



Contents lists available at ScienceDirect

## Journal of Ayurveda and Integrative Medicine

journal homepage: <http://elsevier.com/locate/jaim>

## Case Report

## Ayurveda treatment can be helpful in management of snoring, obesity and type 2 Diabetes Mellitus: A case report

Amit Nakanekar\*, Punam Khobarkar

Department of Kayachikitsa Government Ayurved College, Nagpur, India

## ARTICLE INFO

## Article history:

Received 9 September 2019

Received in revised form

1 August 2021

Accepted 1 August 2021

Available online xxx

## Keywords:

Obesity

Type 2 DM

Nidra

Sleep apnoea

Gut lung axis

## ABSTRACT

Sleep is responsible for proper metabolic balance. Disturbances in sleep causes insulin resistance, beta cell dysfunction and obesity through various pathways. Snoring is one of the important indicative symptoms of sleep apnoea that leads to disturbances in sleep. A 54-years old male patient was presented to Kayachikitsa casualty Government Ayurveda College Nagpur with complaints of snoring, difficulty in breathing while climbing stairs since 10 years. After evaluation he was diagnosed as obese with type 2 Diabetes mellitus (DM). Sleep study revealed presence of sleep apnoea. We treated this patient following the principle of *Vyadhi Hetu Sankar* (~one cause for many diseases). In such a case treatment of *Hetu* (~cause of disease) can be principle of treatment. Snoring was subsided in patient after one -month of treatment. Significant reduction in HbA1c, fasting and post prandial blood glucose level were observed along with reduction in Lipid levels and BMI in three months. *Ayurveda* concepts can bring major breakthrough in treatment of metabolic disorders. Various *Ayurvedic* concepts of gut, lung endocrinal pathways and *Agni* (~metabolic power) can generate future studies in this direction.

© 2021 The Authors. Published by Elsevier B.V. on behalf of Institute of Transdisciplinary Health Sciences and Technology and World Ayurveda Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Introduction

Disturbances in *sleep* are responsible for weight loss as well as weight gain. [1. Su 21/5]. Sleep is also responsible for proper metabolic balance [1 Su 21/36]. Disturbances in sleep may cause insulin resistance, beta cell dysfunction and obesity through various pathways

Snoring is one of the important indicative symptoms of sleep apnoea. Sleep apnoea produces sleep disturbances; mechanisms are intermittent hypoxia, followed by high oxygen perfusion that causes metabolic disturbances. Hypoxia affects insulin receptors and in turn lowers uptake of glucose by adipose tissue [2].

Parasympathetic nervous system works predominantly in person with normal sleep; but disturbed sleep leads to elevation of sympathetic predominant increase in metabolic rate. This causes metabolic disorders such as obesity and Diabetes mellitus [3].

We treated the patient who was presented for complaints of snoring. After evaluation he was diagnosed as Class II obesity and

type 2 Diabetes. the treatment goal was to reduce snoring and induce proper sleep; that is to treat cause of disease. Treatment modalities used were *Abhyanga* (~Massage with oils), *Utsadan* (~Massage with powders) Oral medications and *Basti* (~Medicated enema). Bitter herbs were used for Oral route and *Basti* established proper respiratory cycle during the sleep [1 Su 21/52,53,54]. These herbs act through Bitter receptors present in lungs and intestines. Studies performed on *Basti* showed that *Basti* can reduce weight and various inflammatory markers [4] This particular case is important because we treated the case through fundamental principles of treatment of sleep apnoea, respiration, obesity and snoring mentioned in *Ayurveda* classics.

## 2. Patients information

A 54 years old obese male patient was referred to *Kayachikitsa* from *Shalakyatantra* Department, Government Ayurveda College, Nagpur (GACN) with complaints of snoring, difficulty in breathing during stair climbing since 10 years. He did not have any history of Diabetes, Hypertension, ischaemic heart disease, tuberculosis etc. He used to consume alcohol occasionally. He is non-smoker non tobacco chewer with sedentary life style.

\* Corresponding author.

E-mail: [amitnakanekar@gmail.com](mailto:amitnakanekar@gmail.com)

Peer review under responsibility of Transdisciplinary University, Bangalore.

<https://doi.org/10.1016/j.jaim.2021.08.001>0975-9476/© 2021 The Authors. Published by Elsevier B.V. on behalf of Institute of Transdisciplinary Health Sciences and Technology and World Ayurveda Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

### 3. Clinical findings

#### General examination

Patient's general condition was good, afebrile, pulse 90/min, blood pressure 120/90 mm Hg. He was centrally obese.

#### Systemic examination

Respiratory and cardiovascular system functioning were within normal limits. Central nervous system examination was also normal. Pupillary reflexes, superficial and deep tendon reflexes were normal.

#### 3.1. Ashtavidh Parikshan

His *Nadi*(~pulse) was *Vatkaphaj*, frequent *Mal Vibandh* (~ constipation) *Mutra* (~urine) was normal, *Jivha* (~tongue) was coated, *Shabd* (~speech) was clear, *Sparsh* (~temperature) was normal, *Drik* (~vision) was normal, *Aakriti* (~body built) was *Sthul* (~obese) BMI 34.6 kg/m<sup>2</sup>.

Patient had complaints of snoring, difficulty in breathing during stair climbing since 10 years. Berlin questionnaire [5] score for snoring was very high (Table 1).

### 4. Diagnostic assessment

During routine investigation patient was diagnosed as obese with type 2 DM. In pathological evaluation, HbA1c was 9.7%, Blood Glucose level (BGL) fasting was 189 mg/dl & BGL post prandial was 295 mg/dl, Cholesterol was 174 mg/dl, triglycerides were 286.1 mg/dl, SGOT was 66.1IU/L, SGPT was 70.4IU/L. Haemoglobin and renal function test were within normal limits. Details of all investigations are summarized in Table 1. Sleep study revealed sleep apnoea. (details of sleep study are provided in supplementary Material).

Evaluation criteria for obesity diagnosis were height, weight, BMI, Abdominal circumference, waist circumference, waist hip ratio, abdominal fold thickness, shoulder fold thickness summarised in Table 1. Apart from high blood glucose levels, other sign and symptoms of Type 2 DM were absent.

Snoring assessment was done with Berlin Questionnaire. Questions were asked to patient and his wife.

Score was assigned to berlin questionnaire as shown in supplementary material. Along with snoring score sleep study was also conducted for sleep apnoea. Patient was diagnosed as sleep apnoea induced type 2 DM and obesity.

### 5. Therapeutic intervention

Detail plan of treatment is explained in Time line. Major Focus was on reduction of snoring, reduction in BMI, and correction of metabolism. *Punarnavadi Kwath* [6. MK 2/120,2 = 121] *Ghanvati* [6. MK 7/3] were advised after meals. *Kal Basti Kram* [1. Si 1/47] mentioned in timeline 1. Herbal medicines with *Tikta Ras* [7. Su 10/28,29] (~bitter taste) dominance were used. Details of treatment are summarized in Table 2 [8,9].

*Virechan* (~purgation therapy) given after 2 months. Dose of *Snehapan* calculated from test dose (~*Rhasiyasi Matra*) [7. Su16/17,18]. Test dose of 30 ml *Guggul Tiktak Ghрут* was given orally on empty stomach. Patient was asked not to consume anything except hot water till complete digestion of *Guggulu Tiktak Ghريتam*. Time taken for digestion of 30 ml *Guggul Tiktak Ghрут* was measured.

*Udgar* (~burping) *Shuddhi* and feeling of hunger after test dose of *Ghрут* were considered as indicative symptoms of completion of digestion.

Based on time taken for digestion of 30 ml *Guggulu Tiktak Ghريتam* we calculated *Madhyama Matra* of *Shodhan Sneha*. For this patient it was 90 ml. Considering *Krur Koshta* (~hard bowel) 7 days would require to complete *Samyak Snehana* (~proper internal oleation). *Guggul Tiktak Ghрут* in 90 ml dose given for 7 days.

*Virechan* was prescribed after evaluating clinical symptoms for *Samyak Snehan* symptoms. [7. Su 16/30,31].

### 6. Follow up and outcomes

Snoring was completely subsided after 1 month of treatment (Table 1). Reduction in weight, BMI, abdominal circumference and waist hip ratio was also observed. there was a slight increase in cholesterol and triglycerides which may have occurred due to *Snehpan* or some other confounding factors. We expect reduction in lipid levels on longer follow up after improving metabolism; the rationale for this expectation is improvement in liver health and decrease in liver enzymes; which will aid in improving lipid profile as liver play important role in lipid metabolism (Table 1).

### 7. Discussion

Disturbances in sleep causes insulin resistance and beta cell dysfunction through various pathways. Bradycardia, low blood pressure, and slow basal metabolism due to predominance of parasympathetic nervous system are prominent features during sleep. Sleep fragmentation triggers activation of sympathetic nervous system, this leads to higher rates of basal metabolism and higher level of stress hormones can contribute for development of type 2 DM. Sleep apnoea also leads to obesity [10]. Meta-analysis studies have also confirmed that Snoring leads to Diabetes [11].

It is very well known that gut microbiota plays very important role in pathogenesis of obesity and type 2 diabetes. Alterations in gut micro biodata leads to obesity and type 2 Diabetes [12]. Sleep disturbances modulates Gut microbiota leading to Type 2 Diabetes and obesity [13]. Gut lung Axis is a recently evolved concept [14] where Gut and respiratory system has impact on each other. Thus alternations in respiratory mechanisms plays major role in pathogenesis of various metabolic disorders. Bitter receptors are situated in Gut as well as lung. When bitter receptors are stimulated they produce bronchodilation. They also have effects on reduction in blood sugar and reduction in snoring [15]. Ayurveda has nicely explained this concept as follows.

Obstructions to *Pran Vayu* leads to *Pranwah Strotas Dushti*. (~respiratory disturbances) [1. Vi 5/7]. *Mulsthana* (~origin) of *Pranwah Strotas* are *Hruday* (~heart and lungs) [16] and *Mahastrotas* (~alimentary canal). Snoring causes obstruction of *Vayu* and *Ras* ~*Rakt Vahan* at the level of *Mahastrotas* [1-verse 5-9].

All routes of *Mahastrotas* are obstructed by *Meda Dhatu* during pathogenesis of *Sthaulya*. This obstructed *Vayu* situated in *Mahastrotas* increases *Jathargni* and decreases *Meda Dhatvagni*. Increased *Agni* leads to excessive eating and weight gain [1-verse5-9]. *Madhavkara* has also explained role of snoring in pathogenesis of obesity (~*Sthaulya*) [17].

*Vyana Vayu* maintains normal circulation through *Hruday* (~heart) [7. Su 12/6]. *Hruday* resembles with lotus that opens during awakening and closes during sleep. *Hruday* is also a site of *Chetana* and *Ojas* [6. PK 5/76-78,89-90].

Sleep disturbances are responsible for disturbances in functions of *Hruday* (~Heart). *Hruday* (~Heart), *Basti* (~Urinary system) and *Shir* (~Brain). These are *Trimarma* (Vital Parts of body) [1. Si 9/4];

**Table 1**  
All baseline investigations.

<b>Blood investigations</b>					
Investigation/Date	8/2/2019	13/2/2019	3/3/2019	29/3/2019	15/5/2019
Haemoglobin (gm/dl)			14.6		12.1
RBC count (million/cumm)			4.44		4.20
PCV (%)			42.6		38.8
MCV (femtolitres)			95.9		92.3
MCH (pgm)			32.8		28.8
MCHC (%)			34.2		31.1
Platelets (lakh/cumm)			2.66		3.42
RDW (%)			13.2		13.9
TLC (/cumm)			5600		7800
DLC					
Polymorphs (%)			58		58
Lymphocytes (%)			38		34
Eosinophills (%)			02		06
Monocytes (%)			02		02
PS FOR opinion					
RBCS			Normocytic mild Hypochromic		Normocytic mild Hypochromic
WBCS			Normal in counts and morphology		Normal in counts and morphology
Platelet			Adequate in number and normal in morphology		Adequate in number and normal in morphology
Parasites			Malarial and other blood parasites not seen		Malarial and other blood parasites not seen
Cholesterol (mg/dl)	174		154		322
Triglycerides (mg/dl)	286.1		161	259	408
HDL (mg/dl)	45.8		49		55
LDL (mg/dl)			72		185
VLDL (mg/dl)			32		81
Total: HDL RATIO			3.1		5.8
HDL: LDL Ratio			1.4		3.3
HBA1C (%)		9.7	9.7		6.8
BSL- Fasting (mg/dl)	189		103	92	81
Post meal (mg/dl)	295		121	153	121
SGOT (IU/L)	66.1				22
SGPT (IU/L)	70.4				18
Billirubin (Total) (MG/DL)	0.37				0.7
Billirubin (direct) (mg/dl)	0.04				0.1
Alkaline phosphate (mg/dl)	169				97
Blood Urea (mg/dl)	25.3				29
Serum Creatinine (mg/dl)	1.27				1.2
Sr. Uric acid (mg/dl)	3.7				
Sodium (mEq/L)					140
Pottasium (mEq/L)					4.6
<b>Anthropometric parameters</b>					
Anthropometric parameters/Date	8/2/2019	25/2/2019	3/4/2019	12/4/2019	17/5/2019
Height (cm)	170	170	170	170	170
Weight (kg)	100	94	95	93	90
BMI (kg/m <sup>2</sup> )	34.60	32.52	32.87	32.17	31.14
Waist circumference (cm)	120	109	118	111.5	107
Hip circumference (cm)	113	106.5	112	106.5	108
Abdominal circumference (cm)	117	110.5	108	111.5	116
Waist hip ratio	1.06	1.02	1.05	0.98	0.99
Shoulder fold thickness (cm)	Rt-8 Lt-8	Rt-8 Lt-8	Rt-8 Lt-8	Rt-7 Lt-7	Rt-7 Lt-7
Abdominal fold thickness (cm)	7.5	7.5	7.5	7	7
<b>Berlin questionnaire score</b>					
Caegory I	18				9
Caegory II	12				3
Separate question	4				1
Caegory III	1				1

and they are also included in *Dashpranayatan* [1. Su 29/3] (~places of *Pran*). They are interdependent.

There are two types of *Madhumeha*. One is *Dhatu Kshayjanya* (~causes by depletion of 7 main constituents of body) & another is *Dosha Avritta Patha* ie *Sthul* (~occurs in obese) [7. Ni 10/18]. Vitiating of *Kapha*, *Pitta*, *Meda* and *Mansa Dhatu* and its accumulation at *Basti*,

results obstruction in path of *Vayu*. This vitiating *Vayu* brings *Oja Dhatu* into *Basti* which results into *Madhumeha* [1. Su 17/79].

*Pran Vayu* maintains *Agni* through process of respiration. Snoring Causes disturbance in respiration (~*Shwas prashaws kriya*). Balance of *Shwas Prashawas* also maintains *Jatharagni* [6. PK 5/89, 90]. Disturbances in *Shwas Prashawas* leads to disturbances in

**Table 2**  
Details of treatment.

Date	Treatment plan	Dose	Aushadhi sevan kal & Anupan	Karma(action)
8/02/2019	1.Punarnavadi kwath ghanvati  2.Tab Lo-MEDUS (Guggul(~commiphora mukul), Amruta(~Tinospora cordifolia), Asana(~Pterocarpus marsupecum), Vidanga(~Embelia ribes), Chitraka(~Plumbago zeylanica), Maricha(Piper nigrum), Pippali(~Piper longum), Nagara(~Zingiber officinale), Loha Bhasma(~Incinerated iron)) 3. Gokshur churna Godanti bhasma  4. Lakshmvilas Ras[8]	500mg  1gm  3gm 250mg  125mg	After meals with lukewarm water  After meals with lukewarm water  After meals with lukewarm water After meals with lukewarm water	Shothahar(~reduces swelling),Anuloman  Lipid reducer and anti-atherosclerotic  Mutrala excreates excessive kled Medogat vicar nashanam,Prameha nashanam through its action on pranvahastrotas
12/2/2019	1.Punarnavadi kwath ghanvati  2.Tab Lo-MEDUS 3. Sudarshan Ghanvati[9]	500mg  1gm 750mg	After meals with lukewarm water  After meals with lukewarm water After meals with lukewarm water	Kledghna, Anuloman,
21/2/2019	1.Tab Lo-MEDUS 2. Sudarshan Ghanvati 3.Shwaskuthar ras[8]	1gm 750mg 125 mg	After meals with lukewarm water	
3/4/2019	1.Triphala churna Daruharidra churna Kutki Churna Musta Churna Pittapapada Churna Kutaj Churna Chirayta Churna Tulsi Churna Combination divided in 150 equal doses	50gm 50gm 20gm 50gm 50gm 20gm 40gm 30gm	On empty stomach and after the meals  After meals with lukewarm water	Rasayn, Anuloman, Sthaulya medo Pramehaghna aampachan
14/5/2019	2. Punarnavadi kwath ghanvati  1.Hingwashtak churna vati[7. Chi 14/35]  2. Tab obenyl neutral(content: Achyranthes aspera, Biotin, Chitosan oligosachharides, Garcinia indica, Green tea,Inulin, L-Carnitine,pyridoxine, taurine)  3. Prameha vati (content:amalaki(~emblica officinalis), Haritaki(~terminalia chebula), Bibhitaki(~terminalia bellirica), Kadulimba(~azardirachta indica), Haridra(~curcuma longa), Jamunbeej(~syzigium cumini),Chirayta(~swertia chirayta), guduchi(~tinospira cordifolia), Musta(~cyperus rotandus))	500mg  2gm  1gm	Before meals with lukewarm water  After meals with lukewarm water  Before meals with lukewarm water	Anulomak, Agni Vruddhikar  Pramehaghna,Sthaulya har

*Jathragni*. Impaired *Jathragni* produces *Ama* in body. This *Ama* causes *Ras-Rakta Dhatu Dushti* [7. Su 13/25].

*Hruday* is made up of *Prasad Bhag* (~Pure part) of *Rakta* and *Kapha* [6. PK 5/76]. *Rakta Dushti* and *Vitiation of Kapha* causes *Hrudaya.Dushti*. Involvement of *vitiated Vyan* and *Apan Vayu* are responsible for *Prameha* [18]. This patient was treated for *Strotorodhjanya Madhumeh* and *Sthaulya*, through basic understanding of *Shwas Prakriya*, *Sleep*, *Sthualya* and *Agni*.

*Tikta* (~bitter) dominant herbs were used in *Basti*, *Abhyang*, *Udvardan*, *Virechan*. Reduction in snoring, obesity, blood sugar thereby achieving reduction in HbA1C was achieved. Details of treatment protocol are summarized in time line and [Table 2](#). Improvement of sleep quality, *Shwas Prashwas Kriya* has also interfered with metabolism, *Basti and Virechan* have also acted on Intestinal targets for correction of metabolism leading to decrease in blood sugar and HbA1C.

## 8. Result

Reduction in Berlin Snoring Questionnaire categories, Weight, BMI, Blood Glucose levels, waist hip ratio, and abdominal circumference were observed. [Table 1](#) summarizes changes in these variables.

## 9. Conclusion

*Ayurveda* concepts can bring major breakthrough in treatment of metabolic disorders through various gut, lung endocrinal pathways. Future studies in this direction are warranted.

## 10. Patient perspective

I was irritated initially but later with decline in snoring; I felt fresh and energetic. With subsequent weight reduction I felt very light. (In his own Language).

## Declaration of patient consent

The authors certified that they have obtained all appropriate consents from patient. The patient has given his consent for images and clinical information to be uploaded to journal portal. The patient understands that his name and identity will not be published and due efforts will be made to conceal his identity.

## Financial support and sponsorship

None.

## Source of Funding

None.

## Conflict of Interest

There are no Conflicts of interest.

## Author contributions

Conceptualization and Treatment Plan - AN. Rough Draft and Ayurveda formulation preparation - AN, PK. Critical Editing of Draft - AN. Data Collection AN, PK. Data Presentation - AN, PK.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jaim.2021.08.001>.

## References

- [1] Tripathi B, editor. *Charak Samhita*; Varanasi. 1<sup>st</sup> ed. Chaukhamba Surbharti Prakashan; 2013.
- [2] Ryan S. Adipose tissue inflammation by intermittent hypoxia: mechanistic link between obstructive sleep apnoea and metabolic dysfunction. *J Physiol* 2017;595(8):2423–30. <https://doi.org/10.1113/jp273312>.
- [3] Chattu VK, Chattu SK, Burman D, Spence DW, Pandi-Perumal SR. The interlinked rising epidemic of insufficient sleep and diabetes mellitus. *Healthcare (Basel, Switzerland)* 5 Mar. 2019;7(1):37. <https://doi.org/10.3390/healthcare7010037>.
- [4] Thatte U, Chiplunkar S, Bhalerao S, Kulkarni A, Ghungralkar R, Panchal F. Immunological & metabolic responses to a therapeutic course of Basti in obesity. *Indian J Med Res* 2015;142(1):53–62. <https://doi.org/10.4103/0971-5916.162099>.
- [5] Thurtell MJ, Bruce BB, Rye DB, Newman NJ, Biousse V. The Berlin questionnaire screens for obstructive sleep apnoea in idiopathic intracranial hypertension. *J Neuroophthalmol* 2011;31:316–9. <https://doi.org/10.1097/WNO.0b013e31821a4d54>.
- [6] Tripathi B, editor. *Sharangdhar Samhita*; Varanasi. 1<sup>st</sup> ed. Chaukhamba Surbharti Prakashan; 2013.
- [7] Tripathi B, editor. *Ashtang Hruday samhita*; Varansi. 1<sup>st</sup> ed. Chaukhamba Surbharti Prakashan; 2013.
- [8] Gune G, editor. *Aayurvediya Aushadhigundharmashastra*. 1<sup>st</sup> ed. Khadiwale Prakashan; 2017.
- [9] Mishra S, editor. *Bhaishajyaratanaawali, Jwaradhikar, Chapter 5, Verse 436-445*; Varanasi, Chaukhamba Surbharti Prakashan. 1st ed. 2019. p. 128–9.
- [10] Chattu Vijay Kumar, Chattu SK, Burman D, Spence DW, Pandi-Perumal SR. The interlinked rising epidemic of insufficient sleep and diabetes mellitus. *Healthcare (Basel, Switzerland)* 5 Mar. 2019;7(1):37. <https://doi.org/10.3390/healthcare7010037>.
- [11] Xiong X, Zhong A, Xu H, Wang C. Association between self-reported habitual snoring and diabetes mellitus: a systemic review and meta-analysis. *J Diabetes Res* 2016;2016:1958981. <https://doi.org/10.1155/2016/1958981>.
- [12] Naseer MI, Bibi F, Alqahtani MH, Chaudhary AG, Azhar EI, Kamal EI, et al. Role of gut microbiota in obesity, type 2 diabetes and Alzheimer's disease. *CNS Neurol Disord - Drug Targets* 2014;13(2):305–11. <https://doi.org/10.2174/18715273113126660147>.
- [13] Anderson JR, Carroll I, Azcarate-Peril MA, Rochette AD, Heinberg LJ, Peat C, et al. A preliminary examination of gut microbiota, sleep, and cognitive flexibility in healthy older adults. *Sleep Med* 2017;38:104–7. <https://doi.org/10.1016/j.sleep.2017.07.018>.
- [14] Enaud R, Prevel R, Ciarlo E, Beaufils F, Wieërs G, Guery B, et al. The gut-lung Axis in health and respiratory diseases: a place for inter-organ and inter-kingdom crosstalks. *Front Cell Infect Microbiol* 2020;10:9. <https://doi.org/10.3389/fcimb.2020.00009>.
- [15] Jeruzal-Świątecka J, Fendler W, Pietruszewska W. Clinical role of extraoral bitter taste receptors. *Int J Mol Sci* 2020;21(14):5156. <https://doi.org/10.3390/ijms21145156>. Published 2020 Jul 21.
- [16] Vavhal S. *Sharir rachna vidnyan 2 chapter 7, Shantanu prakashan*. 11<sup>th</sup> ed., vol. 552; 2010. p. 553.
- [17] Yadunandana U, editor. *Madhawnidan-medorognidan 34/2*. 1<sup>st</sup> ed., vol. 3. Varanasi: Chaukhamba Surbharti Prakashan; 2014. p. 4.
- [18] Shastri A, editor. *Sushrut Samhita of Sushrut, Part-1 Nidan Sthana 1/20*. Varanasi: Chaukhamba Sanskrit Publication; 2002. p. 298.