairy products, yellow lentil (moong dal).

2) Restricted Diet & Lifestyle [35-37]

- Reduced-fat foods and vegetarian sources of protein should be integrated into the diet.
- Avoid or reduce purine (protein) rich foods such as meat and yeast, sweet breads, liver, kidney, consumption of alcohol, particularly beer and spirits. Patients should be encouraged to refrain from consuming alcohol on at least 3 days per week.
- Avoid sugar-sweetened beverages, fruit juices and sweetened soda as fructose inhibits uric acid excretion by the kidneys.
- Avoid sea foods, juicy fruits, oats and germinated gram.

3) Follow Up: Every 7 days or as per the need.

Reviews should include:[38]

- Monitoring the person's symptoms and the ongoing impact of the condition on their everyday activities and quality of life.
- Monitoring of serum uric acid levels.
- Monitoring the long-term course of the condition.
- Discussing the person's knowledge of the condition, any concerns they have, their personal preferences and their ability to access services.
- Reviewing the effectiveness and tolerability of all treatments.
- Reviewing the co-morbidities associated with gout.

Referral Criteria

- Uncontrollable pain and no response to treatment
- Joint destruction
- High fever, weight loss and malaise
- Rise in serum creatinine and serum urea above normal limits
- Suspected cardiovascular complications due to Gout
- Patients taking chemotherapy for neoplastic diseases
- Uncontrolled comorbidities
- Evidence of an increase in severity/complications
- Diagnostic uncertainty
- Substantial impact on their quality of life and activities of daily living.

II. At Level 2: (CHC/Small hospitals (10-20 bedded hospitals with basic facilities such as routine, investigation, X-ray))

- **Clinical Diagnosis:** Same as level 1. The case referred from Level 1, or a fresh case must be evaluated thoroughly for any complications.

- **Investigations:** The diagnosis would be primarily clinical along with some investigations which will be necessary to investigate complications or exclude other differential diagnoses as follows:
    - Serum urate concentration
    - Complete blood count/ESR
    - Renal function Test
    - Fasting lipids, glucose and thyroid functions
    - Urinary urate excretion

Management

Same as level 1. For the patients referred from Level-1, treatment given in Level-1 may be continued if appropriate for the presenting condition or the case may be reassessed for the totality of symptoms and treatment may be given accordingly. For new cases at this level, the medications mentioned for Level-1 may also be considered, however, the totality of symptoms presented by the patient is the sole indicative and guide for treating each patient. Along with level 1 medications including detoxification treatment any of the following medicines can be used.

The application of detoxification methods like therapeutic oilbath and purgation therapies may be decided by the Siddha physician.

a. Internal medication

(**Note**: Administration of medicine, dosage, drug holiday and treatment duration may vary according to the condition of patient, disease severity. This solely depends upon the discretion of the treating Siddha Physician).

Table 7

S. No	Drugs	Dosage form	Dose	Time	Duration and Frequency	Adjuvants/ *Aṉupāṉam*
	***Mezhugu* / Medicinal Wax**					
1.	*Rasagandhi Mezhugu* [23]	Medicinal Wax	250-500 mg	BD, After food	1 month	Palm jaggery
2.	*Idivallathi Mezhugu*[23]	Medicinal Wax	250-500 mg	BD, After food	2-3 weeks	Palm jaggery
Any one of the drugs can be used.						
	***Chenduram* / Red calx**					
1.	*Arumuga Chenduram*[23]	Red calx	50-100mg	BD, After food	2-3 weeks	Honey / Palm jaggery / betel leaf
2.	*Kalamega Narayana Chenduram*[27]	Red calx	50-100mg	BD, After food	2-3 weeks	Honey / Palm jaggery / betel leaf
3.	*Poorna Chandrothyam* [23]	Red calx	50-100mg	BD, After food	2-3 weeks	Honey / Palm jaggery / betel leaf
4.	*Linga Chenduram*[25]	Red calx	50-100mg	BD, After food	2-3 weeks	Honey / Palm jaggery / betel leaf
5.	Ayaveera Chenduram[27]	Red calx	50-100mg	BD, After food	1 week	Honey / Palm jaggery / betel leaf

S. No	Drugs	Dosage form	Dose	Time	Duration and Frequency	Adjuvants/ *Aṉupāṉam*
***Parpam* / White calx**						
1.	*Sangu Parpam*[23]	White calx	100-200mg	BD, After food	1 month	Ghee / Butter
2.	*Muthuchippi Parpam*[23]	White calx	100-200mg	BD, After food	1 month	Ghee / Butter
3.	*Pavala Parpam*[23]	White calx	100-200mg	BD, After food	2-3 weeks	Ghee / Butter
4.	*Thanga Parpam*[23]	White calx	100-200mg	BD, After meal	1 week	Ghee
5.	*Muthu Parpam*[23]	White calx	100-200mg	BD, After meal	2-3 weeks	Ghee
***Maathirai* / Tablet**						
1.	*Soolai Kudaaram*[23]	Tablet (100 mg)	1-2 Nos	BD, After meal	7 days	Honey / Suitable herbal decoction

External Therapies / other procedures

- *Attai Vidal* (Leech Therapy) twice a week on the swollen areas
- *Pattru* (poultice)
  - *Mosambara Pattru* (Resin derived from *Aloe Vera*)
  - *Kazharchi Pattru* (*Caesalpinia bonducella*)
  - *Aavarai Ulunthu Pattru* – (*Cassia auriculata & Vigna mungo*)
  - *Kaavikal Pattru* (Red Ochre)
  - *Amukkura Kizhangu podi Pattru* - (Root Tuber of *Withania somnifera*)
- *Kattu (Compress /Bandage)*
  - Fry the dry stems of *Piraṇṭai* (*Cissus quandrangularis*) with the juice of *Erukku* (*Calotropis gigantia*), crush well and apply as a compress
- *Poochu (Liquid/ Oil Poultice)*
  - *Ulundhu Thylam*
  - *Mezhugu Thylam*
  - *Karpoorathi Thylam*
  - *Vathakesari Thylam*
- *Kalimbu* (Ointment Application)
  - *Kungiliya Vennai*
- *Thylam*
  - *Pinda Thylam*
  - *Mayana Thylam*

b. Siddhar *Varmam Maruttuvam* [28,29]

- *Muṭiccu varmam*
- *Moḻi piṟaḻkai*

- *Cavvu kālam*
- *Kavuḷi kālam*
- *Kaimūṭu varmam*
- *Cuṇṭikai kālam*
- *Kālnerukku varmam*
- *Virutti kālam*
- *Uḷḷaṅkāl veḷḷai varmam*
- *Kompēri kālam*
- *Uppukkuṟṟi varmam*

1) Recommended Diet & Lifestyle

As per level 1

2) Restricted Diet & Lifestyle

3) Follow Up: Every 7 days or as per the need

4) Referral Criteria

Same as mentioned earlier in level 1 and any of these

- Failure of acute exacerbation to respond to initial medical management.
- Cases with prominent joint damage and marked functional impairment.
- Extra-articular tophi
- Uncontrolled complications such as acute uric acid nephropathy
- Any other complications that threaten the life of the patient.

III. At Level 3:

(Ayush hospitals attached with teaching Institution, District Level/Integrated/State Ayush Hospitals, Allopathic hospitals also having tertiary care facilities either standalone or integrative management facilities.

In this facility, all four stages of Gout can be managed through a combination of Siddha internal medication, external medicine and personalized dietary advice.

- **Clinical Diagnosis:** Same as levels 1 & 2.

  Confirm diagnosis and severity with the help of investigations. MRI, CT scan, DECT, Cystatin C, IVP, chemical analysis of uric acid renal stones if present.

Management

Along with level 1 & 2 medications including detoxification treatment any of the following medicines can be used.

a. Internal medication

(**Note**: Administration of medicine, dosage, drug holiday and treatment duration may vary according to the condition of patient, disease severity. This solely depends upon the discretion of the treating Siddha Physician).

Table 8

S. No.	Drugs	Dosage form	Dose	Time	Duration and Frequency	Adjuvants/ *Aṉupāṉam*
	***Chenduram* / Red calx**					
1.	*Kalamega Narayana Chenduram*[27]	Red calx	50-100 mg	BD After meal	2 weeks	Honey / Palm jaggery/ betel leaf
2.	*Poorna Chandrothyam*[23]	Red calx	50-100 mg	BD After meal	2-3 weeks	Honey / Palm jaggery/ betel leaf
	***Parpam* /White calx**					
1.	*Thanga Parpam*[23]	White calx	100-200 mg	BD After meal	2 weeks	Ghee
2.	*Muthu Parpam*[23]	White calx	100-200 mg	BD After meal	2-3 weeks	Ghee

External Therapies / other procedures – As per level 2

Varmam Maruttuvam

- *Naṅkaṉapūtu*
- *Veḷḷai varmam*
- *Kaṇṇāṭi kālam*
- *Viḷaṅku varmam*
- *Maṉṉai aṭaṅkal*
- *kaṇṇupukai varmam*
- *kāri varmam*
- *Kāl caṉṉi aṭaṅkal*
- *Kutikāl varmam*
- *Pāta varmam*

Recommended Diet & Lifestyle

1) **Restricted Diet & Lifestyle** As per level 1

2) **Follow Up:** Every 7 days or as per the need

3) **Referral Criteria**

- Same as mentioned earlier at level 2 along with
- Any condition or serious complication not responding to treatment.

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CHAPTER

4

NON ALCOHOLIC FATTY LIVER DISEASE

NON ALCOHOLIC FATTY LIVER DISEASE

Siddha terminology - *Aiyā kallīral noy*[1]

ICD 10 CODE: K76.0 Fatty (change of) liver, not elsewhere classified (non-alcoholic fatty liver disease) [2]

CASE DEFINITION

Non-alcoholic fatty liver disease (NAFLD) is a spectrum of chronic liver disease characterized by accumulation of fat in the liver, Non-alcoholic steatohepatitis (NASH), and liver fibrosis unrelated to recent or ongoing significant amount of alcohol intake and due to over-nutrition and its associated metabolic syndrome.[3] An international group of expert consensus statement suggested to change the name to Metabolic-associated Fatty Liver Disease (MAFLD).[4] But due to the unavailability of an acceptable definition of metabolic dysfunction, currently the nomenclature of the condition is still to be accepted as NAFLD.[5]

INTRODUCTION **(incidence/prevalence, mortality/morbidity)**

- NAFLD is a spectrum of disorder ranging from Non-alcoholic Fatty liver to Non- Alcoholic steatohepatitis (NASH), NASH with fibrosis, NASH- cirrhosis and NASH associated with hepatocellular carcinoma (HCC).[6,7]
- The prevalence of NAFLD in India varies from 9-35% as per the accordance to ultrasonography data.[8,9] Studies demonstrated area-wise prevalence data of NAFLD with 16.6 % in Western India, 24.5 % in Eastern India, and 32 % in South India.[8]
- A certain proportion of patients suffering from NAFLD may have normal body mass index and such cases are known as 'Lean NAFLD'. A pooled proportion of studies show that Lean NAFLD consists of 16.97% of all persons suffering from NAFLD.[5]
- Metabolic syndrome (MS) or 'Syndrome X' characterized by a constellation of various components namely, obesity, type 2 diabetes, dyslipidemia, and hypertension. NAFLD and MS share the same associations and risk factors, and often NAFLD is considered as the hepatic manifestation of MS.[9]
- NAFLD is consistently associated with type 2 diabetes mellitus (28-55%) and dyslipidemia (27-92%). Two other factors namely hypertriglyceridemia (62%) and low HDL-cholesterol (54%) are found in NAFLD patients.[9]
- NAFLD is known to be associated with several extrahepatic conditions like chronic kidney disease (CKD),[10] cardiovascular diseases,[11-13] osteopenia, osteoarthritis,[14], obstructive sleep apnoea,[15] hypothyroidism,[16] and polycystic ovarian syndrome.[17,18] NAFLD has also been shown to increase the risk of extrahepatic malignancies like carcinoma colon, gastric cancer, carcinoma pancreas, uterine, and breast conditions.[19]

- The most common cause of mortality in patients with NAFLD is cardiovascular diseases. Cancer related mortality is among the top three causes of death in patients with NAFLD. Patients with NASH have a higher liver-related mortality rate.[20]
- Diseases of the liver is mentioned under *Kallīral nōykal* in *Siddha* literatures with synonyms such as *Vaḷappēr̲r̲al noy, mānta kaṭṭi, kal māntam, yākkutam.*There are three types of *Kallīral nōykal* caused by vitiation of humors. *Ayyā kallēral nōy* can be interpreted as Non-alcoholic fatty liver disease. *Ayyā kallēral nōy* results by aggravation *Aḷal kur̲r̲am* along with *Ayyā kur̲r̲am.* It is usually characterised by enlargement of liver, Fever, Vomiting, Headache, Dysuria, Dark coloured urine, Jaundice, Swelling of the body, Pallor followed by ascites in the later stages.[1]

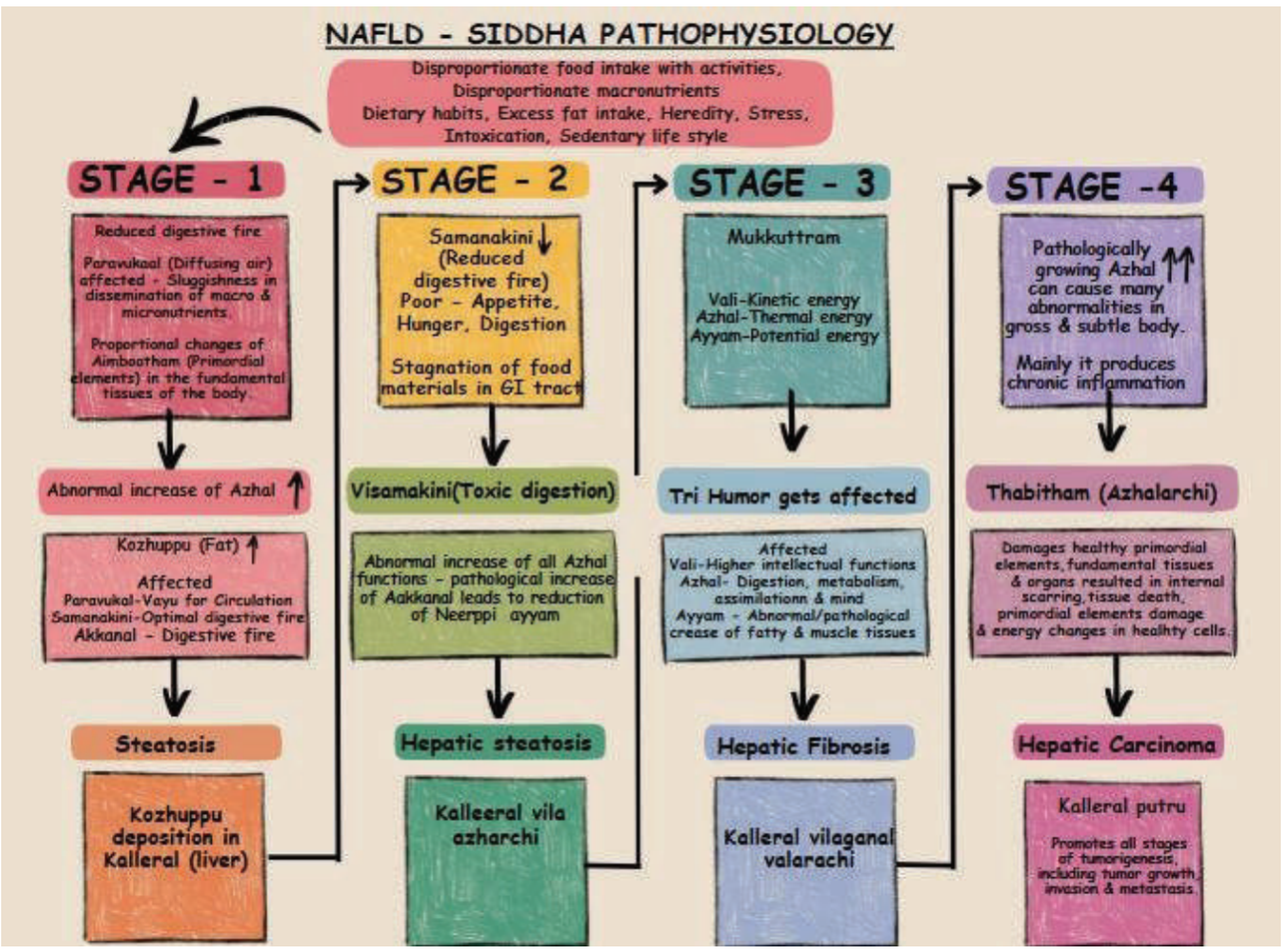

Fig 1. NAFLD- Siddha Pathophysiology

CLINICAL PRESENTATION AND EXAMINATIONS

The majority of patients with NAFLD are asymptomatic and do not experience any specific symptoms related to the disease. Few individuals complain of symptoms like fatigue, nausea, vomiting, pruritis, ascites, memory impairment, right upper quadrant discomfort, hepatomegaly,

acanthosis nigricans and lipomatosis.[21] A certain proportion of patients with NASH-cirrhosis may present with signs of end stage liver disease such as spider angiomas, erythema, caput medusae, gynecomastia, petechiae, dupuytren scontracture. On clinical examination, mild to moderate hepatomegaly may be the most common finding. Patients of NAFLD may often present with obesity and hypertension.[22] The National cholesterol Education Program – Adult treatment Panel III (NCEP ATP III) criteria modified for Indians has been developed for determining certain risk factors associated with metabolic syndrome.[23] Patients with such risk factors must be screened as it has been observed that Metabolic syndrome is closely associated with NAFLD.[24]

Table 1

Abdominal obesity	Waist circumference > 90 cms in males and > 80 cms in female
Impaired fasting glucose	Fasting glucose ≥ 110 mg/dl or on pharmacological treatment
Hypertension	Blood pressure ≥ 130/85 mm of Hg or on antihypertensives
Hypertriglyceridemia	Serum triglycerides ≥ 150 mg/dl or on pharmacological treatment that lowers triglycerides
Decreased HDL	Serum HDL < 40 mg/dl in males and < 50 mg/dl in females

DIFFERENTIAL DIAGNOSIS

As the diagnosis of NAFLD is mainly driven by exclusion of the alternate causes of hepatic steatosis. The alternate causes of hepatic steatosis are as follows:

Table 2

Macro-vesicular steatosis	Micro-vesicular steatosis
Excessive alcohol consumption	Reye's syndrome
Hepatitis C (genotype 3)	Medications like valproate and antiretroviral drugs
Wilson's disease	Acute fatty liver of pregnancy
Lipodystrophy	HELLP syndrome
Starvation	Inborn errors of metabolism
Parenteral nutrition	
Abetalipoproteinemia	
Medications like methotrexate and steroids	
Kwashiorkor	
Anorexia nervosa	
Personality Disorders	

SUPPORTIVE INVESTIGATION

With a paucity of specific symptoms for the diagnosis of NAFLD, imaging and other investigations remain the main diagnostic indicator for the condition. Though hepatic histology is considered as the gold standard for the diagnosis of the condition, the complexity, complications associated with the procedure, and lack of preference among the patients

prevents this method of investigation as a popular modality for diagnosis.[5] Non- invasive tests remain the investigation of choice among the physicians and patients alike.

Table 3

Investigations	Findings	
Essential Investigations		
Liver function tests	Mild to moderately elevated serum transaminases (AST and ALT), ALT elevation more common than AST, raised alkaline phosphatase levels, albumin and bilirubin levels raised. Aspartate aminotransferase (AST) and alanine aminotransferase (ALT) are often somewhat raised, ranging from two to five times the upper limit of normal, with ALT being larger in a 2:1 ratio to AST. Since the AST and ALT in alcoholic hepatitis typically differ by a ratio of more than 2:1, this pattern of elevated serum aminotransferase aids in the differentiation of NAFLD from alcoholic hepatitis.	
Other blood investigations	Serum ferritin and transferrin saturation levels, abnormal clotting time, HbA1c, Fasting Blood glucose, Celiac disease screening test, Lipid Profile, HBsAg, Hepatitis C	
Ultrasonography	The grading of hepatic steatosis in ultrasonography are done as per the following criteria:	
	Grade of fatty liver	**USG findings**
	Grade 1 (Mild)	Increased echogenicity of the liver in comparison to spleen and right kidney
	Grade 2 (Moderate)	Blurring of intravascular structures in addition to Grade 1 findings
	Grade 3 (Severe)	Deep attenuation of ultrasound signal; diaphragm cannot be readily discerned from posterior surface of live in addition to Grade1/2 findings
Advanced Investigations		
Non contrast CT scan	Hepatic steatosis can be inferred by comparing the attenuation of liver in comparison to the spleen. Liver attenuation index (LAI) < - 10 HU is suggestive of moderate to severe macrovesicular steatosis, while LAI > + 5 HU suggests absence of significant steatosis[27]	
Magnetic resonance – protondensity fat fraction (MR-PDFF)	Higher sensitivity compared to all imaging procedures but not recommended for routine detection of hepatic steatosis.	

Assessment of hepatic fibrosis

Hepatic fibrosis is the most important parameter for the prognosis, treatment, and outcome in patients with NAFLD. Non-invasive scoring methods of assessing hepatic inflammation and fibrosis are performed using certain scores by combining results of elastography and blood parameters.

Table 4

Name of score	Measuring components	Utility
FAST score[28]	Median liver stiffness by TE, CAP and blood AST	Hepatic inflammation. FAST score varied on a scale from 0 to 1, with the patients being classified as having low (<0.35), intermediate (0.35–0.67), or high (>0.67) probability of having SH with significant inflammatory activity and fibrosis.
AST to Platelet Ratio Index (APRI) score[29]	AST and platelet levels	Hepatic fibrosis.
Fibrosis-4 score (Fib-4)[30]	AST, ALT, age, and platelets	Hepatic fibrosis
NAFLD fibrosis scores (NFS)[31,32]	BMI, Age, AST/ALT ratio, Albumin, and presence of insulin resistance and diabetes	Hepatic fibrosis
BARD score[32]	BMI, Age, AST/ALT ratio, and presence of diabetes	Hepatic fibrosis
Magnetic resonance elastography (MRE) and Fibrosis-4 score (MEFIB)[33]	Magnetic resonance elastography and Fibrosis- 4 scores	NASH

A score of greater than 1 with APRI less than 0.676 with NFS and greater than 2.67 with Fib-4 predicts the presence of advanced fibrosis, while NFS less than -1.455 and Fib-4 score less than 1.3 suggests a low risk for advanced fibrosis.[26]

DIAGNOSTIC CRITERIA

Most of the diagnosis of NAFLD stakes place incidentally on ultrasonographic (USG) examination of the abdomen done for dyspepsia or asymptomatic rise of blood transaminases. There are also recommendations for screening of NAFLD in patients with type 2 diabetes mellitus, obesity and metabolic syndrome[5,20,25]. The diagnosis of NAFLD includes documentation of hepatic steatosis of variable severity on imaging and exclusion of secondary causes of hepatic steatosis. Investigations for alcoholic hepatic steatosis especially with an history of significant alcohol intake, hepatitis B and C, and autoimmune hepatitis must be done to rule out alternate causes of hepatic steatosis.

Siddha Diagnostic Criteria

Eṇvakai tērvu (Eight types of diagnosis) [26]

- *Nāṭi* - *Aḻal vali/ vali aiyam nāṭi*
- *Sparicam* - Warmth
- *Nā* - Yellowish Coated
- *Niram* - Pallor yellow
- *Moḻi* - Low pitched
- *Viḻi* - Yellowish discolouration
- *Malam* - Yellow/ Pale, constipation altered with diarrhoea
- *Mūttiram*

  a) *Nīrkuṟi* (Uro-macroscopy) - Yellow / red, decreased output

  A. B. *b) Neykūṟi* (Oleo Uro-macroscopy) - Oil may spread in the form of ring / pearl.

PRINCIPLES OF MANAGEMENT

The principles of management include assessment of signs and symptoms before initiating treatment and the need for management through conventional treatment for associated co-morbidities. If the patient is already under standard care, the physician may advice to continue the same along with add-on homoeopathy and can be assessed for the same in the follow ups for tapering or discontinue the treatment in consultation with the conventional physician.

Red Flag Signs

- NASH-associated cirrhosis
- End-stage liver disease
- Hepatocellular carcinoma (HCC)
- Uncontrolled co-morbidities
- LSM ≥ 20
- Platelet count < 150 x 106 / L
- Portal hypertension
- Hepatic encephalopathy
- Weight loss or anorexia

The major challenge in the management of the condition is that there are no specific symptoms for the disease and the majority of the patients are asymptomatic. Such circumstances become difficult to the physicians to encourage the patients to undergo treatment or lifestyle modification. The first step for initiation of treatment includes appropriate counselling of the patients and educating them about the disease condition. The patient must be educated that NAFLD is not a mere gastrointestinal disorder, but a metabolic disorder and dietary modification alone may not be helpful for resolving the condition. Adequately guided individualized therapy and overall lifestyle modification is essential for the treatment of the condition.

A) Prevention management

Lifestyle interventions including dietary calorie management and exercise constitute the main pillars of NAFLD management. Studies have demonstrated that there is a dose-response relationship between the magnitude of weight loss and the degree of histological improvement of NAFLD. 3-5%, ≥ 7%, and ≥ 10% of weight loss has been associated with regression in steatosis, steatohepatitis, and fibrosis respectively.[34] Daily caloric restriction by 30% with cutting down of both carbohydrates and fat in the staple diet. Intermittent fasting (e.g. alternate day fasting, 5:2 fasting with 2 days of severely reduced caloric intake and 5 days of normal consumption) may be a promising approach but sufficient evidence is still not available to routinely recommend such practice.[35] Exercise shall consist of moderate-intensity aerobic exercises such as brisk walking, jogging, running, swimming, etc. supplemented by resistance exercises.[36,37]

Levels of Prevention for NAFLD

a) Primordial Prevention: Prevent risk factors like obesity, insulin resistance, and poor diet.

b) Primary Prevention: Prevent NAFLD in high-risk groups (obese, prediabetic individuals).

c) Secondary Prevention: Detect NAFLD early and prevent progression to NASH (Non-Alcoholic Steatohepatitis) or cirrhosis.

d) Tertiary Prevention: Manage complications like fibrosis, cirrhosis, or hepatocellular carcinoma.

Siddha System of Medicine emphasis adhering to *Tēraiyar piṇi aṇukā viti* for prevention of disease and lead to healthy life.

Table 5

Dietary Habits (*Uṇavu Muṟaikaḷ*)	
Do's - *Pattiyam*	**Don'ts - *Apattiyam***
• Drink warm water • Add *Trithoda sama porutgal* inclusive of turmeric, pepper, cumin seeds, asafoetida, dry ginger, cardamom, fenugreek and garlic in food preparations • Consume low fat, low-calorie & high fiber diet, fresh vegetables, whole grains, legumes, greens & citrus fruits • Easily digestible foods should be taken such as rice gruel/double boiled rice gruel, buttermilk, tender coconut water • Include moderate intake of nuts • Include lean proteins and low fat dairy in diet	• Always avoid fatty meals especially at night • Avoid highly processed refined carbohydrate diet and advised to take complex carbohydrates • Avoid foods containing added sugars, trans fat and refined grains • Avoid deep fried food and junk foods • Avoid night and late-night snacking
Lifestyle Practices (*Vāḻviyal Muṟaikaḷ*)	
Do's	**Don'ts**
• Practice at least 45 minutes of moderate physical activity (like walking) 5 days a week • Consume food to the level of hunger • Consume food only half of stomach, liquid quarter of stomach and always leave quarter stomach empty • Prefer left lateral position for sleeping • Better balance of mood and sleep	• Avoid daytime sleep or oversleeping • Avoid sedentary life style • Avoid stress • Avoid nap or sleep after food • Avoid salty foods • Avoid alcohol and smoking • Don't self-medicate

• Undergo therapeutic emesis once in six months • Undergo therapeutic purgation once in four months • Practice siddha *kāyakaṟpam* – take ginger, dried ginger and chebulic myrobalan in the morning, afternoon and evening respectively • Routine liver screening test	

B) Interventions

At level 1- Solo Physician Clinic / Health Clinic / PHC (Optimal Standard of treatment where technology and resources are limited).

Clinical diagnosis

The diagnosis of NAFLD shall be done in level 1 especially in cases who have incidental discovery of fatty liver disease. Depending on the infrastructural setup of the clinic/health center an ultrasonography examination may be conducted. To confirm the diagnosis the alternate causes of hepatic steatosis must be ruled out by clinical history and available investigations.

Investigations

1. Liver function tests (Bilirubin, transaminases, total protein), Lipid profile (Total cholesterol, HDL, LDL, VLDL, Triglycerides), Fasting and post-prandial blood sugar, Urea, Creatinine, Complete haemogram, HBsAg, Celiac disease screening.
2. Assessment scores like APRI, Fib-4, and BARD.
3. Ultrasonography of upper abdomen (if available)

Management

Patients may seek *Siddha* management at different stages of NAFLD and the line of treatment may vary accordingly.

The first line of treatment is to normalize the altered or deranged humours and revitalization of seven fundamental tissues through detoxification methods followed by internal medications.

The application of detoxification methods like therapeutic oilbath and purgation therapies may be decided by the Siddha physician.

a. *Vāmaṉa maruttuvam* (Therapeutic emesis)

- *Marukarai Kudineer* - 15- 30 ml, OD, in the early morning on an empty stomach
- *Marukarai nei* - 10-15 ml, OD, at the early morning in an empty stomach (Either one medicine can be administered for inducing emesis)

b. *Kaḷiccal maruttuvam* (Therapeutic purgation)

- *Kakkarattan ver Kudineer*[1] - 30ml
- *Kattamanakku ver Kudineer*[1] - 30ml

  To eliminate the vitiated humour, either one *Kudineer* can be advised to induce purgation. After *purgation, the* patient will experience lightness in the body and improvement in appetite.

Rules to be followed during purgation:

- It is advised to take purgative medicine early morning at 5-6 am on an empty stomach.
- If bouts of purgation do not commence, the patient may be advised to drink hot water.

- Some patients may have nausea, profuse sweating, and vomiting symptoms during this treatment.
- After the average number (5-6 times) of bowel evacuations, watery diarrhoea commences. This indicates that the purgation therapy has been completed. Then, the patient is advised to take buttermilk/ lemon juice/tea decoction/ fried cumin seeds decoction.
- After purgation, the patient may have symptoms like tiredness, slimness, and lightness of the body which is a good sign.

Dietary regimen during purgation:

- Easily digestible foods should be taken
- Luke warm water
- Butter milk
- Rice porridge
- Double boiled porridge
- Tender coconut water
- Non spicy Moong dal curry

Precautions:

- Avoid sleeping during daytime of purgation therapy
- Should not take heavy meals before or during the procedure
- Avoid high oil/ spicy masala diet.

Treatment:

(**Note**: Administration of medicine, dosage, drug holiday and treatment duration may vary according to the condition of patient, disease severity. This solely depends upon the discretion of the treating Siddha Physician).

c. Single herbs:

Table 6

Sl. No	Herb	Dosage form	Dose	Time	Frequency and Duration	Adjuvants /*Anupanam*
1.	*Avuri ver Kudineer /Indigofera tinctoria* [39,40]	Decoction	30 ml	BD after food	48 days	--
2.	*Sombu vitai / Pimpinella anisum* [39,41]	Seed Powder	½2- g	BD after food	48 days	Plain or with sugar
3.	*Adathodai/ Justicia beddomei* [39,42,]	Leaf Juice	10 to 20 drops	BD after food	48 days	Honey
4.	*Amanakku* and *Keezhanelli / Ricinus communis* and *Phyllanthus amarus* [39,43,44]	Leaf Paste	5–10 g	Morning empty stomach	3 days	On 4th day *Sivathai poți / Ipomea turpethum* – for Purgation[4]
5.	*Karisalai / Eclipta alba* [39,45]	Leaf powder	2 g	BD after food	48 days	--

Table 7: Compound Formulations:

Sl. No.	Drugs	Dosage form	Dose	Time	Duration and Frequency	Adjuvants/ *Aṉupāṉam*
***Chooranam* / Medicinal Powder**						
1.	*Mandura Chooranam -1*[46,47]	Medicinal powder	5 g	BD	48 days	Butter milk
2.	*Mandura Chooranam-2* [46,48]	Medicinal powder	2 g	BD	48 days	Hot water
3.	*Paavettai Chooranam* [39,49]	Medicinal powder	40-80 ml	BD	48 days	Rice Water
***Maathirai* / Tablet**						
1.	*Chithiramoola Maathirai* [46,50]	Tablet	1 - 2	BD	48 days	Water

Targeting a weight loss of 7-10% is recommended in overweight and obese patients with NAFLD.[5]

Table 8: Recommended diet and lifestyle modifications

Tender vegetables [51]	• Drumstick/ *Muruṅkai* (*Moringa oleifera*) • Broad beans/ Āvarai (*Lablab purpureus*) • Brinjal/ *Kattiri* (*Solanum melongena*) • Fig/ *Atti* (*Ficus racemosa)* • Lady finger/ *Veṇṭai* (*Hibiscus esculentus*) • Unripe Papaya/ *Pappāḷi piñcu* (*Carica papaya)* • Cucumber/ *Veḷḷari* (*Cucumis sativus*) • Bottle guard/ *Curaikkāy* (*Lagenaria siceraria*) • Ivy gourd/ *Kōvai /(Coccinia grandis)*
Any of the vegetables can be prepared as curry, *Kūttu, Poriyal* etc.	
Green leafy vegetables	• Black night shade/ *Maṇattakkāḷi /*(*Solanum nigram*) • Dwarf copper leaf spinach/ *Poṉṉāṅkaṉi* (*Alternanthera sessilis*) • False daisy/ *Karicālai* / (*Eclipta prostrata*) • Creeping woodsorrel / *Puḷiyarai /(Oxalis corniculata)* • Kidney leaved moon-seed/ *Poṉmucuṭṭai /(Rivea ornata)* • Amaranthus green/ *Kīrai taṇṭu /(Amaranthus gangeticus)* • Purslane seeds/ *Paruppukīrai /(Portulaca oleracea)* • Curry leaves / *Karuvēppilai /(Murraiya koenigii)*-
Soup, saute and curry-like preparations can be made from these vegetables for consumption	
Pulses	• Black Gram / *Uḷuntu* (*Vigna munga)* • Green gram / *Pāci payaṟu* (*Vigna radiata*)
Pulses can be used to make Rice, Porridge, Salad, *Chutney, Pongal, Idly*, *Dosa* and *Curry*	
Fruits	• Indian gooseberry/ *Nelli (Phyllanthus emblicus)* • Lemon/ *Eṟumiccai (Citrus lemon)* • Pomegranate/ *Mātulai (Punica granatum)* • Guava/ *Koyyā (Psidium guava)*
Fruits can be taken as salad, juice (without sugar), or cut fruit	

Exercise recommendations[5]

- Moderate intensity aerobic or resistance exercises for 30-45 min/day at least 5 days in a week in all patients of NAFLD irrespective of body weight.

- Moderate intensity aerobic exercise includes brisk walking, jogging, running, swimming, cycling, etc.
- Resistance exercises may supplement aerobic exercises and may be particularly useful for patients with who cannot partake in aerobic exercises like patients with arthritis, morbid obesity, poor cardiorespiratory fitness, etc.
- Asanas as in yoga that involve physical exertion and the maintenance of certain body postures like isometric resistance exercises may be beneficial.
- **Yoga:** Various Yoga practices are helpful for the management of NAFLD. These include Pranayama like Bhastrika, Kapalabhati and Anuloma-Viloma; various relaxation techniques viz. twisting movement of the body; yogasanas like Vajrasana, Trikonasana, Dhanurasana, Naukasana, Ardha Matsyendrasana, Pavana Muktasana and Surya namaskara.

Restricted diet and lifestyle[5]

- In obese and overweight individuals, the dietary calorie intake should be restricted by 30% or 500-1000 kcal by cutting down carbohydrates and fats in staple diet. In lean individuals, energy intake should be balanced with energy expenditure.
- Total fat consumption should not exceed 30% of total energy intake with saturated fats being <10% and trans-fat <1% of total energy intake.
- Free sugar intake must be limited to < 10% of total energy intake and further 5% reduction may have additional benefits. Fructose and sweetened beverages should be curtailed.
- Protein restriction is not required in patients with NAFLD, although meat proteins may be replaced with plant, dairy and fish proteins.
- Evidence shows benefit of > 2 cups of caffeinated coffee per day in NAFLD. But the standard habit of sweetening and use of milk/cream should be avoided.

Follow-up: (at an interval of 14 days or as required)

Reviews should include:

- Monitoring the person's symptoms and the ongoing impact of the condition on their everyday activities and quality of life.
- Management of NAFLD in terms of diet, exercise, and other interventions.
- Discussing the person's knowledge of the condition, any concerns they have, their personal preferences, and their ability to access services.
- Reviewing the effectiveness and tolerability of all treatments.
- Self-management support.
- Monitoring the long-term course of the condition with periodic review.

Referral criteria

- Non-response to treatment
- Progression of the disease to NASH, NASH- associated Cirrhosis, or NASH associated Hepatocellular Carcinoma

- Any other hepatic or extra-hepatic complications such as Gallstone disease commonly seen in older age and higher grade of NAFLD.
- Evidence of an increase in severity/complications
- Co-morbidities, such as cardiac disease.
- Substantial impact on their quality of life and activities of daily living
- Diagnostic uncertainty

At level 2- (CHC/Small hospitals (10-20 bedded hospitals with basic facilities such as routine investigations and imaging facilities)

Clinical diagnosis

Same as Level 1. Any fresh case, cases on incidental discovery, or referred case from Level 1 shall be evaluated thoroughly for confirmation of diagnosis and complications.

Investigations:

Same as Level 1. Ultrasonography examination must be conducted compulsorily with proper grading of the hepatic steatosis.

Management:

Same as Level 1. For the patients referred from Level-1, treatment given in Level-1 may be continued if appropriate for the presenting condition or the case may be reassessed for the totality of symptoms and treatment may be given accordingly. For new cases at this level, the medications mentioned for Level-1 may also be considered, however, the totality of symptoms presented by the patient is the sole indicative and guide for treating each patient. Complications of the disease is an important clinical presentation at this stage of care especially the early signs and symptoms of such complications. Conditions progressing to steatohepatitis and fibrosis may be treated according to the presenting complications. Accessory management of co-morbidities like diabetes mellitus, dyslipidemia, and hypertension must be accordingly managed.

d. *Ennai mulukku* (Therapeutic oil bath)

Ennai mulukku is a preparatory procedure in which medicated oil massage with a bath of lukewarm water. It will strengthen the five sensory organs. According to disease severity oil bath can be advised.

- *Keezhanelli Thylam* - Quantity Sufficient (For ext. use only)

Rules to be followed during *Ennai mulukku*

Apply oil before 7 am. Instil 2 drops of medicated oil in each nostril, ear, and eye. Spread the oil from head to foot and give a gentle massage. After application, leave it for 15 to 45 minutes and bathe with lukewarm water

Take tender vegetables and easily digestible food. Avoid daytime sleep, intercourse, and exposure to sunlight and cold items on the day of the oil bath

e. *Kaḷiccal maruttuvam* (Therapeutic purgation):

Table 9

Sl.No.	Drugs	Dose form	Dose	Time	Adjuvant/ *Aṉupāṉam*
1.	*Agathiyar Kuzhambu*[51]	*Kuzhambu* (Medicated viscous Mixture)	100-200 mg	At early morning on an empty stomach.	Lemon *(Citrus limon)* juice / white onion *(Allium cepa)* juice
2.	*Meganatha Kuligai*[51]	Tablet	1-2 pills	-do-	Ginger juice *(Zingiber officinalis)*
3.	*Sivathaiver Kudineer*[51]	Decoction	15-30 ml	at early morning on an empty stomach	--

Along with Siddha formulations mentioned in Level 1, the following formulations are also recommended:

(**Note**: Administration of medicine, dosage, drug holiday and treatment duration may vary according to the condition of patient, disease severity. This solely depends upon the discretion of the treating Siddha Physician).

a. Single herbs:

Table 10

Sl. No.	Herb	Dosage form	Dose	Time	Frequency and Duration	Adjuvant /*Aṉupāṉam*
***Karkam* - Medicinal paste**						
1.	*Adathodai Karkam (Justicia beddomei)*[51]	Medicinal paste	10-20 drops	BD after food.	30 days	Honey
2.	*Serangkottai (Cassia fistula Linn)*[51]	Medicinal paste	5- 10 g	OD	if there is chronic constipation	Lukewarm water
3.	*Sivanar Vembu Karkam (Indigofera aspalathoides)*[51]	Medicinal paste	5- 10 g	OD	30 days	Lukewarm water
4.	*Muthirukkansevi Karkam (Elytraria acaulis)* [51]	Medicinal paste	5- 10 g	OD	30 days	Lukewarm water
5.	*Kadukkai Karkam (Terminalia chebula)* [51]	Medicinal paste	5 – 10 g	OD before food	30 days	Lukewarm water
6.	*Amukkura Ilai Karkam (Withaniya Somnifera)*[51]	Medicinal paste	5-10 g	OD before food	30 days	--
Any one of the herb may be used.						

b. Compound Formulations:

Table 11

Sl. No	Drugs	Dosage form	Dose	Time	Duration and Frequency	Adjuvants /*Aṉupāṉam*
***Kudineer* - Decoction**						
1.	*Sarakondrai Kudineer*[51]	Decoction	30 – 60 ml	early morning on an empty stomach	2 – 3 days	--
2.	*Pidangunaari Kudineer*[51]	Decoction	30 – 60 ml	BD after food	48 days	--
3.	*Mookirattai ver Kudineer*[51]	Decoction	40-80 ml	BD after food	48 days	--
4.	*Sodakku takkali Kudineer*[51]	Decoction	30-60 ml	BD after food	48 days	--
5.	*Nerunjil Kudineer*[51]	Decoction	60-80 ml	BD after food	48 days	--
6.	*Kadukkai Kudineer*[51]	Decoction	60 -80 ml	BD after food	48 days	--
7.	*Paavettai ver Kudineer*[51]	Decoction	40-80 ml	BD after food	48 days	--
8.	*Mandurathi Adai Kudineer*[51]	Decoction	60-80 ml	BD after food	48 days	--
Any one of the *Kudineer* can be prescribed						
***Maathirai* –Tablet**						
9.	*Keezhanelli Maathirai*[51]	Tablet	1 - 2	BD/TDS, after food	48 days	Buttermilk
10.	*Santha chandrothaya Maathirai* [51]	Tablet	1 -2	BD after food	48 days	Honey
11.	*Bavana Kadukkai*[51]	Tablet	1 -2	BD, after food	48 days	(to be chewed)
12.	*Amirthathi Maathirai* [51]	Tablet	1 -2	BD after food	If there is Jaundice	Honey
13.	*Nannari Maathirai* [51]	Tablet	1 -2	BD after food	45 days	Honey
14.	*Maha elathi Maathirai* [51]	Tablet	1 -2	BD after food	45 days	Honey/ milk
15.	*Maha vasantha kusumakara Maathirai*[51]	Tablet	1 -2	BD after food	21 days	Honey
Any one of the tablets can be advised if jaundice is present						
***Chooranam* – Medicinal Powder**						
16.	*Nilavgaai Chooranam*[51]	Medicinal powder	1 - 2 g	BD/TDS after food	if constipation is present	Lukewarm water

Sl. No	Drugs	Dosage form	Dose	Time	Duration and Frequency	Adjuvants /*Aṉupāṉam*
17.	*Thiriphala Chooranam*[51]	Medicinal powder	1 - 2 g	BD/TDS, after food	90 days	Water
18.	*Pancha lavana Chooranam* [51]	Medicinal powder	1 - 2 g	BD/TDS after food	to neutralize electrolyte imbalance	Lukewarm water
19.	*Elathi Chooranam*[51]	Medicinal powder	1 - 2 g	BD/TDS after food	if there is gastric irritation	Lukewarm water
20.	*Dhratchathi Chooranam*[51]	Medicinal powder	1 - 2 g	BD/TDS after food	48 days	Lukewarm water
21.	*Kadukkai Chooranam*[51]	Medicinal powder	1-2 g	BD after food	48 days	Lukewarm water
***Manapagu* - Syrup**						
22.	*Turunji Manapagu*[51]	Syrup	15 – 30 ml	BD after food	if vomiting is present	Water
23.	*Nannari Manapagu*[51]	Syrup	15 -30 ml	BD after food	if there is fatigue	Water
24.	*Mathulai Manapagu*[51]	Syrup	15 - 30 ml	BD after food	if there is nausea and vomiting	Water
25.	*Naarathai Manapagu*[51]	Syrup	15 - 30 ml	BD after food	if there is nausea and vomiting	Water
***Karpam* - Rejuvenating drug**						
26.	*Ayabringaraja Karpam*[51]	Rejuvenating drug	100-200 mg	BD, after food	40 days	Honey/ tender coconut water/ palm jaggery
27.	*Ayasambeera Karpam*[51]	Rejuvenating drug	one piece (1/4 of lemon)	BD after food	48 days	--
28.	*Ponnankanni Karpam*[51]	Rejuvenating drug	2 - 3g	BD, after food	48 days	

a. ***Puṟamaruttuvam*** (External Medicines)/ other procedures

Pattru (Semi Solid Poultice): *Carakkoṉṟai puli Pattru* - Quantity sufficient

b. ***Varma maruttuvam***

- *Aṭappā kālam*
- *Kāraral varmam*

2. Recommended diet and lifestyle: Same as Level 1

3. Restricted diet and lifestyle: Same as Level 1

4. **Follow-up:** At an interval of 15 days or as per the need
5. **Referral criteria:**

   Same as level 1 and

- Failure of acute exacerbation to respond to initial medical management.

At level 3-

Ayush hospitals attached with teaching institution, District Level/Integrated/State Ayush Hospitals, Tertiary care allopathic hospitals having Ayush facilities, multiple departments/ facilities for diagnosis and interventions.

Clinical diagnosis

Same as Level 2. The diagnosis must be confirmed using advanced biochemistry, serology and imaging studies.

Investigations: Same as Level 1

Supportive investigations:

1. Non-contrast CT scan
2. MRI based Elastography
3. Blood levels for carbohydrate-deficient transferrin (CDT), Gamma glutamyl transferase for determination of chronic alcoholism.
4. Hepatitis C antigen
5. Serum copper levels and ceruloplasmin to rule out Wilson's disease (only if needed)
6. Metabolic profile for ruling out lipodystrophy, and starvation
7. Genetic testing for apo B and MTTP to rule out abetalipoproteinemia (only if needed)

Management

Same as Levels 1& 2. For the patients referred from Level-1 or 2, treatment given in Level-1 &/or 2 may be continued if appropriate for the presenting condition or the case may be reassessed for the totality of symptoms and treatment may be given accordingly. For new cases at this level, the totality of symptoms presented by the patient is the sole indicative and guide for treating each patient. Along with Siddha formulations mentioned in Level 1 and Level 2 Management, the following Siddha formulations are also recommended:

Day 1 - *Vāmaṉa maruttuvam* (Therapeutic emesis):[51]

- *Marukkarai vidhai Chooranam* (2-5 g) with unripe papaya

(Carica papaya) juice (5-10 ml) in the early morning on an empty stomach.

Day 2 – Rest

Day 3 – First Line of Treatment:[30]

- *Sara kondrai Kudineer* - 30 – 60 ml in the early morning on an empty stomach for 2 – 3 days.
- *Keezhanelli Maathirai* (500 mg) - 1 - 2 tabs with butter milk BD/TDS, after food.
- *Santha chandrodaya Maathirai* (100 mg) - 1 -2 pills with honey, BD after food.

a. Compound Formulations:

(Note: Administration of medicine, dosage, drug holiday and treatment duration may vary according to the condition of patient, disease severity. This solely depends upon the discretion of the treating Siddha Physician).

Table 12

Sl. No.	Drugs	Dosage form	Dose	Time	Duration and Frequency	Adjuvants /*Aṉupāṉam*
***Kudineer* - Decoction**						
1.	*Mandurathi adai Kudineer*[51]	Decoction	60-80 ml	BD after food	48 days	--
***Ney*- Medicated Ghee**						
2.	*Vallarai nei* [51]	Medicated Ghee	5 – 10 ml	BD after food	45 days	Lukewarm water
***Maathirai* - Tablet**						
3.	*Elathi Maathirai*[51]	Tablet	1 – 2 tabs	BD after food	45 days	Butter milk
4.	*Karisalai Maathirai*[51]	Tablet	1 – 2 tabs	BD after food	45 days	Butter milk
5.	*Panchadeepakini Maathirai* [51]	Tablet	1 – 2 tabs	BD after food	45 days	Butter milk
***Kuzhambu*- Medicated viscous mixture**						
6.	*Lavaṇa Kuzhambu*[51]	Medicated viscous mixture	100 – 200 mg	BD after food.	Discretion of the Physician.	Palm jaggery
7.	*Narathangai Kuzhambu* [51]	Medicated viscous mixture	100 – 200 mg	BD after food	if there is vomiting	Palm jaggery
8.	*Vilvathi Kuzhambu*[51]	Medicated viscous mixture	100 – 200 mg	BD after food	Discretion of the Physician.	Palm jaggery
***Chenduram* – Red calx**						
9.	*Vedi Annabehi Chenduram* [51]	Red calx	100-200 mg	BD after food	40 days	Honey
***Parpam* – White calx**						
10.	*Kariyuppu Parpam* [51]	White calx	65-130 mg	BD after food.	40 days	*Oma ilagam*
11.	*Silasathu Parpam*[51]	White calx	100 – 200 mg	BD after food.	40 days	Ghee / butter
***Karpam* - Rejuvenating drug**						
12.	*Karisalai karpam*[51]	Rejuvenating drug	1 – 2 tabs	BD after food	40 days	Lukewarm water

Recommended diet and lifestyle: Same as Levels 1 & 2

1. **Restricted diet and lifestyle:** Same as Levels 1 & 2
2. **Follow-up (at an interval of 15 days or as per the need)**
3. **Referral criteria:**
    - Same as mentioned in Level 1 & 2 and any of these
    - Hepatic encephalopathy
    - Portal hypertension
    - Hematemesis or melaena or any condition requiring blood transfusion or critical care management
    - Any condition or serious complication beyond the scope of homoeopathic treatment
    - Other modalities can be considered depending on the case and to rehabilitate properly.

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CHAPTER

5

OBESITY

OBESITY

ICD 10 code: E 66.0-E 66.9[2]
ICD 11 code: 5B81.0-5B81.Z

அதிதூலம்[1]

WHO Code -ISMT-4.4.20

CASE DEFINITION

Obesity is a chronic complex disease defined by excessive fat deposits that can impair health. Obesity in ICD- 10 (and in ICD- 11) is defined as a body mass index (BMI) of 30 kg/m^2 or higher and BMI between 25 and 30 kg/m^2 is defined as overweight. The WHO Asia-Pacific region defined BMI ≥ 23kg/m^2 as overweight and ≥ 25kg/m^2 as Obesity. Obesity is defined as a body mass index (BMI) equal to or greater than the 95th percentile for age and sex.[3]

INTRODUCTION

- In 2022, 1 in 8 people in the world were living with obesity. 2.5 billion Adults (18 years and older) were overweight. Of these, 890 million were living with obesity.[4]
- As per National Family Health Survey-5 (NFHS-5), one in every four Indians is now having obesity. There are 135 million obese individuals in India. The prevalence of abdominal obesity in the country was found to be 40% in women and 12% in men.[5]
- In 2022, overweight affected around 37 million children under 5 globally and over 390 million children and adolescents aged 5–19 years were overweight, including 160 million who were living with obesity – 75% of whom live in low- and middle-income countries.[6]
- Obesity and overweight are a major risk factor for non-communicable diseases such as heart disease, stroke, type 2 diabetes, PCOS and certain cancers (endometrial, breast, ovarian, prostate, liver, gallbladder, kidney and colon).[7] Therefore, Obesity is more effectively defined by assessing its linkage to morbidity and mortality.[8] The current guidelines deal with management of both overweight and obesity.
- Obesity is synonymously known as *Tūlaṉ nōy, Uṭal paruman̲* in Siddha. According to Siddha system of medicine, Obesity is explained by increased *Aiyam* which influences *Vāli (viyāṉaṉ ma̲r̲rum camaṇaṉ) a̲l̲al (aṉarpitam, catakapitam).* This alteration influences the seven body constituents.

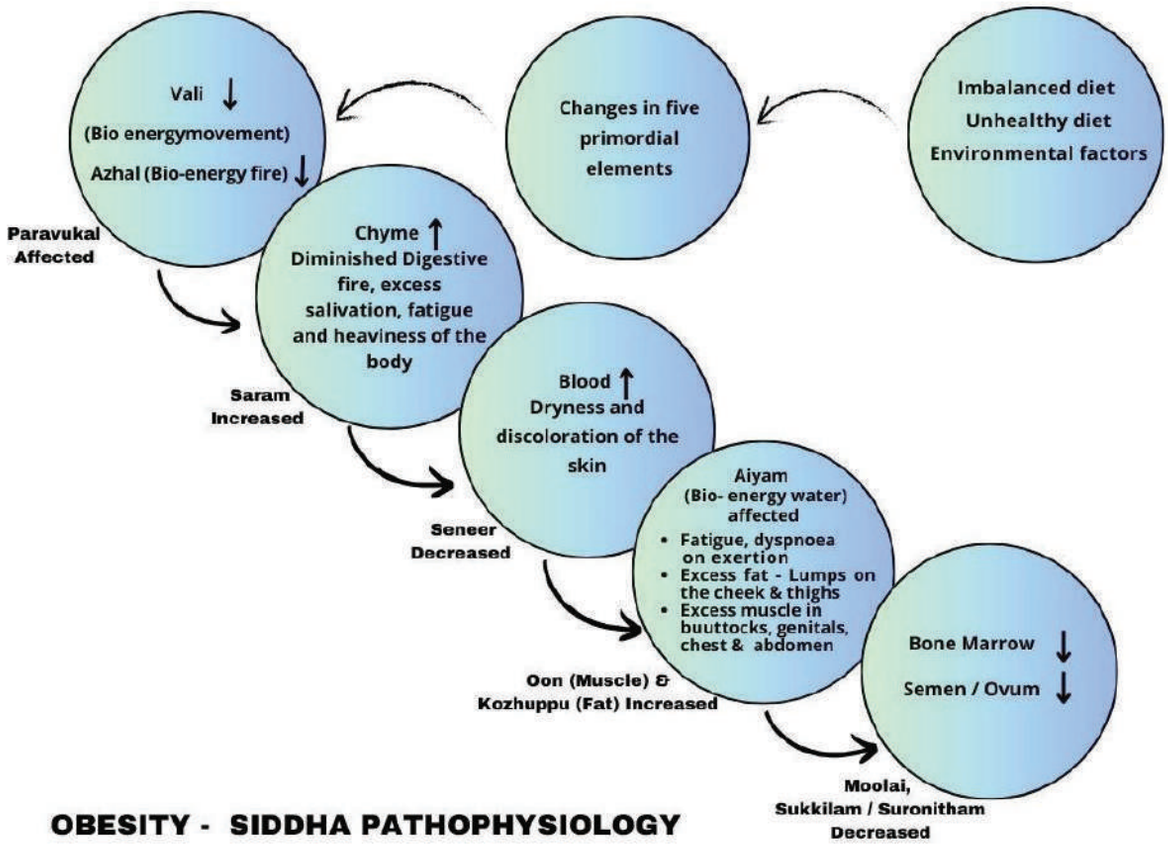

Fig 1: Pathophysiology of Obesity

CLINICAL EXAMINATION[9]

Persons presenting with overweight or obesity must have a detailed history taken, a clinical examination performed and appropriate investigations done (Figure – 2). This is done to identify the environmental, genetic and lifestyle factors responsible for obesity and at the same time identify impact of overweight and obesity on the individual, physically, mentally and socially.

Clinical History

- **Body weight history** in persons who are overweight or present with pre- obesity/obesity may begin with an assessment of body weight increases or reductions over the individual's lifetime (e.g., slow and gradual, rapid and sudden or a combination) and factors influencing weight change. Short sleep duration and poor sleep quality may increase the risk of obesity, making it important to record sleep patterns in patients.[10]
- **A detailed family history** is important and often suggests a genetic predisposition.
- **Drug history** should be taken to identify possible drugs that may be contributing to weight gain, such as steroid hormones, antidepressants (tricyclics), antipsychotics (phenothiazines and butyrophenones), anticonvulsants (valproate and carbamazepine), lithium and antihyperglycemics (insulin, sulfonylurea and thiazolidinediones).

- The psychological aspects of eating behaviour should be explored, such as loneliness, boredom or stress. Often obese persons express feelings of low self-esteem and depression. Eating disorders should be particularly sought.
- A thorough review of systems must be taken to assess any co-morbidities that are directly or indirectly related to obesity to identify any evidence of endocrine disease as an occult aetiology of obesity.
- A thorough examination of the patient's present dietary habits is essential. This evaluation can be conducted by a dietitian. It should involve assessing the total daily calorie intake and determining the percentage of calories derived from fat. Individuals with obesity often show abnormal eating patterns. The eating disorders that have been most frequently studied in individuals with obesity are binge eating disorder and bulimia nervosa.
- History pertaining to physical activity Physically active and fit individuals are considerably less likely to be obese than physically inactive and unfit individuals. Therefore, it's essential to gather comprehensive information to understand their current activity level any past injuries or limitations, their exercise preference and Lifestyle Factors.

Clinical and imaging indicators of obesity

Apart from BMI, waist circumference, waist-hip ratio and skin-fold thickness, the variations in lean muscle mass and body fat percentage are also assessed utilizing the body composition analyzer.[11]

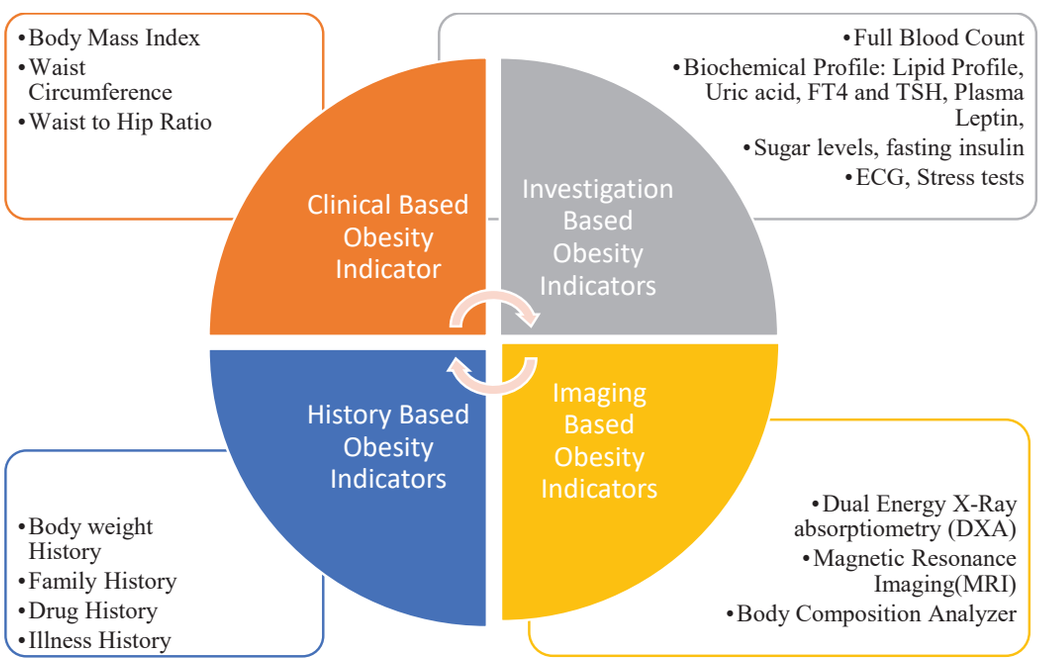

Figure 2 Assessments in overweight and obese persons Physical Examination[12]

- Height
- Weight
- BMI
- Waist Circumference, Hip circumference, neck circumference, wrist circumference
- Waist to Hip Ratio (WHR)
- Blood Pressure
- Pulse
- Percentage of body fat determined by skinfold thickness measurements[13]
- Tongue examination (Size, Colour and Texture)

Markers of insulin resistance- Skin tags and acanthosis nigricans

DIFFERENTIAL DIAGNOSIS

Obesity is known to be multifactorial, occurring due to complex interactions occurring between genetics and environmental factors. Where genetic factors per se can affect lipid metabolism and adiposity, the endocrinal factors affecting metabolism may also have genetic and environmental causations.

Identification of underlying cause of overweight and obesity are the mainstay of its management and treatment.

Table 1: Differential diagnosis

Sl. No.	Condition	Features
1.	**Obesity due to Lifestyle Factors**	• Imbalanced diets and sedentary lifestyles are linked to weight gain and adiposity. Physical inactivity is a hallmark of sedentary living and is often associated with increased body weight • Unhealthy eating patterns, including frequent consumption of fast food and sugary beverages, along with a low intake of fruits and vegetables, eating much more rapidly than usual, eating until uncomfortably full and consuming large amounts of food when not physically hungry are symptoms of Binge Eating and may contribute to the rising rates of obesity • Snacking and reliance on fast food are recognized as significant contributors to childhood overweight and obesity[14]
2.	**Obesity due to Endocrinal conditions[15]**	The mechanisms underlying the development of obesity vary according to the abnormalities of endocrine function, whilst at the same time, increase in body fats also tends to lead to abnormalities in endocrinal functions. Some endocrinal disorders associated with obesity are: • Hypothyroidism • Cushing's Syndrome • Insulinoma • Ovarian disorders and hyper ovarian syndrome • Hypogonadism in men • Hypothalamic tumours or damage to this part of the brain as a consequence of irradiation, infection or trauma

Sl. No.	Condition	Features
3.	**Obesity with Genetic conditions**[16]	Genetic and epigenetic variations contribute to obesity by influencing the function of metabolic pathways in the body and regulating neural pathways and appetite centres. Subsequently, these variations influence insulin resistance, dyslipidaemia, inflammation, hypertension and ectopic fat deposition-especially in the liver, which are the markers of obesity.
		Obesity can be syndromic due to • Chromosomal rearrangements, monogenic due to mutations in leptin signalling pathways or polygenic i.e. multiple mutations coding for proteins in skeletal and adipose tissues • Down's syndrome • Prader-Willi syndrome • WAGR syndrome • SIM1 syndrome • Bardet-Biedl syndrome • Fragile X syndrome • Cohen syndrome • Albright hereditary Osteodystrophy/PHP Type 1 a • Alstrom syndrome • Carpenter syndrome • Chudley-Lowry syndrome, etc.
4.	**Drugs-Induced obesity**[17,18]	Weight gain or body fat redistribution are common side effects of many widely used drugs, some of which are given below: • **Anticonvulsants:** Sodium Valproate, Phenytoin • **Hypoglycaemics:** Insulin, Sulfonylurea (SU), Thiazolidinediones • **Beta-Blockers**: Atenolol, Metoprolol, Propranolol • **Antidepressants:** Amitriptyline, Nortriptyline, Imipramine, Desipramine, Dosulepin, Doxepin, Clomipramine • **Antipsychotics:** Haloperidol, Perphenazine

SUPPORTIVE INVESTIGATIONS[19]

The role of laboratory and other investigations is to exclude possible underlying causes of overweight/ obesity and its complications. Some key investigations that can be conducted for identifying causes / complications of overweight and obesity are as follows:

i. Essential Investigations

- Complete Blood Count/ESR
- Fasting lipid profile
- Fasting plasma glucose
- Fasting Insulin levels
- Serum uric acid
- Serum FT4 and TSH
- HbA1c

ii. Advanced Investigations

- 24-hour urine free cortisol
- Electrolyte Panel test
- ECG and chest x-ray
- Respiratory function tests
- Liver function test
- USG whole abdomen and pelvis
- Plasma Leptin
- Test For Insulin Resistance (OGTT, Insulin Sensitivity Test and Insulin Tolerance Test)
- Hormonal Assay (FH, LH, Prolactin, Androstenedione, Progesterone and Testosterone) in cases of Females

DIAGNOSTIC CRITERIA

Diagnosis of overweight and obesity is made by measuring people's weight and height and by calculating the body mass index (BMI). BMI equals the ratio of weight in kilograms divided by height in meters squared (kg/m^2): weight (kg)/height (m^2).

The BMI categories for defining obesity vary by age and gender in infants, children and adolescents.

- Obesity in adults is defined as a BMI greater than or equal to 30; overweight is defined as a BMI greater than or equal to 25
- In children aged below 5 years, overweight is 2 standard deviations and obesity is greater than 3 standard deviations above the WHO Growth Reference median.[20]
- In children aged between 5–19 years, overweight is 1 standard deviation and obesity is greater than 2 standard deviations above the WHO Growth Reference median[21]

The classification of body weight as per BMI in adults and children is given in Tables 1 & 2 respectively.

Table 2: Classification of obesity by BMI in adults[22]

CLASSIFICATION	OBESITY CLASS	BMI
Obesity	I	30.0-34.9
Severe Obesity	II	35.0-39.9
Morbid Obesity	III	40.0-49.9
Severe Morbid Obesity	IV	>50

Table 3: Classification of weight by BMI in adult Asians

Classification	BMI (kg/m^2)
Underweight	<18.5
Normal range	18.5-22.9

Classification	BMI (kg/m^2)
Overweight	23-24.9
Obese I	25-29.9
Obese II	≥ 30

Table 4: Classification of BMI in children[22]

CLASSIFICATION	BMI
Overweight	85th percentile to less than the 95th percentile
Obesity	95th percentile or greater
Severe Obesity	120% of the 95th percentile or greater 35 kg/m^2

The BMI percentile chart for children aged 6 to 18, as provided by RBSK, is given in Annexure - I

The body mass index is a surrogate marker of fatness and additional measurements, such as the waist circumference, are also used to diagnose obesity.[23] Measures of overweight and obesity and their cut-off for the Indian population are given in Table 3.

Table 5: Indian cut-offs for Indicators[24]

PARAMETER	INDIAN CUT-OFF MALE	INDIAN CUT-OFF FEMALE
Waist Circumference (WC)(cm)	>90	>80
Waist-Hip Ratio (WHR)	>0.9	>0.85
Wrist circumference (cm)	>16.5	>15.7
Neck circumference (NC) (cm)	>35.25	>34.25
Body Fat Percentage	>25%	>30%
Body Mass Index (kg/m^2)	>23 Overweight, >25 – Obesity	

The 5th National Family Health Survey (NFHS) conducted in India (2019–21) assessed abdominal obesity through waist circumference for the first time. The survey identified that the prevalence of abdominal obesity was high in India. Overall, 40% of women and 12% of men were abdominally obese in the country, but 49.3% of women in the age group of 30–39 and 56.7% of women in the age group of 40–49 crossed the cut-off mark. Measured on BMI, only 23% of the women crossed the cut-off mark for obesity. Thus, some women who have healthy BMI also happened to have abdominal obesity.[25]

Types of Body Fat Distribution[26,27]

The distribution of accumulating adipose tissue varies among individuals but can generally be classified as lower body, abdominal subcutaneous (underneath the skin), overall coverage or visceral fat (Figure 3)

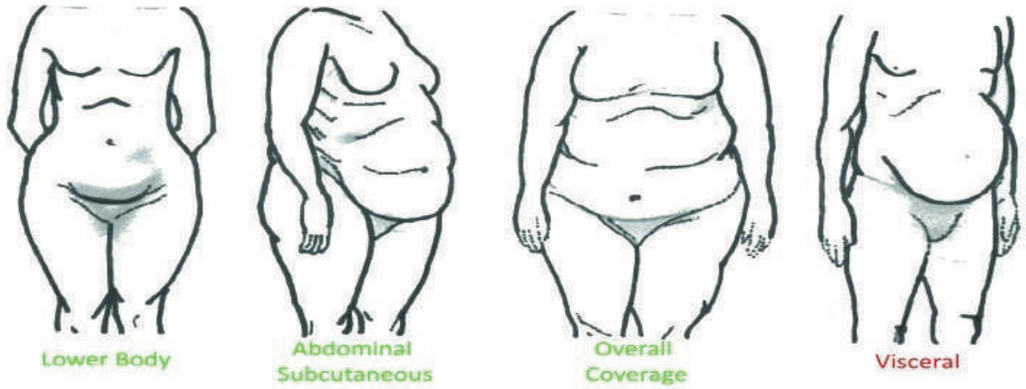

Figure – 3 Body fat distribution is characterized as **Lower body:** fat storage around the buttocks, hips and thighs; **Abdominal subcutaneous:** subcutaneous fat storage around the stomach and chest; **Overall coverage:** fat accumulation in the arms, breast, thighs, buttocks, lower back and breast, **Visceral:** Intra-abdominal fat deposition among organs such as the intestines, stomach, liver and pancreas. Fat distributed within the visceral cavity is highly associated with obesity-related health consequences whereas other fat distribution is not.

Siddha Diagnostic Criteria

***Envagai Thervu* (Eight-Fold System of clinical Assessment)**[28,29]

- *Nāṭi* (Pulse) – *Aiyam/ Aiyā aḻal / Aḻal aiyam*
- *Sparisam* (Touch)– Cool
- *Nā* (Tongue) -Thick/ coated
- *Niram* (Colour) – Normal/Fair
- *Moḻi* (Speech) – Normal/Rough/Hoarseness
- *Viḻi* (Eye) – Normal
- *Malam* (Stool) - Normal / constipation
- *Mūttiram* (Urine) -
  - *Nīrkkuri* (Uro-macroscopy) Yellowish in colour, tamarind odour
  - *Neykūṟi*(Oleo Uro-macroscopy) - Oil may spreads in the form of pearl

A(a). Comorbidities and Complications[30]

Obesity and Overweight are associated with raised risk of disabilities and a number of comorbidities and complications[28] as listed in Table 4, which must be diagnosed timely.

Table 6: Complications and Comorbidities

SYSTEM	DISEASES
Respiratory	• Obstructive sleep apnoea (OSA) • Obesity Hypoventilation Syndrome (OHS)
Cardiovascular	• Coronary Heart Disease • Congestive Cardiac Failure • Hypertension
Cerebrovascular	• Stroke

SYSTEM	DISEASES
Gastrointestinal	• Gastroesophageal Reflux Disease • Barrett's Oesophagus • Erosive Oesophagitis • Diverticular Disease • Oesophageal Cancer • Colon Cancer • Abdominal Hernia
Metabolic	• Dyslipidemia • Type 2 Diabetes Mellitus • Hyperinsulinemia • Metabolic Syndrome • Gout • Gestational Diabetes
Hepato-biliary	• NASH (Non-alcoholic steatohepatitis) • Liver Cirrhosis • Hepatocellular Carcinoma • Gallstone • Gall Bladder Cancer
Musculoskeletal	• Osteoarthritis
Cutaneous	• Acanthosis nigricans • Cutaneous fungal and yeast infections • Venous stasis
Reproductive disorders	• Male: gynaecomastia • Female: Menstrual Irregularities, PCOS, Infertility
Cancer	• Male: Liver cancer, Pancreas cancer, Rectum cancer, Prostate • Female: Gall bladder, Bile duct, Breast, Ovary, Uterine, Cervix

PRINCIPLES OF MANAGEMENT

The principles of management involve evaluating signs and symptoms before beginning treatment and addressing any co-morbidities with appropriate conventional therapies. If the patient is already receiving standard of care, the physician may recommend continuing the current regimen along with Siddha medications. Follow-up assessments can then help to determine whether to taper or discontinue the additional treatment, in consultation with the conventional healthcare provider.

Red Flag Signs

- Breathlessness
- Sleep apnoea syndrome
- Unintentional weight gain
- Rapid Onset of weight gain
- Body Mass Index (BMI) greater than 40 kg/m2 – Morbid obesity
- Weight gain associated with other systemic complications
- Cardiac arrhythmia and unstable cardiac conditions

PREVENTIVE MANAGEMENT

- Measures that focus on dietary intake, the home nutrition environment, nutrition knowledge, physical self-concept, body perception and overcoming barriers to exercise are effective in preventing obesity, especially in younger individuals.[31,32]
- The primary goals of treatment are to improve obesity-related comorbid conditions, improve quality of life and reduce the risk of developing future obesity-related complications.
- Obesity in children and adolescents also requires an interprofessional team approach. Failure to adequately diagnose and treat overweight/obesity results in comorbid medical conditions and the likelihood that a child will become an obese adult.[33]

  Patients who present with obesity-related comorbidities and who would benefit from weight-loss intervention should be managed proactively.

a) Levels of Prevention for obesity

b) Primordial Prevention: Prevent the development of obesity risk factors (sedentary behavior, poor diet).

c) Primary Prevention: Prevent onset of obesity in at-risk individuals (e.g., children of obese parents, sedentary adults).

d) Secondary Prevention: Early detection of overweight and obesity to prevent complications (diabetes, hypertension).

Tertiary Prevention: Manage established obesity and prevent further health deterioration or disability. Siddha System of Medicine emphasis adhering to *Tēraiyar piṇi aṇukā viti* for prevention of disease and lead to healthy life.

Table 7

Dietary Habits (*Uṇavu Muṟaikaḷ*)	
Do's - *Pattiyam*	**Don'ts - *Apattiyam***
• Drink warm water • Add *Trithoda sama porutgal* inclusive of turmeric, pepper, cumin seeds, asafoetida, dry ginger, cardamom, fenugreek and garlic in food preparations • Consume low fat, low-calorie & high fiber diet, fresh vegetables, whole grains, legumes, greens & citrus fruits • Nuts, calcium rich foods – *Rāki aṭai, Pērīccam, Muruṅkai kīrai cūp, Tūtuvēḷai tuvaiyal* • Include traditional rice varieties like *Pūṅkār, kāṭṭu yāṇam karuppu kavuṇi, māppiḷai campā, iluppai campā, kuḷḷakkār* • Advised millet diet 3 days/week • Include lean proteins and low fat dairy in diet • *Thiriphala chooranam*[34] 2g BD before food	• Avoid skipping meals • Always avoid heavy meals especially at night • Avoid untimely food, overcooked food, poorly cooked food • Food should never be consumed during excessive hunger, anger or grief • Food should never be taken full stomach • Avoid highly processed refined carbohydrate diet and advised to take complex carbohydrates • Limit added sugars, trans fat and refined grains • Avoid root tubers except yam – *Typhonium trilobatum (L.) Schott*

Table 8

Lifestyle Practices (*Vāḻviyal Muṟaikaḷ*)	
Do's	**Don'ts**
• Practice Siddha *Pancha Karpa* bath and sunbath • Practice at least 40 minutes of moderate physical activity (like walking) 5 days a week • Practice regular meditation • Consume food to the level of hunger • Consume food only half of stomach, liquid quarter of stomach and always leave quarter stomach empty • Always practice post meal walk • Sleep in left lateral position • Maintain balanced mood • Undergo therapeutic purgation once in four months • Practice Siddha *kāyakaṟpam* – take ginger, dried ginger and chebulic myrobalan in the morning, afternoon and evening respectively	• Avoid daytime sleep or oversleeping • Avoid sedentary life style • Avoid stress • Avoid nap or sleep after food • Avoid alcohol and smoking

i. Siddha culinary medicine for prevention

1. Pre-meal herbal water infusion include

- Cumin seeds
- Tulsi leaves
- Mint + lemon

Anyone of the water can be used

- Cucumber

2. Take high fiber food like *Kīrai maciyal* (Spinach), Black gram and Sprouted fenugreek

3. Following medicinal seeds may be included in diet

- *Muruṅkai vitai* (Moringa seed)–Powder mixed with honey
- *Alici vitāy (*Flax seed) – with palm jaggery
- *Curai* (Bottle guard) *and Pūcāṇi* (Pumpkin) – roast in ghee and add pepper and salt

4. Unique Siddha foods for preventions

***a. Marutam* Tea** - The following ingredients can be used for preparing one serving and can be taken.

- *Marutampaṭṭai (Terminalia Arjuna)* bark 1 part
- *Chukku* (Dry ginger) 1 part
- Rose petals 1 part
- *Milāku* (Pepper) ½ part
- *Karuñcīrakam* (Blackcumin seeds) 1/2 part
- Ēlakkāy (Cardamom) -1 No

b. Annapodi - Dry roast the ingredients and grind them as a coarse powder.Take 3tsp/day with buttermilk /hot water

- *Chukku* (Dry ginger)- 1 part
- *Milāku* (Pepper) -1 part
- *C*īrakam (Cumin seeds) - 1 part
- *Karuñcīrakam* (Black cumin) 1 part
- *Peruṅkāyam* (Asafoetida) -1 part
- *Karuvēppilai* (Curry leaves) -10 part

c. Idhaya Avizhtham - Add equal quantity of *Veṇtāmarai* (White lotus), *Cemparutti* (Hibiscus) and Rose petals with Palm Jaggery and make into balls.

- Herbal tea prepared with *Koḷḷu* (Horse gram), *Karuvēppilai* (curry leaves), *Intuppu* (Rock salt), *Milāku* (Pepper) and *Kōṭampuli* (Malabar tamarind) juice can be used.
- *Moringa olifera (Muruṅkai kīrai)* [35] can be taken in the form of rasam
- One teaspoon of *Cissus quadrangularis*, rock salt powder and lemon juice (5 lemons) and dry it. Take ½ teaspoon of this mixture with food or water after food to reduce body weight. It also cures low back pain especially for ladies [35]

5. *Kōllu puṭṭu* - Horse gram rice cake[36]

- Raw rice powder – 1 cup
- Horse gram –½ Cup
- Grated coconut – ¼ cup
- Ghee – 2 table spoon
- Cashew nut – 5
- Almond - 4
- Lemon Juice – 1 table spoon
- Turmeric powder –1 teaspoon
- Mustard – little
- Salt – required quantity

Clean the horse gram and roast until it turns aromatic. Once cooled, grind it coarsely. Mix it with pre heated raw rice powder, salt to taste and add sufficient quantity of water and make a moist flour with crumbly texture. Then, keep the flour in a closed container for ten minutes, add a pinch of turmeric powder and steam the mixture. Temper it with ghee, mustard seeds and curry leaves. Add grated coconut, lemon juice to the mixture. Top it with fried almond and cashew before serving.

Quantity to be taken – 100 g / Serving

6. *Koḻḷū Aṭai* - Sprouted Horse *gram* pan cake[36]

- Par boiled rice - 1
- Sprouted horse gram – 1 cup

- Ginger –1 piece
- Pepper – 5
- Black sesame seed –2 table spoon
- Curry leaves –small quantity
- Oil, Salt –Required quantity.

Preparation

Soak parboiled rice for one hour. Grind it coarsely with sprouted horse gram, ginger and pepper. Add sesame seeds, curry leaves and salt to the batter. Make it as *Aṭai* (pan cake).

Quantity to be taken – 2 Nos - 100 g / 1 Serving

7. *Koḷḷū* soup - Horse *gram* soup[36]

- Horse gram - ½ Cup
- Tomato - 3 Nos
- Lemon Juice - ½ table spoon
- Coriander leaves - Q.S
- Salt - Required quantity
- Ghee- 2 teaspoon
- Black pepper - 1 teaspoon
- Cumin Seeds- 1 teaspoon
- Garlic - 2 pearls
- Curry leaves - Small

Preparation

Soak horse gram overnight and pressure cook it for 4-5 whistles. Filter the water and keep it aside. Pound the garlic and curry leaves. Saute the tomato in ghee, add the pounded mixture, powdered cumin seeds and pepper for 3 minutes. Now, add the horse gram water, salt and boil it for 5 minutes. Then add lemon juice and garnish it with coriander leaves.

Quantity to be taken – 100 ml / Serving

8. *Sāmai kañji*- Little *millet* Porridge[36]

- Well fried Little millet (Panicum sumatrense) -50 g
- Groundnut oil cake flour -25 g
- Urad dhal flour-25 g
- Jaggery-20 g

Preparation

Dissolve jaggery in water, filter and boil it. Mix all the flour in water. Pour this mixture slowly into the boiling jaggery. Stir it continuously for 10 to 15 minutes until the porridge is ready.

Quantity to be taken – 100 ml / Serving

9. *Vāragu kañji*- Kodo millet rice porridge[37]

- Kodo millet rice
- Buttermilk
- Onion
- Salt

  Mix Kodo millet with water and boil it for 10 Minutes. Once it is ready add buttermilk and salt to it. Take it along with onion.

  Quantity to be taken – 100 ml / Serving

- Fasting

  'Pāṭiṉi perumaruntu' is one of the Siddha schools of thought for well-being. Hence, fasting can be followed with the proper guidance of a Siddha physician. Following fasting methods can be adopted.

- Once a day fasting - one-time meal may be skipped
- Moon cycle fasting - 15 days once, 11th lunar day (Ēkātaci)
- Monthly once any specific day
- Honey fasting - Take 1 tsp of honey and keep it in the oral cavity at least for 3 min. After mixing it with saliva swallow, it slowly. Repeat the same procedure whenever feel stressed, tired and hungry. This can be done 15-20 times /day for a maximum of 3 days/week.
- Eat ½ hr after sunrise and ½ hr prior to sunset

ii. Behavioural therapy:

- Self-monitoring techniques- (e.g., journaling, weighing and measuring food and activity) Stress management
- Stimulus control-(e.g., using smaller plates, not eating in front of the television or in the car)
- Follow sleep hygiene
- Avoid nap after food
- Have dinner 3 ½ hrs before sleep

iii. Physical activity[38]

The combination of dietary modification and exercise is the most effective behavioural approach for the treatment of obesity. Walking is one of the easiest and healthiest ways to exercise. At least a minimum period of 150 min of moderate-intensity or 75 min a week of vigorous-intensity aerobic physical activity per week is necessary. Examples include brisk walking, using the stairs, doing housework and yard work and engaging in sports. A high level of physical activity (>300 min of moderate-intensity activity per week) is often needed to lose weight and sustain weight loss.

- **Yogic practices include:**

➢ Om chanting and Prayer

➢ Shodhana Kriyas: Kapalabhati, Kunjal, Agnisara, Nauli

- Suryanamaskar
- Sukshma Vyayama
- Yogasanas: Tadasana, Katichakrasana, UrdhwaHastottanasana, Pawanamuktasana, Sarvangasana, Matsyasana, Halasana, Bhujangasana, Dhanurasana, UttanPadasana, Paschimottanasana, Ardha Matsyendrasana, Ushtrasana, Mandukasana, Shavasana
- Pranayama: Nadishodhana, Suryabhedi Pranayama, Bhramari, Sitali, Bhastrika
- Special Practice: Yoga Nidra
- Dhyana (Meditation): Om Chanting, Om Meditation, and Anapana Meditation
- Yama and Niyama: This will help to have a controlled behaviour and would help to pacify the wandering mind and in turn help to have control over the eating and other habits of a person.

- Physical activity can be in the form of moderate to vigorous intensity aerobic activity, resistance training and muscle strengthening exercises.

Dance with *Mudhra*, *Baratham* with *mudhra*, *Parai isai*, *Kummi*, *Kavadi attam* may be practiced. Do any traditional sports like *Silambam, Kayittrattam* (skipping), *Pandi*/Hopscotch,etc.

8 (b) Curative Interventions

1) At Level 1:

a. (Solo Physician Clinic/Health & Health Clinic/PHC (Optimal Standard of treatment in a situation where technology and resources are limited)

Clinical symptoms

There are no specific symptoms of overweight and obesity. Overweight and obesity are diagnosed based on clinical history and high body mass index (BMI).

Clinical Diagnosis

Based on anthropometry, clinical assessment of risk of co-morbidities and complications, the following investigations may be conducted:

- Complete Blood Count / ESR
- Fasting lipid profile
- Fasting plasma glucose
- HbA1c
- Serum uric acid
- Serum FT4 and TSH

Management

Siddha line of management:

Patients may seek Siddha management for overweight/ different stages of Obesity i.e., level I, level II and level III with or without comorbidities. Hence, the line of treatment may vary accordingly. The treatment algorithm is attached as Annexure – II.

The first line of treatment is to normalize the altered or deranged humours and revitalization of seven fundamental tissues through detoxification methods followed by internal medications.

The application of detoxification methods like therapeutic oilbath and purgation therapies may be decided by the Siddha physician.

Day 1

***Eṇṇey muḻukku* (Therapeutic oilbath):**

Eṇṇey muḻukku is a preparatory procedure, in which medicated oil massage with a lukewarm water bath. It will strengthen the five sensory organs. According to disease severity, *eṇṇey muḻukku* can be advised for one day to three days.

- *Arakku Thylam* (medicinal oil) – Quantity sufficient (External use)
- *Citramutti Thylam* - Quantity sufficient

Rules to be followed during *Eṇṇey muḻukku*

Apply oil before 7 am. Instil one drop in each eye, two drops in each nostril and three drops in each ear. Spread over the medicated oil from head to foot and give a gentle massage. After

application, leave it for 45 minutes and bathe with lukewarm water using herbal hair wash powder.

Take tender vegetables and easily digestible food. Avoid daytime sleep, intercourse and exposure to sunlight and cold items on the day of the oil bath.

Day 2

Therapeutic purgation *(Kaḷiccal maruttuvam)* [30]

Table 9

Sl. No.	Drugs	Dose form	Dose	Time	Duration and Frequency	Adjuvants/ *Anupaana*
1.	*Agathiyar Kuzhambu*	*Kuzhambu* (medicated viscous mixture)	100-200 mg	early morning onan empty stomach	1st day of Treatment	Ginger juice (*Zingiber officinalis*)
2.	*Meganatha Maathirai*	*Maathirai* (pills/tablets)	1-2 pills	early morning on an empty stomach	1st day of Treatment	*Kāyntāṟiya vennīr* (lukewarm water)
3.	*Sanjeevi Maathirai*	*Maathirai* (pills/tablets)	1-2 pills	early morning on an empty stomach	1st day of Treatment	*Kāyntāṟiya vennīr* (lukewarm water)

Rules to be followed during *Kaḷiccal Maruttuvam*

- The medication should be taken in the early morning 5 to 6 AM
- After the average number (5-6 times) of bowel evacuations, watery diarrhoea commences. In this stage, the patient is advised to take buttermilk/ lemon juice/fried cumin seeds decoction/Ash of sweet flag (*Vacampu).*
- After purgation, the patient may have symptoms like tiredness, slimness, lightness of the body and tiredness of sense organs which is a good sign.
- Dietary regimen during purgation:
    - *Mōr* (Butter milk)
    - *Kañci* (Rice porridge)
    - *Irumuṟaivaṭitta kañci* (Double boiled porridge)
    - *Kāyntāṟiya vennīr* (Luke warm water)
- Precautions
    - Avoid daytime sleep during purgation therapy
    - Should not take heavy meals before or during the procedure

Day 3 onwards

(**Note:** Administration of medicine, dosage, drug holiday and treatment duration may vary according to the condition of patient, disease severity. This solely depends upon the discretion of the treating Siddha Physician).

Table 10: Single herbs

Sl. No	Single herbs	Dosage form	Dose	Time	Frequency and Duration	Adjuvants /*Anuppanam*
1.	*Amukkura (Withania somnifera)*[39]	Dried root powder	2 g	BD	For 48 days	Boiled gruel
2.	*Sangan (Azima tetracantha)*[40]	Dried powder of root bark	2 g	BD	For 48 days	Ghee or Honey

Table 11: Compound formulation

Sl. No.	Compound formulations	Dosageform	Dose	Time	Duration and frequency	Adjuvants/ *Aṉupāṉam*
***Chooranam* / Medicinal powder**						
1.	*Thiriphala Chooranam* [41-42]	Medicinal powder	2 g	Morning & Night	48 days	Water
2.	*Kakkirattan Chooranam* [43]	Medicinal powder	4–12 g	Morning & Night	48 days	Lemon Juice, Rose water, Tamarind syrup
3.	*Asuwathi Chooranam*[44,45]	Medicinal powder	2 g	Morning & Night	48 days	Honey

2) Recommended Diet & Lifestyle [46, 47]

A comprehensive programme of lifestyle modification is considered the first option for achieving the goal of obesity management. This involves three essential elements of lifestyle

1. Diet therapy

- The primary focus of diet therapy is to reduce overall calorie consumption.
- A calorie-deficit diet is advised, taking into consideration nutritional requirements.
- The calorie deficit can be instituted through dietary substitutions or alternatives. Examples include choosing smaller portion sizes, eating more fruits and vegetables, consuming more whole-grain cereals and selecting leaner cuts of meat and skimmed dairy products.
- Adequate intake of micronutrients and fibre-rich such as pulses, nuts, chia seeds, flax seeds and whole grains including millets, vegetables and fruits helps to maintain levels of blood glucose, insulin, cholesterol as well as triglycerides. Use of healthy cooking methods like grilling, baking, steaming or sautéing with minimal oil instead of frying is recommended.
- A daily calorie deficit of 500-1000 kcal is commonly recommended which typically results in a weight loss of 0.5-1kg per week. Total calorie intake is 1200-1500 kcal /day for women, 1500-1800 kcal/day for men. These values may vary and should be adjusted to individual needs to avoid nutritional deficiencies. A reduction of half a kilogram body weight per week

is considered to be safe. Approaches of rapid weight loss should be avoided. Consuming higher amounts of protein (15% energy from protein) may be important during typical energy-deficient weight loss diets (i.e. 500 to 750 kilo calorie per day deficit) to preserve muscle mass. Nevertheless, the protective effect of higher protein diets on muscle mass is compromised if the energy deficit is more than 40% of daily energy needs and the dietary proteins are oxidised for energy production. Weight reducing diet should be nutrient-rich and nutritionally balanced, with adequate intake of micro-nutrients and fibre rich foods.

- The Yogic diet, popularly known as Satvik diet is the most preferred diet in obese condition. Satvik diet contains more of fresh fruits and vegetables in its natural form, soup etc. Rajasic foods like fried food items, spicy foods, soft drinks and beverages, fast foods etc, should be limited.[46]
- Shift to healthy snacking such as fruits, vegetables and sprouts instead of cakes, biscuits and fried snacks.
- Have regular meals at fixed interval.
- Siddha culinary medicine – As given in preventive management

2. **Physical Activity**

- A combination of dietary modification and increased physical activity or exercise is the most effective behavioural approach for the treatment of obesity. The most important role of exercise appears to be in the maintenance of weight loss.[47,48]
- At least 150 minutes aerobic physical activity (e.g., brisk walking) per week (equivalent to 30 minutes per day for 5 days of the week) for initial weight loss, increasing to around 200 to 300 minutes per week to maintain body weight and prevent weight regain is recommended.49 Exercise intensity and duration should be increased gradually over a period of time.[49,50]
- Exercise for weight reduction goes beyond being simply physically active during the day, both in term of type and duration of activity or exercise.
- However, initiating type and duration of exercise and gradual increase in physical activity needs to be undertaken with due consideration of the overall health condition, including systemic complications of the individual patient.
- Cittar yōkam- As given in the preventive management.
- Yoga practices can reduce weight and also manage stress, endocrinal imbalances and other factors associated with obesity. Yoga or physical exercises are suggested to be undertaken under the supervision of a trained therapist.

3. **Behavioural therapy**

- Cognitive behavioural therapy can change and reinforce new dietary and physical activity behaviours.
- Strategies include self-monitoring techniques (e.g., journaling, weighing and measuring food and activity); stress management; stimulus control (e.g., using smaller plates, not eating in front of the television or in the car); social support; problem solving; and cognitive restructuring to help patients develop more positive and realistic thoughts about themselves.

- When recommending any behavioural lifestyle change, the patient should be asked to identify what, when, where and how the behavioural change will be performed.[51]
- Encourage breast feeding as the child who gets proper breast feeding is less likely to develop obesity in the later age.

3) Restricted Diet & Lifestyle[30]

- Avoid overeating and/or eating foods with *mantham* (Dullness) and *thinmai* (Bulkiness) *gunam* in large quantities.
  - Eg: Tubers like potato, topiaco, milk and milk products
- Avoid starchy foods and sugar-sweetened beverages
- Avoid *tamasa* character foods (*Thamasa* food generates heaviness in the body and dullness of mind.): Leftovers, processed, canned foods, fast food or food with additives and colourings
- Avoid deep-fried foods
- Do not eat on the run or while watching TV
- Quit drinking alcohol and smoking

Follow up: Every 15 days or as per need Review should include:

- Monitoring the person's symptoms and the ongoing impact of the condition on their activities of daily living and quality of life.
- Monitoring of signs and symptoms, diet, daily activity, change in weight, anthropometry
- Assessment of energy balance
- Assessment of motivation levels to continue with lifestyle modifications
- Monitoring the long-term course of the condition.
- Discussing the person's knowledge of the condition, any concerns they have, their personal preferences and their ability to access services.
- Reviewing the effectiveness and tolerability of all treatments.
- Self-management support.

Referral criteria

- Non-response to treatment, no change in weight, anthropometry despite negative energy balance.
- Sudden loss or gain of more than 10% body weight.
- Uncontrolled endocrinal profile.
- Morbid obesity where it is difficult to insinuate lifestyle changes.
- Evidence of an increase in severity/complications
- Diagnostic uncertainty
- Co-morbidities, such as cardiac disease.
- Substantial impact on their quality of life and activities of daily living.

II. At Level 2:

(CHC/Small hospitals (10-20 bedded hospitals with basic facilities such as routine, investigation, X-ray)

Clinical Diagnosis: Same as level 1

- Clinical assessment of body fat percentage

Investigations:

- 24-hour urine free cortisol
- ECG and Chest X-ray
- Respiratory function tests
- Test For Insulin Resistance (OGTT, Fasting plasma insulin)
- Serum Electrolytes
- USG whole abdomen and pelvis

Management

Along with level 1 medications including detoxification treatment any of the following medicines can be used. For new cases at this level, medications listed for Level-1 may also be considered, but the comprehensive set of symptoms exhibited by the patient remains the key factor in determining the appropriate treatment.

(**Note**: Administration of medicine, dosage, drug holiday and treatment duration may vary according to the condition of patient, disease severity. This solely depends upon the discretion of the treating Siddha Physician).

Table 12: Single herbs

Sl. No	Single herb	Dosage form	Dose	Time	Frequency and Duration	Adjuvants /*Anupānam*
1.	*Vilvam (Aegle marmelos)*[51]	*Kudineer* / Decoction of root or root bark	30ml-45ml	BD before food	48 days	--
2.	*Nilavagai (Cassia italica)*[52]	Leaf powder	1-2 g	BD	48 days	Honey
3.	*Nilavagai (Cassia italica)*[52]	Whole plant powder	800 mg – 1000 mg	BD	48 days	Honey
4.	*Karisalai (Eclipta prostrata)*[52]	Leaf Powder	5 g	OD on an empty stomach	48 days	Water
5.	*Kollu (Macrotyloma uniflorum)*[53]	Powder	2 tablespoons	BD after food	According to the discretion of Physician	Water

6.	*Neermulli (Hygrophilla auriculata)*[54]	Root powder	2 g	BD	For 48 days	Honey
7.	*Ilanthai (Ziziphus mauritiana)*[54]	*Karkam* / medicinal Paste	2 g	BD	For 48 days	Gruel
8.	*Ilanthai (Ziziphus mauritinia)*[54]	Leaves soaked in water overnight	30ml – 45ml	OD	For 48 days	The water should be taken next day morning

Table 13: Compound formulations

Sl. No.	Compound formulations	Dosageform	Dose	Time	Duration and Frequency	Adjuvants /*Aṉupāṉam*
***Kudineer* / Decoction**						
1.	Powder of *Nerunjil (Tribulus terrestris)*, *Neermulli (Hygrophilla auriculata)*, *Sombu (Pimpinella anisum)*, *Kothamalli (Coriandrum sativum)* in equal ratio [35]	The decoction of this powder	30ml- 45ml	BD after food	twice daily	Milk
***Chooranam* / Medicinal powder**						
2.	*Pungu (Pongamia Pinnata)* and *Veṇgai (Pterocarpus marsupium)*[54]	Medicinal powder	2 g	BD	48 days	with water
***Chenduram* / Red calx**						
3.	*Chunnaloga Chenduram* [55]	Red calx	200 mg 360 mg	BD	48 days	Honey
4.	*Ekku Chenduram*[55]	Red calx	488 mg	BD	48 days	*Thiriphala Chooranam*, Palm Sugar, Honey
5.	*Velvanga Chenduram*[56]	Red calx	135 g to 260 g	BD	48 days	*Moongil Ilai* juice (Tender bamboo leaf juice)
***Nei* / Medicated Ghee**						
6.	*Megasanjeevi Nei*[30]	Medicated ghee	6 – 12 g	BD	48 days	Sugar or Puffed rice flour

Siddha *Puṟamaruttuvam* (External therapies)

***Podithirmirthal* (powder massage)**[20]

- *Kollu podi* (Horse gram powder)
- *Manjal Podi or Ilai Karkam*
- *(Turmeric or leaf paste)*
- *Thiriphala Chooranam*
- *Puttru man* (Termite mound soils)

15 minutes 1 hr depending on level of obesity

1. **Recommended Diet & Lifestyle**
2. **Restricted Diet & Lifestyle** As per Level 1
3. **Follow Up**

Every 15 days or as per the need

4. **Referral Criteria**

- Same as mentioned at Level 1 and any of these
- Psychological imbalance
- Suspected life-threatening complications such as heart failure

III. At Level 3:

(Ayush hospitals attached with teaching Institution, District Level/Integrated/State Ayush Hospitals, Allopathic hospitals also having tertiary care facilities either standalone or integrative management facilities).

Clinical Diagnosis:

Same as levels 1 & 2. Confirm diagnosis and severity with the help of the following investigations:

Treadmill Test or Exercise stress Test to evaluate the efficacy of functioning of heart during exercise

Management

Along with level 1& 2 medications including detoxification treatment any of the following medicines can be used. For patients referred from Level 1 or 2, the treatment provided at those levels may be continued if it suits the current condition. Alternatively, the case may be reassessed to identify the underlying causes of obesity, symptoms the treatment will be adjusted accordingly. For new cases at this level, the complete set of symptoms presented by the patient will be the primary factor guiding treatment decisions.

(**Note:** Administration of medicine, dosage, drug holiday and treatment duration may vary according to the condition of patient, disease severity. This solely depends upon the discretion of the treating Siddha Physician).

Table 14: Single herbs

Sl. No	Single drug	Dosage form	Dose	Time	Frequency and Duration	Adjuvants /Anupānam
1.	*Nathaisoori (Spermacoce hispida)*[57]	Dried root powder	1-2 g	BD	48 days	Warm water
2.	*Karuveppilai (Murraya koenigi)*[57]	Dried leaf powder	1-2 g	BD	48 days	Warm Water
3.	*Seenthil (Tinospora cardifolia)*[57]	Dried leaf powder	1-2 g	BD	48 days	Warm Water

Table 15: Compound formulations

Sl. No.	Compound formulation	Dosage form	Dose	Time	Duration and Frequency	Adjuvants /*Aṉupāṉam*
***Kudineer*/Decoction**						
1.	*Mantharaiver Kudineer* [30]	Decoction	60 ml	BD before food	48 days	NA
***Chooranam* /Medicinal powder**						
1.	*Thirikatuku Chooranam* [30]	Medicinal powder	1-2 g	BD after food	Depending upon the severity of the disease condition.	Warm water
2.	*Nilavagai Chooranam*[30]	Medicinal powder	1-2 g	BD after food	-do-	Warm water
3.	*Karisalai karpa Chooranam* [30]	Medicinal powder	1-2 g	BD after food	-do-	Warm water
4.	*Kukkilathi Chooranam*[30]	Medicinal powder	1-2 g	BD after food	-do-	Warm water
5.	*Karuṇai kizhangu Chooranam* [30]	Medicinal powder	1-2 g	BD after food	-do-	Warm water
6.	*Nathaisoori Chooranam*[30]	Medicinal powder	1-2 g	BD after food	-do-	Warm water
7.	*Kazharchi Chooranam* [30]	Medicinal powder	1-2 g	BD after food	-do-	Warm water
8.	*Karunjeeraga Chooranam* [30]	Medicinal powder	1-2 g	BD after food	-do-	Warm water
9.	*Asoka pattai Chooranam* [30]	Medicinal powder	1-2 g	BD after food	-do-	Warm water

Sl. No.	Compound formulation	Dosage form	Dose	Time	Duration and Frequency	Adjuvants /*Aṉupāṉam*
***Maathirai* / Tablet**						
10.	*Veppampoo Maathirai*[30]	*Maathirai*	1-2	BD after food	-do-	Warm water
***Chenduram* /Red calx**						
11.	*Kaantha Chenduram*[30]	Red calx	100-200 mg	BD after food	48 days	Honey
12.	*Ayakantha Chenduram*[30]	Red calx	100 - 200 mg	BD after food.	48 days	Honey
13.	*Aya Chenduram*[30]	Red calx	-100-200 mg	BD after food	48 days	Honey
14.	*Ekku Chenduram*[30]	Red calx	-100-200 mg	BD after food	48 days	Honey
***Parpam* / White calx**						
15.	*Kungiliya Parpam*[30]	White calx	200 - 400 mg	BD after food	48 days	Warm water
16.	*Silasathu Parpam*[30]	White calx	200 - 400 mg	BD after food	48 days	Warm water
17.	*Palakarai Parpam*[30]	White calx	65 - 130 mg	BD after food	48 days	Warm water
***Karpam* / Rejuvenating drugs**						
18.	*AyasamberaKarpam*[30]	Rejuvenating drug	100- 200 mg	BD after food	48 days	Honey
19.	*Ayabringaraja Karpam*[30]	Rejuvenating drug	100- 200 mg	BD after food	48 days	Honey

***Siddha puramaruthuvam* (Siddha external therapies)**

***Podi Thimirthal* (Powder Massage):** *30*

- *Kollu Podi (Macrotyloma uniflorum)* Podi Thimirthal for 7 days
- *Pottru man* (Termite mound soils)

***Vedhu* (Steaming):**

- *Nochi (*Five-leaved chaste tree-*Vitex negundo)* leaves
- *Manjal (*Turmeric-*Curcuma longa)* powder
- *Elumichai* (Lemon - *Citrus limon)* seed

***Suttigai* (Cautery cauterization)**

- *Kānthi suttigai* (Sun bath)- 30 to 45 minutes with herbal poultice/ day for 48 days

1) **Recommended diet and lifestyle:** Same as Levels 1& 2
2) **Restricted diet and lifestyle:** Same as Levels 1& 2

3) **Follow up:** Every 15 days or as per need

4) **Referral Criteria**[50]

Same as mentioned in Level 2 and any of these

- Morbid obesity not responding to treatment
- Uncontrolled hypertension
- Worsening Hypertriglyceridemia
- Worsening insulin resistance and hyperglycaemia
- Suspected Cardiac arrythmias
- Suspected Polycythaemia
- Other modalities can be considered depending on the case and to rehabilitate properly.

Table 16: Siddha culinary medicine to be added[28]

Vegetables	• *Veḷḷari* / Cucumber *(Cucumis sativus*) • *Vellai pōsani* / Pumpkin *(Cucurbita pepo)* • *Suraikkāi* / Bottle gourd *(Lagenaria siceraria)* • *Vālai thandu* / Banana stem *(Musa paradisiaca)* • *Murungai kai* / Drumstick *(Moringa oleifera)* • *Vendaikkāi* / Ladies finger *(Abelmoschus esculentus)* • *Kērai* / Green leafy vegetable • *Iñji* / Ginger *(Zingiber officinale)* • *Pōndu* / Garlic *(Allium sativum)* • *Chinna vengāyam* / Small onion *(Allium parvum)* • *Kovakāi* / Coccinia *(Coccinia grandis)*
Any one or more vegetables can be included in daily diet in soup, salad, veg curry, etc.	
Fruits	• *Nellikāi* / Gooseberry *(Ribes grossularia)* • *Elumitchai* / Lemon *(Citrus limon)* • *Pappāli* / Papaya *(Carica papya)* • *Koyya* / Guava *(Psidium guajava)*
A bowel of fruit salad of the above fruits can be included daily	
Millets	• *Keḻvaragu* / Finger millet *(Eleusine coracana)* • *Thinai* / Foxtail millet *(Setaria italic)* • *Kuṭhiraivāli* / Barnyard millet *(Echinochloa frumentacea)* • *Sāmai* / Little millet *(Panicum sumatrense)*
These millets may be taken in the form of various culinary preparations like *Idly, Pongal*, Porridge, *Dōcai, Aṭai*, Variety rice etc.	

RBSK_BMI for Age

WHO Simplified field tables– BMI for age 6 to18 years (z-scores)

Refer any child whose BMI for age and sex is ><3 SD.

BMI-for-age GIRLS 5 to 19 years (z-scores)							Age in		BMI-for-age BOYS 5 to 19 years (z-scores)						
-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD	Year: Month	Months	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
11.8	12.7	13.9	15.2	16.9	18.9	21.3	5:01	61	12.1	13	14.1	15.3	16.6	18.3	20.2
11.8	12.7	13.9	15.2	16.9	18.9	21.4	5:02	62	12.1	13	14.1	15.3	16.6	18.3	20.2
11.8	12.7	13.9	15.2	16.9	18.9	21.5	5:03	63	12.1	13	14.1	15.3	16.7	18.3	20.2
11.8	12.7	13.9	15.2	16.9	18.9	21.5	5:04	64	12.1	13	14.1	15.3	16.7	18.3	20.3
11.7	12.7	13.9	15.2	16.9	19	21.6	5:05	65	12.1	13	14.1	15.3	16.7	18.3	20.3
11.7	12.7	13.9	15.2	16.9	19	21.7	5:06	66	12.1	13	14.1	15.3	16.7	18.4	20.4
11.7	12.7	13.9	15.2	16.9	19	21.7	5:07	67	12.1	13	14.1	15.3	16.7	18.4	20.4
11.7	12.7	13.9	15.3	17	19.1	21.8	5:08	68	12.1	13	14.1	15.3	16.7	18.4	20.5
11.7	12.7	13.9	15.3	17	19.1	21.9	5:09	69	12.1	13	14.1	15.3	16.7	18.4	20.5
11.7	12.7	13.9	15.3	17	19.1	22	5:10	70	12.1	13	14.1	15.3	16.7	18.5	20.6
11.7	12.7	13.9	15.3	17	19.2	22.1	5:11	71	12.1	13	14.1	15.3	16.7	18.5	20.6
11.7	12.7	13.9	15.3	17	19.2	22.1	6:00	72	12.1	13	14.1	15.3	16.8	18.5	20.7
11.7	12.7	13.9	15.3	17	19.3	22.2	6:01	73	12.1	13	14.1	15.3	16.8	18.6	20.8
11.7	12.7	13.9	15.3	17	19.3	22.3	6:02	74	12.2	13.1	14.1	15.3	16.8	18.6	20.8
11.7	12.7	13.9	15.3	17.1	19.3	22.4	6:03	75	12.2	13.1	14.1	15.3	16.8	18.6	20.9
11.7	12.7	13.9	15.3	17.1	19.4	22.5	6:04	76	12.2	13.1	14.1	15.4	16.8	18.7	21
11.7	12.7	13.9	15.3	17.1	19.4	22.6	6:05	77	12.2	13.1	14.1	15.4	16.9	18.7	21
11.7	12.7	13.9	15.3	17.1	19.5	22.7	6:06	78	12.2	13.1	14.1	15.4	16.9	18.7	21.1
11.7	12.7	13.9	15.3	17.2	19.5	22.8	6:07	79	12.2	13.1	14.1	15.4	16.9	18.8	21.2
11.7	12.7	13.9	15.3	17.2	19.6	22.9	6:08	80	12.2	13.1	14.2	15.4	16.9	18.8	21.3
11.7	12.7	13.9	15.4	17.2	19.6	23	6:09	81	12.2	13.1	14.2	15.4	17	18.9	21.3
11.7	12.7	13.9	15.4	17.2	19.7	23.1	6:10	82	12.2	13.1	14.2	15.4	17	18.9	21.4
11.7	12.7	13.9	15.4	17.3	19.7	23.2	6:11	83	12.2	13.1	14.2	15.5	17	19	21.5
11.8	12.7	13.9	15.4	17.3	19.8	23.3	7:00	84	12.3	13.1	14.2	15.5	17	19	21.6
11.8	12.7	13.9	15.4	17.3	19.8	23.4	7:01	85	12.3	13.2	14.2	15.5	17.1	19.1	21.7
11.8	12.8	14	15.4	17.4	19.9	23.5	7:02	86	12.3	13.2	14.2	15.5	17.1	19.1	21.8
11.8	12.8	14	15.5	17.4	20	23.6	7:03	87	12.3	13.2	14.3	15.5	17.1	19.2	21.9
11.8	12.8	14	15.5	17.4	20	23.7	7:04	88	12.3	13.2	14.3	15.6	17.2	19.2	22
11.8	12.8	14	15.5	17.5	20.1	23.9	7:05	89	12.3	13.2	14.3	15.6	17.2	19.3	22
11.8	12.8	14	15.5	17.5	20.1	24	7:06	90	12.3	13.2	14.3	15.6	17.2	19.3	22.1
11.8	12.8	14	15.5	17.5	20.2	24.1	7:07	91	12.3	13.2	14.3	15.6	17.3	19.4	22.2
11.8	12.8	14	15.6	17.6	20.3	24.2	7:08	92	12.3	13.2	14.3	15.6	17.3	19.4	22.4
11.8	12.8	14.1	15.6	17.6	20.3	24.4	7:09	93	12.4	13.3	14.3	15.7	17.3	19.5	22.5
11.9	12.9	14.1	15.6	17.6	20.4	24.5	7:10	94	12.4	13.3	14.4	15.7	17.4	19.6	22.6
11.9	12.9	14.1	15.7	17.7	20.5	24.6	7:11	95	12.4	13.3	14.4	15.7	17.4	19.6	22.7
11.9	12.9	14.1	15.7	17.7	20.6	24.8	8:00	96	12.4	13.3	14.4	15.7	17.4	19.7	22.8
11.9	12.9	14.1	15.7	17.8	20.6	24.9	8:01	97	12.4	13.3	14.4	15.8	17.5	19.7	22.9
11.9	12.9	14.2	15.7	17.8	20.7	25.1	8:02	98	12.4	13.3	14.4	15.8	17.5	19.8	23
11.9	12.9	14.2	15.8	17.9	20.8	25.2	8:03	99	12.4	13.3	14.4	15.8	17.5	19.9	23.1
11.9	13	14.2	15.8	17.9	20.9	25.3	8:04	100	12.4	13.4	14.5	15.8	17.6	19.9	23.3
12	13	14.2	15.8	18	20.9	25.5	8:05	101	12.5	13.4	14.5	15.9	17.6	20	23.4
12	13	14.3	15.9	18	21	25.6	8:06	102	12.5	13.4	14.5	15.9	17.7	20.1	23.5
12	13	14.3	15.9	18.1	21.1	25.8	8:07	103	12.5	13.4	14.5	15.9	17.7	20.1	23.6
12	13	14.3	15.9	18.1	21.2	25.9	8:08	104	12.5	13.4	14.5	15.9	17.7	20.2	23.8
12	13.1	14.3	16	18.2	21.3	26.1	8:09	105	12.5	13.4	14.6	16	17.8	20.3	23.9
12.1	13.1	14.4	16	18.2	21.3	26.2	8:10	106	12.5	13.5	14.6	16	17.8	20.3	24
12.1	13.1	14.4	16.1	18.3	21.4	26.4	8:11	107	12.5	13.5	14.6	16	17.9	20.4	24.2
12.1	13.1	14.4	16.1	18.3	21.5	26.5	9:00	108	12.6	13.5	14.6	16	17.9	20.5	24.3
12.1	13.2	14.5	16.1	18.4	21.6	26.7	9:01	109	12.6	13.5	14.6	16.1	18	20.5	24.4
12.1	13.2	14.5	16.2	18.4	21.7	26.8	9:02	110	12.6	13.5	14.7	16.1	18	20.6	24.6
12.2	13.2	14.5	16.2	18.5	21.8	27	9:03	111	12.6	13.5	14.7	16.1	18	20.7	24.7
12.2	13.2	14.6	16.3	18.6	21.9	27.2	9:04	112	12.6	13.6	14.7	16.2	18.1	20.8	24.9
12.2	13.3	14.6	16.3	18.6	21.9	27.3	9:05	113	12.6	13.6	14.7	16.2	18.1	20.8	25

BMI-for-age GIRLS 5 to 19 years (z-scores)							Age in		BMI-for-age BOYS 5 to 19 years (z-scores)						
-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD	Year: Month	Months	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
12.2	13.3	14.6	16.3	18.7	22	27.5	9:06	114	12.7	13.6	14.8	16.2	18.2	20.9	25.1
12.3	13.3	14.7	16.4	18.7	22.1	27.6	9:07	115	12.7	13.6	14.8	16.3	18.2	21	25.3
12.3	13.4	14.7	16.4	18.8	22.2	27.8	9:08	116	12.7	13.6	14.8	16.3	18.3	21.1	25.5
12.3	13.4	14.7	16.5	18.8	22.3	27.9	9:09	117	12.7	13.7	14.8	16.3	18.3	21.2	25.6
12.3	13.4	14.8	16.5	18.9	22.4	28.1	9:10	118	12.7	13.7	14.9	16.4	18.4	21.2	25.8
12.4	13.4	14.8	16.6	19	22.5	28.2	9:11	119	12.8	13.7	14.9	16.4	18.4	21.3	25.9
12.4	13.5	14.8	16.6	19	22.6	28.4	10:00	120	12.8	13.7	14.9	16.4	18.5	21.4	26.1
12.4	13.5	14.9	16.7	19.1	22.7	28.5	10:01	121	12.8	13.8	15	16.5	18.5	21.5	26.2
12.4	13.5	14.9	16.7	19.2	22.8	28.7	10:02	122	12.8	13.8	15	16.5	18.6	21.6	26.4
12.5	13.6	15	16.8	19.2	22.8	28.8	10:03	123	12.8	13.8	15	16.6	18.6	21.7	26.6
12.5	13.6	15	16.8	19.3	22.9	29	10:04	124	12.9	13.8	15	16.6	18.7	21.7	26.7
12.5	13.6	15	16.9	19.4	23	29.1	10:05	125	12.9	13.9	15.1	16.6	18.8	21.8	26.9
12.5	13.7	15.1	16.9	19.4	23.1	29.3	10:06	126	12.9	13.9	15.1	16.7	18.8	21.9	27
12.6	13.7	15.1	17	19.5	23.2	29.4	10:07	127	12.9	13.9	15.1	16.7	18.9	22	27.2
12.6	13.7	15.2	17	19.6	23.3	29.6	10:08	128	13	13.9	15.2	16.8	18.9	22.1	27.4
12.6	13.8	15.2	17.1	19.6	23.4	29.7	10:09	129	13	14	15.2	16.8	19	22.2	27.5
12.7	13.8	15.3	17.1	19.7	23.5	29.9	10:10	130	13	14	15.2	16.9	19	22.3	27.7
12.7	13.8	15.3	17.2	19.8	23.6	30	10:11	131	13	14	15.3	16.9	19.1	22.4	27.9
12.7	13.9	15.3	17.2	19.9	23.7	30.2	11:00	132	13.1	14.1	15.3	16.9	19.2	22.5	28
12.8	13.9	15.4	17.3	19.9	23.8	30.3	11:01	133	13.1	14.1	15.3	17	19.2	22.5	28.2
12.8	14	15.4	17.4	20	23.9	30.5	11:02	134	13.1	14.1	15.4	17	19.3	22.6	28.4
12.8	14	15.5	17.4	20.1	24	30.6	11:03	135	13.1	14.1	15.4	17.1	19.3	22.7	28.5
12.9	14	15.5	17.5	20.2	24.1	30.8	11:04	136	13.2	14.2	15.5	17.1	19.4	22.8	28.7
12.9	14.1	15.6	17.5	20.2	24.2	30.9	11:05	137	13.2	14.2	15.5	17.2	19.5	22.9	28.8
12.9	14.1	15.6	17.6	20.3	24.3	31.1	11:06	138	13.2	14.2	15.5	17.2	19.5	23	29
13	14.2	15.7	17.7	20.4	24.4	31.2	11:07	139	13.2	14.3	15.6	17.3	19.6	23.1	29.2
13	14.2	15.7	17.7	20.5	24.5	31.4	11:08	140	13.3	14.3	15.6	17.3	19.7	23.2	29.3
13	14.3	15.8	17.8	20.6	24.7	31.5	11:09	141	13.3	14.3	15.7	17.4	19.7	23.3	29.5
13.1	14.3	15.8	17.9	20.6	24.8	31.6	11:10	142	13.3	14.4	15.7	17.4	19.8	23.4	29.6
13.1	14.3	15.9	17.9	20.7	24.9	31.8	11:11	143	13.4	14.4	15.7	17.5	19.9	23.5	29.8
13.2	14.4	16	18	20.8	25	31.9	12:00	144	13.4	14.5	15.8	17.5	19.9	23.6	30
13.2	14.4	16	18.1	20.9	25.1	32	12:01	145	13.4	14.5	15.8	17.6	20	23.7	30.1
13.2	14.5	16.1	18.1	21	25.2	32.2	12:02	146	13.5	14.5	15.9	17.6	20.1	23.8	30.3
13.3	14.5	16.1	18.2	21.1	25.3	32.3	12:03	147	13.5	14.6	15.9	17.7	20.2	23.9	30.4
13.3	14.6	16.2	18.3	21.1	25.4	32.4	12:04	148	13.5	14.6	16	17.8	20.2	24	30.6
13.3	14.6	16.2	18.3	21.2	25.5	32.6	12:05	149	13.6	14.6	16	17.8	20.3	24.1	30.7
13.4	14.7	16.3	18.4	21.3	25.6	32.7	12:06	150	13.6	14.7	16.1	17.9	20.4	24.2	30.9
13.4	14.7	16.3	18.5	21.4	25.7	32.8	12:07	151	13.6	14.7	16.1	17.9	20.4	24.3	31
13.5	14.8	16.4	18.5	21.5	25.8	33	12:08	152	13.7	14.8	16.2	18	20.5	24.4	31.1
13.5	14.8	16.4	18.6	21.6	25.9	33.1	12:09	153	13.7	14.8	16.2	18	20.6	24.5	31.3
13.5	14.8	16.5	18.7	21.6	26	33.2	12:10	154	13.7	14.8	16.3	18.1	20.7	24.6	31.4
13.6	14.9	16.6	18.7	21.7	26.1	33.3	12:11	155	13.8	14.9	16.3	18.2	20.8	24.7	31.6
13.6	14.9	16.6	18.8	21.8	26.2	33.4	13:00	156	13.8	14.9	16.4	18.2	20.8	24.8	31.7
13.6	15	16.7	18.9	21.9	26.3	33.6	13:01	157	13.8	15	16.4	18.3	20.9	24.9	31.8
13.7	15	16.7	18.9	22	26.4	33.7	13:02	158	13.9	15	16.5	18.4	21	25	31.9
13.7	15.1	16.8	19	22	26.5	33.8	13:03	159	13.9	15.1	16.5	18.4	21.1	25.1	32.1
13.8	15.1	16.8	19.1	22.1	26.6	33.9	13:04	160	14	15.1	16.6	18.5	21.1	25.2	32.2
13.8	15.2	16.9	19.1	22.2	26.7	34	13:05	161	14	15.2	16.6	18.6	21.2	25.2	32.3
13.8	15.2	16.9	19.2	22.3	26.8	34.1	13:06	162	14	15.2	16.7	18.6	21.3	25.3	32.4
13.9	15.2	17	19.3	22.4	26.9	34.2	13:07	163	14.1	15.2	16.7	18.7	21.4	25.4	32.6
13.9	15.3	17	19.3	22.4	27	34.3	13:08	164	14.1	15.3	16.8	18.7	21.5	25.5	32.7
13.9	15.3	17.1	19.4	22.5	27.1	34.4	13:09	165	14.1	15.3	16.8	18.8	21.5	25.6	32.8
14	15.4	17.1	19.4	22.6	27.1	34.5	13:10	166	14.2	15.4	16.9	18.9	21.6	25.7	32.9
14.1	15.5	17.3	19.7	22.9	27.5	34.8	14:02	170	14.3	15.6	17.1	19.1	21.9	26.1	33.3
14.1	15.6	17.4	19.7	22.9	27.6	34.9	14:03	171	14.4	15.6	17.2	19.2	22	26.2	33.4
14.1	15.6	17.4	19.8	23	27.7	35	14:04	172	14.4	15.7	17.2	19.3	22.1	26.3	33.5

BMI-for-age GIRLS 5 to 19 years (z-scores)							Age in		BMI-for-age BOYS 5 to 19 years (z-scores)						
-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD	Year: Month	Months	-3 SD	-2 SD	-1 SD	Median	1 SD	2 SD	3 SD
14.2	15.6	17.5	19.9	23.1	27.7	35.1	14:05	173	14.5	15.7	17.3	19.3	22.2	26.4	33.5
14.2	15.7	17.5	19.9	23.1	27.8	35.1	14:06	174	14.5	15.7	17.3	19.4	22.2	26.5	33.6
14.2	15.7	17.6	20	23.2	27.9	35.2	14:07	175	14.5	15.8	17.4	19.5	22.3	26.5	33.7
14.3	15.7	17.6	20	23.3	28	35.3	14:08	176	14.6	15.8	17.4	19.5	22.4	26.6	33.8
14.3	15.8	17.6	20.1	23.3	28	35.4	14:09	177	14.6	15.9	17.5	19.6	22.5	26.7	33.9
14.3	15.8	17.7	20.1	23.4	28.1	35.4	14:10	178	14.6	15.9	17.5	19.6	22.5	26.8	33.9
14.3	15.8	17.7	20.2	23.5	28.2	35.5	14:11	179	14.7	16	17.6	19.7	22.6	26.9	34
14.4	15.9	17.8	20.2	23.5	28.2	35.5	15:00	180	14.7	16	17.6	19.8	22.7	27	34.1
14.4	15.9	17.8	20.3	23.6	28.3	35.6	15:01	181	14.7	16.1	17.7	19.8	22.8	27.1	34.1
14.4	15.9	17.8	20.3	23.6	28.4	35.7	15:02	182	14.8	16.1	17.8	19.9	22.8	27.1	34.2
14.4	16	17.9	20.4	23.7	28.4	35.7	15:03	183	14.8	16.1	17.8	20	22.9	27.2	34.3
14.5	16	17.9	20.4	23.7	28.5	35.8	15:04	184	14.8	16.2	17.9	20	23	27.3	34.3
14.5	16	17.9	20.4	23.8	28.5	35.8	15:05	185	14.9	16.2	17.9	20.1	23	27.4	34.4
14.5	16	18	20.5	23.8	28.6	35.8	15:06	186	14.9	16.3	18	20.1	23.1	27.4	34.5
14.5	16.1	18	20.5	23.9	28.6	35.9	15:07	187	15	16.3	18	20.2	23.2	27.5	34.5
14.5	16.1	18	20.6	23.9	28.7	35.9	15:08	188	15	16.3	18.1	20.3	23.3	27.6	34.6
14.5	16.1	18.1	20.6	24	28.7	36	15:09	189	15	16.4	18.1	20.3	23.3	27.7	34.6
14.6	16.1	18.1	20.6	24	28.8	36	15:10	190	15	16.4	18.2	20.4	23.4	27.7	34.7
14.6	16.2	18.1	20.7	24.1	28.8	36	15:11	191	15.1	16.5	18.2	20.4	23.5	27.8	34.7
14.6	16.2	18.2	20.7	24.1	28.9	36.1	16:00	192	15.1	16.5	18.2	20.5	23.5	27.9	34.8
14.6	16.2	18.2	20.7	24.1	28.9	36.1	16:01	193	15.1	16.5	18.3	20.6	23.6	27.9	34.8
14.6	16.2	18.2	20.8	24.2	29	36.1	16:02	194	15.2	16.6	18.3	20.6	23.7	28	34.8
14.6	16.2	18.2	20.8	24.2	29	36.1	16:03	195	15.2	16.6	18.4	20.7	23.7	28.1	34.9
14.6	16.2	18.3	20.8	24.3	29	36.2	16:04	196	15.2	16.7	18.4	20.7	23.8	28.1	34.9
14.6	16.3	18.3	20.9	24.3	29.1	36.2	16:05	197	15.3	16.7	18.5	20.8	23.8	28.2	35
14.7	16.3	18.3	20.9	24.3	29.1	36.2	16:06	198	15.3	16.7	18.5	20.8	23.9	28.3	35
14.7	16.3	18.3	20.9	24.4	29.1	36.2	16:07	199	15.3	16.8	18.6	20.9	24	28.3	35
14.7	16.3	18.3	20.9	24.4	29.2	36.2	16:08	200	15.3	16.8	18.6	20.9	24	28.4	35.1
14.7	16.3	18.4	21	24.4	29.2	36.3	16:09	201	15.4	16.8	18.7	21	24.1	28.5	35.1
14.7	16.3	18.4	21	24.4	29.2	36.3	16:10	202	15.4	16.9	18.7	21	24.2	28.5	35.1
14.7	16.3	18.4	21	24.5	29.3	36.3	16:11	203	15.4	16.9	18.7	21.1	24.2	28.6	35.2
14.7	16.4	18.4	21	24.5	29.3	36.3	17:00	204	15.4	16.9	18.8	21.1	24.3	28.6	35.2
14.7	16.4	18.4	21.1	24.5	29.3	36.3	17:01	205	15.5	17	18.8	21.2	24.3	28.7	35.2
14.7	16.4	18.4	21.1	24.6	29.3	36.3	17:02	206	15.5	17	18.9	21.2	24.4	28.7	35.2
14.7	16.4	18.5	21.1	24.6	29.4	36.3	17:03	207	15.5	17	18.9	21.3	24.4	28.8	35.3
14.7	16.4	18.5	21.1	24.6	29.4	36.3	17:04	208	15.5	17.1	18.9	21.3	24.5	28.9	35.3
14.7	16.4	18.5	21.1	24.6	29.4	36.3	17:05	209	15.6	17.1	19	21.4	24.5	28.9	35.3
14.7	16.4	18.5	21.2	24.6	29.4	36.3	17:06	210	15.6	17.1	19	21.4	24.6	29	35.3
14.7	16.4	18.5	21.2	24.7	29.4	36.3	17:07	211	15.6	17.1	19.1	21.5	24.7	29	35.4
14.7	16.4	18.5	21.2	24.7	29.5	36.3	17:08	212	15.6	17.2	19.1	21.5	24.7	29.1	35.4
14.7	16.4	18.5	21.2	24.7	29.5	36.3	17:09	213	15.6	17.2	19.1	21.6	24.8	29.1	35.4
14.7	16.4	18.5	21.2	24.7	29.5	36.3	17:10	214	15.7	17.2	19.2	21.6	24.8	29.2	35.4
14.7	16.4	18.6	21.2	24.8	29.5	36.3	17:11	215	15.7	17.3	19.2	21.7	24.9	29.2	35.4
14.7	16.4	18.6	21.3	24.8	29.5	36.3	18:00	216	15.7	17.3	19.2	21.7	24.9	29.2	35.4
14.7	16.5	18.6	21.3	24.8	29.5	36.3	18:01	217	15.7	17.3	19.3	21.8	25	29.3	35.4
14.7	16.5	18.6	21.3	24.8	29.6	36.3	18:02	218	15.7	17.3	19.3	21.8	25	29.3	35.5
14.7	16.5	18.6	21.3	24.8	29.6	36.3	18:03	219	15.7	17.4	19.3	21.8	25.1	29.4	35.5
14.7	16.5	18.6	21.3	24.8	29.6	36.3	18:04	220	15.8	17.4	19.4	21.9	25.1	29.4	35.5
14.7	16.5	18.6	21.3	24.9	29.6	36.2	18:05	221	15.8	17.4	19.4	21.9	25.1	29.5	35.5
14.7	16.5	18.6	21.3	24.9	29.6	36.2	18:06	222	15.8	17.4	19.4	22	25.2	29.5	35.5
14.7	16.5	18.6	21.4	24.9	29.6	36.2	18:07	223	15.8	17.5	19.5	22	25.2	29.5	35.5
14.7	16.5	18.6	21.4	24.9	29.6	36.2	18:08	224	15.8	17.5	19.5	22	25.3	29.6	35.5

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