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Use of Ayurveda in the Treatment of Type 2 Diabetes Mellitus

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Short abstract

Background

Ayurveda is an ancient medicine practice that is emerging in the United States as a complementary and alternative treatment for chronic illness. Type 2 diabetes is a chronic illness that has major long-term implications for individuals suffering from the disease as well as the health-care system as a whole. Modifications in diet, exercise, and lifestyle are all important factors in successful treatment of type 2 diabetes and are incorporated into the ancient Indian medicinal practice of Ayurveda.

Review Summary: This review summarizes the available evidence for the use of Ayurvedic therapies in the treatment of type 2 diabetes. For the treatment of type 2 diabetes, Ayurvedic practices primarily emphasizes the use of herbal supplements; however, exercise, weight management, and various supplemental procedures are included in Ayurvedic practices. The goal of Ayurvedic practices on the treatment of type 2 diabetes like in Western medicine focuses on bringing the hemoglobin A1c (HbA1c) value into a therapeutic range. Where Ayurveda differs is that it looks at the functionality of a person in the context of striking a balance between the life forces or doshas that each individual possesses. Finally, this article includes a case study received from AyurVAID clinic in Bangalore, India that details the specific Ayurvedic intervention used in a patient, bringing his HbA1c from a level of 11.2 to 5.7 over the course of 9 months.

Conclusion

Patients with type 2 diabetes may inquire about current complementary and alternative therapies available for the treatment of their disease. Awareness of such modalities is necessary for effective patient counseling and care. The benefits of offering a wide array of treatment options

include possible reduction of HbA1c and of comorbidities with adjunct use of supplements and mind–body practices.

Keywords: Ayurveda, Ayurvedic, diabetes, diet, lifestyle, type 2 diabetes mellitus

Introduction

Ayurveda

Originating in ancient India, Ayurveda is a traditional medicinal practice with roots tracing back to 1000 BC. It was first categorized as a religious or spiritual medicine, but during the 6th- to 4th-century BC, the religious healing approach lost popularity, and it began to become systematically organized. Translated from Sanskrit to mean "science of life," Ayurveda connects physical (prakriti), spiritual (purusha), and physiologic processes to promote a healthy relationship between the mind, body, and soul. The primary goal of Ayurveda is to maintain equilibrium between the 5 basic elements (Panchamahabhutas) of earth, water, fire, air, and ether or vacuum within oneself through the theory of the 3 life forces or doshas. The doshas consist of vata, which correlates to ether and air, pitta, which represents fire, and kapha, which equates to the elements of earth and water.[1] Vata, pitta, and kapha are the doshas of the body, while rajas, tamas, and satva are the doshas of the mind. According to Ayurveda, striking an equilibrium between the doshas corresponds to good health. Each living being has a tendency toward certain doshas structurally and physiologically, and such imbalances may lead to disease. Ayurvedic practitioners make use of individualized diet, exercise, and lifestyle as well as procedural, medicinal, and herbal prescriptions in order to bring their patient's doshas into optimal balance. The primary medicines used in Ayurveda are derived from plants; however, metal, mineral, as well as marine- and animal-derived materials are also used.[2] Currently, the Indian government controls all policy development, growth, and implementation of Ayurveda programs.[3] The World Health Organization began understanding the benefits of traditional medicines in the late 1970s, helping to improve the global acceptance of Ayurveda.[4] Ironically, popularity of Ayurveda in the United States grew after Westerners became increasingly aware of the inability to cure certain chronic illnesses while recognizing the side effects of Western medications. Integrative medicine, which combines Eastern and Western practices, is on the rise with the hope of rebalancing health and wellness in Western population. Many case reports have shown the use of traditional medicine such as Ayurveda as being beneficial and even curative to a number of chronic illnesses including but not limited to arthritis, low back pain, hypertension, sciatica, migraine, neuropathy, parkinsonism, thyroid imbalances, liver disease, dysmenorrhea, polycystic ovarian syndrome, irritable bowel syndrome, asthma, allergies, eczema, depression, anxiety, and many others.[2] The use of Ayurveda in type 2 diabetes, a chronic, yet treatable disease, has shown marked improvement on patient outcomes in numerous case reports.[2] Type 2 diabetes involves a lack of sensitivity to insulin and the subsequent inability of the body to regulate blood glucose levels. Type 2 diabetes is the most common form of diabetes in the United States and primarily results from unhealthy lifestyle choices. According to the American Diabetes Association, when possible, type 2 diabetes should be treated with exercise, diet, and lifestyle modifications. However, progression to oral hypoglycemic agents and insulin will likely be necessary at some point during the course of a patient's disease process as their pancreas is unable to keep up with amount of insulin necessary to compensate for the body's resistance to insulin. Risk factors for type 2 diabetes are widely known and include being overweight or obese (body mass index [BMI] of 25 or higher), family history of diabetes, lack of physical ac-

tivity, poor diet, including excessive calorie consumption, low fiber intake, high consumption of saturated and trans fats, high glycemic load, high glycemic index, cigarette smoking, and alcohol consumption.[5] In a study performed by Hu et al., measuring the individual dietary and lifestyle factors as indicators for type 2 diabetes, they found individuals with a low risk of the disease were under the BMI classification of overweight (<25.0), engaged in vigorous or moderate exercise for 30 minutes each day, were nonsmokers, consumed 5 g or more of alcohol per day with no defined upper limit of alcohol consumption because study subjects did not consume more than 45 g of alcohol per day, and ate a diet high in cereal fiber and low in trans-fat.[5] They collected responses to questionnaires for nearly 85 000 female nurses and did follow-up for 16 years. Their research suggests that the majority of cases of type 2 diabetes could be prevented by weight loss, regular exercise, modification of diet, abstinence from smoking, and the consumption of limited amounts of alcohol with weight control appearing to offer the greatest benefit.[5]

Overtime, high blood glucose has major complications, including damage to the heart, blood vessels, kidneys, eyes, peripheral nerves, digestive system, wound healing ability, and sexual response and leads to complications during pregnancy. A small reduction in hemoglobin A1c (HbA1c) of less than 1% has been shown to have a clear association with improved patient outcomes regardless of treatment with Western pharmaceuticals or alternative and complementary medicine.[6] Because both the cause and treatment of type 2 diabetes are related to diet and lifestyle, the ancient medicinal practice of Ayurveda, which is rooted in diet and lifestyle, is a promising traditional approach to the treatment of type 2 diabetes. Due to the large portion of the United States population suffering from type 2 diabetes and the serious complications that result from the disease, health-care costs resulting from this illness are astronomical. Thus, the use of Ayurveda in treating type 2 diabetes should benefit more than just those who are suffering from diabetes.

Case Report

In November of 2015, a 40-year-old man presented to AyurVAID Hospital, an insurance approved Ayurveda treatment center with 4 inpatient facilities throughout India, after the discovery of elevated blood sugar levels when being treated for a sebaceous cyst of the left upper back. At the time, his symptoms included lethargy, weight loss, blurred vision, reduced concentration, and numbness of the big toes bilaterally. He was found to have an HbA1c of 11.2 when he was first diagnosed with type 2 diabetes. His symptoms gradually developed and worsened in severity over the course of 1.5 years. He had been prescribed oral agents for the management of his blood sugar levels by the allopathic physician who made the diabetes diagnosis, which he took for 1 full week prior to presenting to AyurVAID. His decision to visit AyurVAID was because he felt as though he needed to treat his condition at the root cause. The AyurVAID practitioners prescribed him an individualized diet, lifestyle, cleansing, and medicine regimen that focused on the individual and where he specifically was in his disease process.

After 4 months, the patient's clinical signs of diabetes had completely resolved. His HbA1c reduced over the course of 1 month from 11.2 to 8.4 and eventually to 5.7 at 9 months out from his initial AyurVAID treatment. He modified his diet and lifestyle based upon Ayurveda recommendations and lost a significant amount of weight. He was able to taper off the oral allopathic medications due to controlled blood glucose levels with his regimen prescribed by AyurVAID. Impressively, he had no signs of diabetes after 9 months of treatment, The patient wrote a let-

ter to the clinic expressing his gratitude for his new and improved way of life and health status. He also wrote an update letter 6 months after presenting to AyurVAID to inform his friends and family about his progress. He was proud to announce that his energy levels were significantly improved and as such he was jogging 4 times each week. Likewise, he had completely stopped snacking in between meals while also cutting out his computer and mobile phone screen time, which were times in which he would also participate in mindless snacking. He included that the decreased screen time brought him great amounts of calm. He emphasized that despite following a healthy diet and lifestyle, he did not participate in any extreme measures and still ate out with the family occasionally. He reported getting good sleep and was proud of his weight loss and HbA1c changes. In his update letter, he highly recommended Ayurveda and AyurVAID in particular for anybody suffering from diabetes. Although AyurVaid works with many patients in treating type 2 diabetes, this case report was chosen due to it having the most impressive change in HbA1c value in the shortest period of time of the patients treated. Type 2 diabetes is one of the more common conditions treated at AyurVAID hospitals. The other AyurVAID patients who underwent similar treatments also had improvements in their laboratory values and likewise described improvements anecdotally. The following treatment was specific to the single patient case described, yet many other AyurVAID patients had similar treatment plans and result trends.

Methods

Medical Management Strategy

Treatments undergone

1. *Udwartana* is a powder massage often used for slimming and treatment of obesity that can be done daily.
2. *Dhanyamladhara* is often used in Ayurveda to combat obesity, inflammation, muscular pain, neuropathy, hemiplegia, and rheumatic complaints. It is derived from the word cereals (dhanya) and vinegar (amla). Dhanyamla involves preparation navara rice, horse gram, millet, citrus fruits, and dried ginger. During the treatment, the body is covered with this preparation and then by a heated cloth. The duration of the treatment is 45 to 50 minutes depending upon the condition of the patient.
3. *Snehapana* is a process of full body internal and external lubrication via drinking ghee and animal fat oil as well as massaging the oil on without any other oral intake.
4. *Abhyanga* is a warm oil massage. The oil is often premedicated with herbs for specific conditions.
5. *Bashpasweda* is a steam chamber in which the patient sits while steam emanates from a boiling herbal decoction.
6. *Vamana* (induced vomiting) is targeted to expel increased kapha dosha from the body.
7. *Virechana* is the second procedure in the sequence of Panchakarma (Ayurveda Detoxification Program) that involves using plant medicines that have a laxative effect, mainly aimed at reducing pitta dosha and toxic accumulation in the gastrointestinal tract, liver, and gallbladder.
8. *Yogavasti* is a type of medication given by enema, aiding in diminishing extra vata dosha present in the body. Vata is the force behind the elimination and retention of feces, urine, bile, and other excreta.

9. *Shirodhara* is a form of Ayurveda therapy that involves gently pouring liquids over the forehead and can be one of the steps involved in Panchakarma.

Treatments completed

Results

The patient's lab values, symptoms, and BMI changes over the course of 9 months can be viewed (Tables 1 and 2).

Table 1.

Patient Laboratory Results.

Lab Investigations	11/15/15 Before Consultation at AyurVAID	11/29/15 On the First Day of Ayurveda Treatment	12/22/15 At the End of Ayurveda Inpatient Treatment	02/03/15 Fourth-Month Review Status	04/12/15 Sixth-Month ReviewStatus	07/12/15 Ninth-Month Review Status
Oral hypoglycemic agents						
Tab. Dianorm M	1-0-1	1-0-1	Nil	Nil	Nil	Nil
FBS (mg/dL)	211	113	106	100	93	90
FUS (mg/dL)	1+	Nil	Nil	Nil	Nil	Nil
PPBS (mg/dL)	NA	139	138	—	120	113
Mean glucose (mg/dL)	274.74	260.39	194	147	—	116.89
HbA1c (%)	11.20	10.7	8.4	6.7	5.8	5.7

Abbreviations: FBS, fasting blood sugar; FUS, fasting urine sugar; HbA1c, hemoglobin A1c; NA, not applicable; PPBS, postprandial blood sugar.

Table 2.

Patient's Clinical Outcome.

Clinical Outcome Measures	11/24/15	12/22/15	07/12/16
Physiological status			
Coating on tongue	Present (P)	Absent (A)	Absent(A)
Excessive eating (snacking)	Present	Absent	Absent
Weight (kg)	86	84	78
BMI	27.76	27.12	24.54
Lethargy	Present	Present	Absent
Loss of concentration	Present	Absent	Absent
Blurred vision	Present	Present	Absent
Numbness in big toes	Present	Absent	Absent

Abbreviation: BMI, body mass index.

From Date	To Date	Procedure	Treatment Medicines
11/29/15	12/05/15	Udwartanam	Triphaladi choornam + Kolakulathadi choorna in dhanyamla paste
11/29/15	12/05/15	Dhanyamladhara	Dhanyamla
12/06/15	12/10/15	Snehapanam	Triphala ghrita
12/11/15	12/14/15	Abhyanga+Bashpasweda	Body—Mahavishagarbha taila and head—Balaguduchyadi taila
12/12/15	12/12/15	Vamanam	Yashtimadhu phanta—3L, Madanaphala yoga—1 g, and milk—3L
12/14/15	12/14/15	Virechanam	Avipatti choorna—20 g with hot water
12/15/15	12/22/15	Yogavasti	K.V-Erandamoola kashaya 300 mL + Tilataila 150 mL + Honey 150 mL + Shatapushpa kalka 25 g + Madanaphala 10 g + Shilajatu 5 g, A.V-Nimbamritadi erandam 100 mL + Shilajatu 1 g
12/15/15	12/22/15	Shirodhara	Balaguduchyadi taila

Patient Condition on Treatment Day 1 (11/29/2015):

General findings

Blood pressure (BP): 130/80 mmHg
Pulse: 82/minutes
Weight: 86 kg

Physical examination

Abdomen: soft, nontender
Cardiovascular: S1, S2 heard
Pulmonary: normal breath sounds bilaterally

Diagnosis Madhumeha (type 2 diabetes mellitus).

Prakriti (physical diagnosis) Pitta-Kapha (Dosha).

Risk factors Specific: diabetic neuropathy, diabetic nephropathy.

Patient Condition at the Completion of His Treatment on 12/22/2015

General findings

BP: 110/80 mmHg
Pulse: 80/minutes
Weight: 82 kg

Clinical examination

Abdomen: soft, no organomegaly
Cardiovascular: normal S1, S2
Pulmonary: normal breath sounds bilaterally

Treatment conclusion There were no adverse events during the patient's treatment course. The cyst on his upper back healed completely and so too did the numbness in his big toes. He was advised to continue the internal and external treatments and medications for a period of 1 month with follow-up on 01/23/2016. He attained Samyak Lakshana of Vamanam and Virechana, which means that he successfully completed his treatment with desired disease reversal.

Medications *Internal medications*: Guduchi choorna + Amalaki choorna + Gokshura choorna – 1 tsp/day.

External medications:

Diet and exercise regimen for the 15 days following treatment:

Include:

1. Follow timely meal schedule. Have freshly prepared warm food.
2. Churned butter milk and boiled—cooled water to drink.
3. Cooked vegetables.
4. Broken wheat (daliya), millets, and jowar should be included in the diet.
5. Moderate levels of exercise daily.

Avoid:

1. Refrigerated, deep oily fried, salty, spicy, and canned food items.
2. Curd, paneer, cheese, sweets, and sour foods.
3. Reduce excess usage of potato, cauliflower, green peas, rajma (kidney bean), channa (chickpea), peanut, and maida (white flour) products.
4. Daytime sleeping.
5. Exposure to cold water and cold weather.

Discussion

Disease management with Ayurveda entails a prescription of personalized diet, lifestyle, predominantly herbal medicines, and systemic cleansing therapies. As population care for diabetes continues to evolve, future initiatives should consider ways to tailor population care to meet individual patient needs, while leveraging improvements in clinical information systems and care integration to optimally manage and prevent diabetes in the future. AyurVAID treatment for type 2 diabetes involves an extensive inpatient treatment, which can often last for over 2 weeks, as was the case in the case description above. Health care in the United States is not currently structured for such extensive inpatient treatment for type 2 diabetes. At first glance, an inpatient treatment program for type 2 diabetes does not appear to be cost effective, yet, when looking at health-care dollars spent in the United States on future complications of type 2 diabetes, early inpatient therapy is not an unreasonable method of treatment.

Ayurvedic Herbs

Of all of the Ayurvedic treatments forms, herbal therapy is the most commonly studied.[7] Some of the studied herbs that prove beneficial for the lowering of glucose levels include *Coccinia indica*, holy basil, fenugreek, *Gymnema Sylvestre*, Ayush-82, D-400, *Cinnamomum tamala*, *Eugenia jambolana*, and *Momordica charantia*.[7] How these herbal supplements assist in treatment of type 2 diabetes depends on how the herbs are prepared and used. For example, abhyanga is the use of herbs in a hot oil massage, and udwartana is a powder massage that incorporates herbs.

Traditional Indian medical herbs used for strengthening the body's immune system are known to have many essential and nutritional elements. Their excess or deficiency may disturb normal biochemical functions of the body.[8] Each herb used in Ayurveda has a different dominating or therapeutic elemental property. "Mechanisms such as the stimulating or regenerating effect on beta cells or extrapancreatic effects are proposed for the hypoglycemic action of these herbs."[9] As such, depending on the symptoms presented by a patient, an Ayurvedic practitioner can select the appropriate treatment. For treatment of type 2 diabetes, the herbs *M. charantia*, *Pterocarpus marsupium*, and *Trigonella foenum greacum* have been proven most successful.[9]

The top 10 plants used in Ayurvedic treatment of type 2 diabetes are bitter melon (*M. charantia*), Fenugreek, Indian Kino Tree, Gymnema, Turmeric, Tinospora, Margosa Tree, Holy Fruit Tree, Ivy Guard, and Pomegranate.[9] Each plant helps treat diabetes in different ways. For example, studies have shown bitter melon reduces polyuria, which partially prevents renal hypertrophy, while also reducing urinary albumin excretion.[9] Water extract of the Indian Kino Tree has been used in treating diabetes since ancient times.[10] "The water extract of these plants in a dose of 400 mg/dL reduced hyperglycemia and … insulin levels."[9] Each of the plants has been studied in groups of human or animal controls and has recommended uses. With each plant having vastly different properties and each person having a different manifestation of the doshas, their utilization is different for each patient.

Chromium is an element responsible for maintaining normal glucose metabolism and is found in the same area of the pancreas where insulin is produced. Plants and herbs contain elements which maintain glucose metabolism in similar fashion to the way in which insulin regulates blood glucose levels. As such, these natural resources have the ability to assist in treating type 2 diabetes. Lokhande et al. completed a study on the curative properties of herbs frequently used in Indian medicine and found that fruits of Babbul and seeds of Karranj beej were among the most beneficial in the treatment of diabetes. These 2 fruits have high levels of chromium in them with fruits of Babbul containing 2.71 μg/g and seeds of Karranj containing 2.11 μg/g.[8] Chromium has been shown to aid in the action of insulin, and some studies have demonstrated a chromium deficiency in diabetic patients.[11]

Practitioners of Ayurveda do not recommend only 1 course of action for their patients. Each patient comes into the clinic with different symptoms, diets, lifestyles, medical complications, support systems, and spiritual beliefs. Thus, the treatment plan is often tailored toward these individualized aspects surrounding a patient's life in order to bring their doshas into a more perfect harmony. In their study on how Ayurvedic medicine affected individuals with diabetes, Sridharan et al. "postulated that Ayurvedic medications may act through potential pancreatic as well as extrapancreatic effects," with probable mechanism of action including

> *delaying gastric emptying, slowing carbohydrate absorption, inhibition of glucose transport, increasing the erythrocyte insulin receptors and peripheral glucose utilization, increasing glycogen synthesis, modulating insulin secretion, decreasing blood glucose synthesis through depression of the enzymes glucose-6-phosphatase, fructose-1, and 6-bisphosphatase, and enhanced glucose oxidation by the enzyme glucose-6-phosphatase-dehydrogenase pathway.*[2]

Chronic medical conditions have major impacts on both an individual and the health-care system as a whole. The amount of health-care dollars spent due to type 2 diabetes alone is astronomical, and based upon recent trends, will continue to rise. Alternative and complementary medicines such as Ayurveda present many treatment options for chronic illnesses such as type 2 diabetes. With a strong focus on mind–body connection, nutrition, exercise, lifestyle modifications, and herbal use, Ayurveda has the power to truly make a large impact on patients suffering from diabetes as well as the health-care system. Often, chronic conditions are best treated with lifestyle modifications. The research around Ayurveda and its treatment of type 2 diabetes is limited due to the individualized nature of the intervention. Funding for these types of studies can be sparse, as the treatments for Ayurveda seek to eliminate the use of pharmaceutical agents by practicing a holistic approach to medicine and managing chronic conditions. Patients

with diabetes and other "common chronic medical conditions are more likely to use complementary and alternative medications" as compared to the general population.[2] Most studies on the use of Ayurveda for the treatment of all medical conditions have only assessed some components of Ayurvedic treatment individually without replicating Ayurvedic interventions in their entirety.[2] Funding for future, controlled studies on the use of Ayurveda and its relationship to treating type 2 diabetes is needed. The integration of Ayurveda system of medicine in diabetes management may be helpful to prevent, reverse, and better control the glycemic burden and its sequala beyond mere symptom management to comprehensive metabolism correction.

Declaration of Conflicting Interests

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