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dental Symptoms of Diabetes Mellitus**

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dental Symptoms of Diabetes Mellitus**

ABSTRACT

Oil pulling or oil swishing, in an alternative medicine is a procedure that involves swishing of oil in the mouth for oral and systemic health benefits. Oil pulling has been used extensively as a tradition Indian folk remedy for many years to prevent decay, oral malodor, bleeding gums, dryness of throat and cracked lips for strengthening teeth, gums and jaws. With this background, we intend to do Oil Pulling which is a therapy involving swishing of natural oil (derived from sesame) to achieve pharmaceutical related health benefits. The present study extensively researched the efficacy of Oil pulling technique using sesame oil in patient management with various signs and symptoms present in controlled and uncontrolled group of diabetes mellitus patients. Moreover, the study reviewed the efficacy of Oil pulling technique on oral symptoms like burning mouth syndrome, numbness, altered taste, tingling sensation of oral mucosa and xerostomia in patients with diabetes mellitus. Moreover, the efficacy of Oil pulling technique on stomatopyrosis and its effectiveness in management of oral signs like inflammation of gingiva, periodontal inflammation a clinical sign present in diabetic patients has also been studied. Descriptive statistics were compiled for the variables 2x2 table used to calculate the sensitivity and specificity and their correlation. The Pearson Chi square test was used to test significance the association between variables like subjective improvement of symptoms by this technique of oil pulling. All the statistical analysis was done on Statistical Software SPSS version 16.0 and using paired t test. To conclude, Oral manifestation of diabetes can be managed, abated or at least curtailed by early detection and prompt treatment, comprehended by patient education, motivation and supervised oral care, delivered with the help of competent health team including oral physician. Oil pulling therapy help in minimizing the severity of oral manifestations necessitates regular surveillance and counselling in order to reassure the patient and improve the overall health of the patient.

Introduction

Oil pulling or oil swishing, in alternative medicine is a procedure that involves swishing oil in the mouth for oral and systemic health benefits. Oil pulling has been used extensively as a tradition Indian folk remedy for many years to prevent decay, oral malodor, bleeding gums, dryness of throat and cracked lips for strengthening teeth, gums and jaws.

Oil pulling is not a new concept and it has been mentioned in the Ayurvedic text '*Charaka Samhita*' (*Sutrasthana* 5, 78-80) in where it is called '*Kavala Gandoosha*' and is claimed to cure about more than thirty systemic diseases ranging from headache and migraine to diabetes and asthma.

The modern version of Oil pulling was familiarized by Dr. F Karach during the 1990's in Union Soviet Socialist Republics (USSR), after he experimented swishing oil methodically and cured himself from a blood disease. Dr. Karach further studied it, systematized it and propagated it as well across the world.

Oil pulling therapy can be done using edible oils like sunflower or sesame oil. Sesame plant (*Sesamum indicum*) of the Pedaliaceae family has been considered a gift of nature to mankind for its nutritional qualities and desirable health benefits.

Sesame oil is considered to be the queen of oil seed crops because of its beneficiary effects. Sesame oil has been used in households since years because of its known nutritional qualities and cost and accessibility effectiveness.

For oil pulling therapy, a tablespoon (or teaspoon for children between 5 to 15 years of age) of sesame oil is given in the mouth and is sipped, sucked, and pulled between the teeth for 10 to 15 minutes duration. The viscous oil turns thin and milky white. The oil should not be swallowed as it contains bacteria and toxins. Oil pulling therapy should be followed by brushing the teeth and is preferably done on an empty stomach in the morning.

It is indeed one of the simplest treatments in the world as one doesn't need to swallow bitter tablets or undergo strict diet practices, and take up restricted lifestyle because oil pulling is just as easy as swishing water or using a mouth wash and spitting it out with tons of bacteria, toxins and other harmful bodies in the human system and improving quality of life.

The purpose of this project study is to emphasize transformation of health through this ancient Indian technique and observe the effect of oil pulling therapy on controlled and uncontrolled group of diabetic patients, effect on their various orodental disorders including gingivitis (inflammation of gingiva) and stomatopyrosis (burning mouth syndrome) and various oral symptoms like alteration in taste, numbness and tingling of oral mucosa.

In recent years, complementary and alternative medicine is gaining popularity over conventional allopathic medicine due to reasons like -products and practices used are natural and safe. There has always been provision of self-treatment, it is cost effective, increase in prevalence of chronic diseases such as diabetes, hypertension, coronary artery diseases etc, and finally lack of success of current modality of treatment.

Indian Ayurveda is one of the popular and well accepted modality of complementary and alternative medicine. Ayurveda is also defined as the system of traditional medicine native to Indian subcontinent and practiced in other parts of world, third world countries as a form of alternative medicine.

Seven Major Benefits of Oil Pulling

Oil pulling can really transform one's health. With the oral cavity (mouth) as a home to millions of bacteria, fungi, viruses and other toxins, the oil acts like a cleanser, pulling out the nasties before they get a chance to spread throughout the body.

This frees up the immune system, reduces stress, curtails internal inflammation and aids well-being. The major seven benefits can be summarized as follows:

1. **Whitens teeth:** There is no need for chemical teeth whitening strips when oil pulling works just as well. The oil possesses natural antibiotic and antiviral properties that brighten and cleans teeth, keeping them pearly white. Celebrity practitioners like Hollywood actress Gwyneth Paltrow and many Indian celebrities are known to follow the practice each morning.
2. **Increases energy:** When our immune system is put to work in clearing out toxic waste from our body, it drains our energy levels. Removing the noxious culprits in the first instance by oil pulling lowers the amount of work our body has to do function, which leaves us feeling a whole lot better. Oil pulling is even one of David Wolfe's top ten tips for next level health.
3. **Detoxes the body :** Germs in the body are much like poison causing inflammation and leading to diseases and illness in turn. The gateway to the body for such contamination is the mouth. Therefore, in removing the toxins at the source before they get a chance to spread, the body undergoes a complete detox.
4. **Helps to facilitate hormonal change:** Without having to compete with foreign substances, hormones can behave as they should, functioning to their best ability without being thrown off balance.
5. **Reduce headaches:** When the body is under toxic stress, headache and migraines occur. It is nature's way of asking for some time out to recover. By eliminating bacteria from the body via oil pulling, headaches can be avoided.
6. **Keeps the skin clear:** The benefits even extend to your skin. Removing toxins from the body that would otherwise make it into the bloodstream means the skin has a chance to shine. Rashes and skin issues often reduce dramatically, or even clear up completely, when oil pulling.
7. **Promotes oral hygiene:** Oil pulling is highly effective at reducing tooth cavities. Removing the Streptococcus mutant bacteria, as well as other microorganisms, oil pulling is great for oral health.

Need for the Study

There is an ancient Indian saying "*Jaisa Ann Waisa Mann*" meaning "You are what you eat" Invariably there is a direct connection between the eating habits and diseases linked with it Therefore, the Medical Fraternity calls it "Life Style

Diseases.” Hence the new market for medical food is emerging with great business potential, called medical nutrition.

The therapeutic role of the medical food is increasing with the increasing life span of an average human life/being. The dietary products, nutritional supplements and alternate medical products are impacting not only the wellbeing but also help to minimize the side effects of the drugs and strengthening the immune system. Nutritional status is considered one of the determinants of health and disease and several diseases have a clear link with the lifestyle factors including diet.

The pharmaceutical companies are instrumental in narrowing the gap between the food and their products. Multinational Firms like Nestle have made their Slogan as: “*Food is the new Pharma*”

There are also examples of nutritional products that effectively contribute to the therapeutic regimen. Hence “*Let Food be thy medicine & medicine be thy food*” an apt saying by great Greek scholar Hippocrates.

With this background, we intend to do **Oil Pulling** which is a therapy involving swishing of natural oil (derived from sesame) to achieve pharmaceutical related health benefits. Ayurveda and Charak Samhita has also mentioned the use of pure sesame oil for its rich nutrients, therapeutic properties and varied pharmaceutical related health benefits.

This ancient remedy is popular across the globe and most of the people start trusting its healing potential after giving it a try with bit of hesitation and lack of trust.

It is one of the **simplest** treatments in the world as one doesn't need to swallow bitter tablets, undergo strict diet practices, and take up restricted lifestyle because **oil pulling is just as easy as swishing water** or using a mouthwash and spitting it out with tons of bacteria, toxins and other harmful bodies in the human system and improving quality of life.

Sesame oil has been used in households since years because of its known nutritional qualities and cost and accessibility effectiveness. The purpose of this study is to **establish the efficacy of Sesame oil pulling technique** in management of oral signs and symptoms present in diabetic patients such as xerostomia, stomatopyrosis. Thereby spoonful of natural food product Sesame oil can keep doctors away too in diabetic patients!

Let us make use of this simple and clean natural food derivative and revive the habit of our healthy ancestors thereby bridging the gap for optimal oral hygiene and overall health.

Aim of the Study

To assess the efficacy of Oil pulling technique using sesame oil in patient management with various signs and symptoms present in controlled and uncontrolled diabetes mellitus patients.

Objectives of the Study

1. To assess the efficacy of Oil pulling technique using sesame oil on oral symptoms like burning mouth syndrome, numbness, altered taste, tingling sensation of oral mucosa and xerostomia in patients with diabetes mellitus.
2. To assess the efficacy of Oil pulling technique using sesame oil on stomatopyrosis using Visual analog Scale (VAS) in patients with burning mouth syndrome.
3. To assess the effectiveness of Oil pulling therapy in management of oral signs like inflammation of gingiva, periodontal inflammation a clinical sign present in diabetic patients.

Research Questions

Can “Sesame oil be used as a health supplement or adjunct in management of various oral symptoms and signs of patients with diabetes mellitus: especially oral xerostomia and oral burning mouth?

Whether the same benefits can be derived from application of sesame oil?

Null Hypothesis

There may not be significance in the efficacy of ‘Oil pulling therapy’ in treatment of patients with oral signs and symptoms of diabetic patient’s xerostomia and oral burning mouth?

Review of Literature

Hebbar A, Keluskar V, Shetti A (2010) in a study published in Journal of International Oral Health advocated the use of sesame oil as the latest panacea for all ills. They also outlined the usefulness of traditional Indian folk remedy to prevent tooth decay, oral malodor, bleeding gums, dryness of throat, cracked lips and strengthening of teeth and jaws.

Asokan S (2008) did an extensive work on patients and found out significant aspects of sesame oil.

Sharath Asokan, Pamela Emmadi, Raghuraman Chamundeswari (2009) in original study published in Indian Journal of Dental research have concluded that the oil pulling therapy showed a reduction in the plaque index, modified gingival scores and total colony count of aerobic microorganisms in patients with gingivitis.

Sharath Asokan, R Sarvana Kumar, Pamela Emmadi, Raghuraman, N Sivakumar (2011) in their study on effect of oil pulling and microorganisms causing halitosis have concluded that therapy has been equally effective and has been an advantageous as it does not cause any staining, non-allergic to skin and oral mucosae and no-lingering after taste.

Tomar P, Hongal S, Jain M, Rana Kuldeep, Saxena V (2013) in their published study emphasized that food derivative Sesame oil derived from plant *Sesamum indicum* of the pedaliaceae family has been considered a natural food derivative, gift to mankind for its nutritional qualities and health benefits.

Poonam Sood, Aruna Devi M, Ridhi Narang, Swathi V and Diljot Kaur Makkar (2014) in their study on comparative efficacy of oil pulling and chlorhexidine on oral malodor: a randomized control, trial have concluded there has been significant reduction in the mean scores of all parameters within sesame oil and chlorhexidine group. Thereby, oil pulling with sesame oil should be promoted as a preventive home care therapy.

Shetti A et al (2010) in his article described Oil pulling as unravelling the path to mystic cure and outlined the simplicity and effectiveness of modality with an emphasis of ancient health care practices.

Global newsletter Just in Print (2015) has reported Indian Ayurveda as a cure from oro-dental ailments and maintaining general wellbeing of body, with celebrity practitioners Gwyneth Paltrow who has also benefited from usage of sesame oil in improvement of her oral health.

Oil Pulling therapy has been very helpful in patients with Diabetes mellitus. Covering a historical review of Diabetes mellitus, its oral manifestations and in results we will be evaluating the beneficial aspects of oil pulling therapy in therapeutic aspects of oral manifestations in both controlled and uncontrolled group of diabetic patients.

Oral Manifestations of Diabetes Mellitus

The oral cavity may show changes, which correlate with those occurring systematically in health and disease and among these diabetes mellitus merits particular consideration. A wide spectrum of oral manifestation of diabetes mellitus has been reported previously although findings, have been diverse and various. There are no specific pathognomonic oral manifestations associated with diabetes; however, various oral mucosal and dental conditions are exacerbated in the diabetic patient.

Malaowalla M.A et al (1958) reported the oral changes, among the uncontrolled diabetics and stated the following oral changes associated with poorly controlled diabetics as follows:

1. Gingival hypertrophy with deep red colour.
2. Accurate gingival swellings resembling abscess formation.
3. Recurrent periodontal abscess
4. Large deposits of calculus
5. Dryness and blurring of tongue with hyperemia of papillae.
6. Thick and flabby tongue.
7. Severe odontalgia or pulpitis.

The American Diabetes Association Expert Committee (ADEAC) has revised the diagnostic criteria for diabetes and implemented changes in NDDG classifications:

- a. Use of terms Type 1 and Type 2 diabetes instead of IDDM and NIDDM to refer to the major type of diabetes mellitus
- b. Use two fasting plasma glucose determination
- c. A lower cut off level for fasting plasma glucose is 126 mg/dl to diagnose diabetes.

The American Diabetes Association Expert Committee on the diagnosis and classification of Diabetes mellitus approved new criteria for the diagnosis of Diabetes mellitus (ADAEC 2015):

- a. A casual plasma glucose level (taken at any time of day) of 200 mg / dl or greater when the symptoms of diabetes are present.
- b. A fasting plasma level of 126 mg / dl or greater (fasting is defined as no caloric intake for at least 8 hours)
- c. Two -hour post prandial glucose of 200 mg/dl or greater during an oral glucose tolerance test using a glucose load containing the equivalent of 75 g of anhydrous glucose dissolved in water.

Thereby Diabetes mellitus has a worldwide distribution affecting approximately 6% of the global population with almost half of them being unaware of the condition.

According to Diabetes Epidemiology collaborative analysis of diagnostic criteria in Asia (DECODA) studies (2014), the prevalence of diabetes varies markedly among Asian population, it rises with age up to 70s and 80s in Chinese and Japanese population. In Indian men and women, it rises with age upto 60s and 70s and then stabilizes. The age and sex specific prevalence and the peak prevalence of diabetes were higher in cohorts from India and Singapore than in most of the Chinese and Japanese cohorts.

There has always been a concern over rising trend in diabetes. Diabetes has emerged as a major global public health threat. The number of diabetics were expected to rise by 120% from 135 million in 1995 to 300 million in 2025 and India -which has 33 million diabetics already-has emerged as the diabetic capital of the world.

Material and Methods

Study Design

The present study was carried to evaluate the effects oil pulling therapy in 50 controlled and 50 uncontrolled type 2 diabetes mellitus patients. The study was conducted in Department of Oral Medicine and Radiology, I.T.S Dental College, Hospital and Research Centre, Greater Noida, with guidance of Head and Dean Prof. Sunita Singh Sengupta FMS, University of Delhi.

The observations were compiled and results were also statistically analysed.

Study Population

The age range of controlled and uncontrolled diabetic patients in our study was varied. Therefore, the patients were divided into four groups as per their age among 50 controlled and 50 uncontrolled diabetic subjects as follows:

- Group I: Patients less than 40 years of age.
- Group II: Patients between 41 to 50 years of age.
- Group III: Patients age ranging from 51 to 60 years.
- Group IV: Patients above 60 years of age.

Study Sample

The mean age of controlled diabetics was 46.9 years and the mean age of uncontrolled diabetics was 48.02 years. This present study comprised of 22 (44%) male patients and 28 (56%) female patients as controlled diabetics and 27 (54%) male patients and 23 (46%) female patients as uncontrolled diabetics.

Source of Data

All diabetic patients/subjects reported in Outpatient department (OPD) of Department of Oral Medicine with complaint of dryness of mouth (xerostomia), primary burning mouth syndrome with history of alteration in taste, oral numbness was considered for the study. The study was conducted during a period from July to October 2017.

Method of Collection of Data

Written consent from the patients was obtained and its appropriate statement has been enclosed.

- Subjects with clinically proven and established oral signs and symptoms were considered for study.
- Each participant were **recalled after a month** and sachets for the next month were given to the compliant patients for a **total period of three months**. All participants were also **some extra sachets** in a plastic box along so that the non-compliant patients could be identified.
- Informed Consent were taken from the patient after explaining the whole procedure in detail along with subject information sheet.
- Follow up and appropriate treatment were done.
- Appropriate Psychological evaluation and counselling was also done.
- No fear Psychosis was encouraged.
- No financial support has been applied or was sought from the manufacturer in support of the present study
- No conflict of interest

Inclusion Criteria

1. Patients with complaint of persistent alteration in taste, numbness dryness in the mouth.
2. Patients with complaint of unexplained burning sensation in the mouth.
3. Patients willing to participate in the study.
4. Hundred diabetic subjects were selected at random from outpatient department.
5. Out of hundred, fifty controlled diabetic patients and fifty patients randomly diagnosed as diabetics with reference to their symptoms and manifestations (Type II) and were screened consecutively for oral manifestations.
6. Fifty controlled diabetic patients with positive history of diabetes mellitus who were undergoing treatment, were also subjected for investigation. Their clinical data obtained by their physician/ endocrinologist or stomatologist was also reviewed. All these patients were examined to detect oral manifestations of diabetes. Diabetes was also confirmed by estimation of blood sugar (Random, fasting and post prandial) for all the patients.

Exclusion Criteria

Patients who disagree to continue with the study after 1st intra-operative oil pulling (*Instructional demonstration of the process*).

1. Patients allergic to any content of the oil (*Enrolled patients to be dropped out if they report any allergy*).
2. Patients with any mucosal lesion attributing to the symptoms.
3. Patients with moderate to severe gag reflex.

Material & Methods for Oil Pulling Therapy

All patients who reported and diagnosed with controlled and uncontrolled diabetics with oral signs and symptoms were considered for the study.

- All patients were approached with a Patient Information Sheet and an Informed Consent to participate in the study.
- Patients were also explained verbally the benefits and possible side effects of the technique.
- Patients were advised to use a sachet in front of the investigator to better explain the procedure.

Each participant was instructed to:

- Consume **one sachet, once daily**, for a period of **three months**.
- Perform this procedure **before brushing** teeth.

- Open the sachet and directly convert all of its contents into the mouth.
- Keep the oil in the mouth and keep swishing it for **10-15 minutes**.
- **Not to ingest** the oil.
- Spit the oil.
- Not to eat or drink anything for at least half an hour.
- Each participant was **recalled after a month**.
- Sachets for the next month were given to the compliant patients.
- Each patient was followed up for a total period of **three months**.

Procedure

A table spoon (10ml) of sesame seed oil is taken in the mouth, it is sipped, sucked and swished in the mouth between the teeth for 10 to 15 minutes until the oil loses its viscosity and becomes milky white in color. Then it is spit out and mouth is rinsed thoroughly with water for several times. There are several instructions to be followed during the practice of oil pulling.

It is preferably practiced during early morning hours, on empty stomach, after brushing the teeth and cleaning the tongue. It is practiced in sitting position with chin upright. It can be done for a maximum of three times in a day in case of acute diseases. There is no contraindication for the practice of oil pulling except for the children below the age of 5 years due to the dangers of aspiration and swallowing. It can also be practiced during pregnancy and menstruation also.

Mechanism of Action

The exact mechanism of the action of oil pulling therapy is not clear. It was claimed that swishing of oil in the mouth activates enzymes and draws the toxins out of the blood. The bottom line is that the oil pulling actually cannot pull the toxins out of the blood because oral mucous membrane does not act as a semipermeable membrane to allow the toxins to pass through.

Sesame seed oil has a high concentration of polyunsaturated fatty acids and is a good source of vitamin. The antioxidants present in it are namely sesamin, sesamol and sesaminol. These lignans have certain actions on the living tissues like detoxification of toxins, antioxidant effect, potentiates the action of vitamin E, prevents lipid peroxidation and antibiotic effect in that it helps in the destruction of microorganisms.

Sesamin has found to inhibit the absorption of cholesterol as well as its production in the liver, reduce lipogenesis and exhibits an antihypertensive action.

Clinical Methodology

The subjects were made to sit comfortably on the physiological dental chair with artificial illumination. Then diluted 0.2% Chlorhexidine gluconate mouth wash was given to rinse the oral cavity

Wearing sterile hand gloves and mouth mask the subjects were examined under artificial illumination. The clinical examination was carried out by adopting the methods of Kerr, Ash, Millard and relevant data were recorded in the proforma, the copy of which is enclosed.

All the patients were examined to detect oral signs based on their reported symptoms using dental mouth mirror, dental explorer and right-angled probe.

Results

The present study was carried to evaluate the effects oil pulling therapy in 50 controlled and 50 uncontrolled type 2 diabetes mellitus patients. The study was conducted in patients attending O.P.D with guidance of Dean Prof. Sunita Singh Sengupta FMS, University of Delhi.

The observations were compiled and results were also statistically analysed.

Age

The age range of controlled and uncontrolled diabetic patients in our study was varied. Therefore, the patients were divided into four groups as per their age among 50 controlled and 50 uncontrolled diabetic subjects as follows:

Group I: Patients less than 40 years of age.

Group II: Patients between 41 to 50 years of age.

Group III: Patients age ranging from 51 to 60 years.

Group IV: Patients above 60 years of age.

In our study, Group I had equal number of 14 (28%) controlled diabetic patients and 14 (28%) uncontrolled diabetic patients. However, there was a preponderance of controlled diabetics in Group II 22 (44%) as compared to 16 (32%) patients of uncontrolled diabetics.

Whereas, Group III had again more number of uncontrolled diabetic patients 16 (32%) as compared to 11 (22%) patients of controlled diabetic group. Moreover, Group IV, constituted 3 (6%) and 4 (8%) in controlled and uncontrolled diabetic group respectively.

The mean age of controlled diabetics was 46.9 years and the mean age of uncontrolled diabetics was 48.02 years.

Sex of the Study Group

This present study comprised of 22 (44%) male patients and 28 (56%) female patients as controlled diabetics and 27 (54%) male patients and 23 (46%) female patients as uncontrolled diabetics.

Thus, a higher prevalence of female patients in controlled diabetics and male patients in uncontrolled diabetics was observed. The exact prevalence of male patients and female patients according to their age group was also studied. Group I of controlled diabetic patients of 6 (42.9%) male patients and 8 (57.1%) female

patients. Among uncontrolled diabetics of Group I equal number of male and female patients around 7 (50%) were present.

The patients categorized under Group II, based on their age ranging from 41 to 50 years, constituted 9 (40.9%) male patients and 13 (59.1%) female patients as controlled diabetics in comparison to 7 (43.8%) male patients and 9 (56.3%) female patients of uncontrolled diabetes.

Furthermore, Group III had total number of 11 controlled diabetics {6 (54.5%) males; 5 (45.5%) females} and 16 uncontrolled diabetics {10 (62.5%) males, 6 (37.5%) females} respectively. Group IV had 1 (33.3%) male, 2 (66.7%) female patients in controlled diabetes group and 3 (75.0%) male and 1 (25.0%) female patients as uncontrolled diabetics. A significant association of positive family history of diabetes in controlled group was also observed. 20 (40%) patients had positive family history as compared to 8 (16%) of patients in uncontrolled diabetes group.

General Physical Examination

In the present study Body mass index (BMI) was calculated for all 100 patients. Body mass index is a clinically usable nutritional parameter, and BMI is recorded by the following formula as follows:

$$\text{BMI} = \text{Weight in Kg/Height square in meter.}$$

The mean body mass index for controlled diabetic patients was 21.61 and 22.69 for uncontrolled diabetic patients.

Beneficial Effects of Oil Pulling Therapy in Varied Diabetic Symptoms

Altered Taste

In controlled diabetics 2 (14.28%) patients of Group I, 3 (13.63%) patients of Group II, 3 (27.2%) patients of Group III and 2 (66.6%) patients of Group IV had beneficial effects of oil pulling therapy with altered taste sensation. In uncontrolled diabetics 5 (35.7%) patients of Group I, 8 (50%) patients of Group II, 13 (81.25%) patients of Group III and 2 (50%) patients of Group IV had beneficial effects by oil pulling therapy in treatment of altered taste sensation. The results were also found out to be statically significant (p value 0.000).

Though the prevalence of altered taste was more in uncontrolled diabetics 28 (56%) as compared to controlled diabetics 10 (20%), the results were equally significant in treatment by oil pulling therapy.

Numbness

Oil pulling therapy had beneficial effects in management of numbness in diabetic group. In controlled diabetic patients 3 (21.4%) patients of Group I, 2 (9.09%) patients of Group II, 3 (27.2%) patients of Group III, and 2 (66.6%)

patients of Group IV. In uncontrolled diabetics, 8 (57.1%) patients of Group I, 13 (81.2%) patients of Group II, 11 (68.7%) patients of Group III and 3 (75.0%) patients of Group IV had relieved from numbness sensation. Though, beneficial effects of oil pulling therapy in numbness was recorded in 4 (18.18%) male patients and 6 (21.42%) female patients of controlled diabetic group. However, beneficial effects of oil pulling therapy was also reported in 15 (55.55%) male patients and 20 (36.95%) female patients of uncontrolled diabetic group. It was also found out to be statistically significant.

Tingling Sensation of Oral Mucosa

Oil pulling therapy had beneficial effects in management of tingling sensation of oral mucosa. It has been observed in the study, 1 (7.14%) patient of Group I, 2 (9.09%) patients of Group II, 3 (27.2%) patients of Group III and 1 (33.33%) patient of Group IV had reported relief from oil pulling therapy amongst controlled diabetic group.

The reported relief was also significant in uncontrolled diabetic group of patients and was in 3 (21.4%) patients of Group I, 4 (25%) patients of Group II, 6 (37.5%) patients of Group III and 4 patients were also had relief through oil pulling therapy. Overall uncontrolled diabetics 17 (34%) had more tingling sensation when compared to controlled diabetics 7 (14%), the beneficial effects were present in both the study groups.

Burning Mouth

Burning mouth (Stomatopyrosis) was reported to be relieved in 2 (14.28%) patients in Group I, 3 (13.6%) patients in Group II, 2 (18.18%) patients in Group III and 1 (33.3%) patient in Group IV of controlled diabetic group.

In uncontrolled diabetic group 8 (57.14%) patients of Group I, 5 (31.25%) of Group II, 4 (25%) patients of Group III and 3 (75%) patients of Group IV had reported relief from burning mouth symptom. Overall, the prevalence of burning mouth was more in uncontrolled diabetics 20 (40%) as compared to controlled diabetics 8 (16%), the results were found to be statistically significant in reported relief from management of oil pulling therapy in both controlled and uncontrolled diabetic groups.

Gingivitis

In the present study, oil pulling therapy provided relief from gingivitis among controlled diabetics in Group I with 13 (92.9%) patients, Group II 21 (95.5%) patients, Group III 10 (90.9%) patients, and Group IV with 2 (66.7%) patients.

Marked relief from gingivitis was also observed in uncontrolled diabetic study group that comprised of 14 patients in Group I, 13 (81.3%) in Group II, 15 patients in Group III and Group IV patients who practiced thoroughly oil pulling therapy had complete relief in their gingivitis.

Periodontitis

Periodontitis is inflammation of periodontal tissues. The presence of mild, moderate and severe periodontitis was observed both in controlled and uncontrolled diabetic patients. Oil pulling therapy provided relief in both the study groups.

Among controlled diabetics, Group I with 7 (50.0%) patients had relief from mild periodontitis. Within the same group 7 (50%) patients had transient relief from moderate periodontitis. Group II patients comprised of 7 (50.0%) patients had relief in their symptom of mild periodontitis, 9 (40.9%) patients with reported relief from therapy in moderate periodontitis. Group III had reported relief through oil pulling therapy in 1(9.1%) patient with mild periodontitis, 8 (72.7%) patients in their moderate periodontitis and 2 (18.2%) patients with severe periodontitis. Group IV comprised of 1 (33.33%) patient with mild periodontitis, 1 (33.33%) patient with moderate periodontitis and 1 (33.33%) patient with relief in severe periodontitis respectively.

Among uncontrolled diabetics, Group I reported relief in 1 (7.1%) patient with mild periodontitis, 13 (92.9%) patients with moderate periodontitis. Group II had 2(12.5%) patients with mild periodontitis, 10 (62.5%) patients with relief in moderate periodontitis and 4 (25%) patients with reported relief in severe periodontitis. Moreover, among uncontrolled diabetics, Group III with 1 (6.3%) patient of mild periodontitis, 10 (62.5%) patients of moderate periodontitis and 4 (25%) patients of severe periodontitis reported relief. In Group IV beneficial effects of oil pulling therapy was observed in 3 (75%) patients with moderate periodontitis, and 1 (25%) patient with severe periodontitis. Overall, the reported relief in periodontitis through oil pulling therapy was more in uncontrolled diabetics as compared to controlled diabetics and the results were statistically significant.

Different Incidental Oral Findings in Subject Patients who had Relief in their Symptoms through Oil Pulling Therapy

Periodontal Abscess

With the reported findings of periodontal abscess in study groups, oil pulling therapy had shown reported relief in this particular condition as follows (*Graph 12*)

Among controlled diabetic patients, Group I had 1 (7.14%), Group II had 2 (9.09%), Group III had 1 (9.09%) and Group IV had 1 (33.3%) patients that had shown relief in periodontal abscess. Uncontrolled diabetic patients had 6 (42.8%) in Group I, 5 (31.25%) in Group II, 7 (43.75%) in Group III and 2 (50%) patients with reported relief in Group IV from periodontal abscess.

Whereas, 3 (13.63%) male patients and 2 (7.14%) female patients of controlled group and 8 (29.62%) male patients and 12 (52.17%) female patients of uncontrolled diabetes had reported relief from oil pulling therapy in periodontal abscess.

In the present study, the higher reported relief from oil pulling therapy was reported in 20 (40%) patients of uncontrolled diabetes as compared to 5 (10%) patients of controlled diabetic group and the results were found to be statistically significant.

Coated Tongue

Reactionary changes including relief in coated tongue through oil pulling was also studied and recorded in both controlled and uncontrolled subject groups.

Among controlled group oil pulling beneficial effects were studied in Group I 1(7.14%), Group II (4.54%), Group III 3 (27.27%) and Group IV had 3 subjects who had reported transient relief in coated tongue. Among uncontrolled diabetic group, study subjects in Group I with 5 (35.71%), Group II 5 (31.25%), Group III 7 (43.75%) and Group IV with 3 (75%) had transient relief in reactionary changes of coated tongue with oil pulling therapy.

Candidiasis

It is regarded as a potentially malignant disorder of oral mucosa, and an opportunistic fungal infection caused by *Candida albicans*. It was observed in both controlled and uncontrolled diabetic groups. Though, traditional oil pulling therapy cannot alone cure this fungal infection, it had been a remarkable study that potential complication of this infection has been minimized, however, patients were put on conventional anti-fungal treatment for complete elimination of the entity in subject study groups.

In 1 (33.33%) patient of Group IV in controlled diabetic group, and 4 (25%) patients of uncontrolled diabetic group, 8 (50%) of Group III and 3 (75%) patients of Group IV had reported relief from redness, erythema and further progression of candidal infection manifested in study groups.

Lichen Planus

Lichen planus is a potentially malignant disorder and is a potential cause of oral burning sensation. The beneficial effect of oil pulling therapy minimized burning sensation, potential effects of lichen planus in 1 (7.14%) study sample of controlled diabetic Group I order. Whereas, in uncontrolled diabetic group, 2 (14.2%) study sample subjects had beneficial effect of oil pulling therapy while minimizing the oral effect of lichen planus. Overall, in study controlled group 1(2%) subject and 2 (4%) subjects had reported relief from potential effects of lichen planus while practicing oil pulling therapy.

Pyogenic Granuloma

Oral mucous membrane lesion, pyogenic granuloma, attributes to a response as a result of an injury to oral mucosa. However, its reactionary effects can be minimized through oil pulling therapy. Therapy had beneficial effect in 1 (7.14%) patient in Group I of controlled diabetic group. Among uncontrolled diabetic study group, 2 (14.2%) patients in Group I, 3 (18.7%) in Group II had transient relief from effects of incidentally observed granulomatous lesion in oral mucosa.

Thereby, oil pulling therapy had soothing effect in 1 (3.5%) female subject of controlled diabetic group and 1(3.7%) male subject and 4 (17.9%) subjects of uncontrolled diabetic group with presence of granulomatous lesion.

Discussion

Oil pulling is a traditional Indian folk remedy. It is an ancient health care practice that involves swishing of oil in the oral cavity for oral and systemic health benefits. The saponification and emulsification process during oil pulling is responsible for cleansing action of sesame oil. It also generates antioxidants which kill microbes and cause their cell wall damage.

In the present study on diabetic patients, sesame oil was used for oil pulling and hereby in the study it has also proven its several medicinal properties and desirable oro-dental health benefits.

Diabetes mellitus is a chronic metabolic disease known to affect oral disease progression. Patients with diabetes mellitus appear to lack important knowledge about the oral health complications of disease. For every four known cases of diabetes, it is indicated, there are three undiagnosed cases. Oral diagnosticians have an opportunity and the responsibility to promote good oral health that may significantly affect the oral health of such patients.

Thus experts in oral medicine fulfil the obligation of the famous quotation of Sir William Osler that, '**Mouth is the Mirror of the Body**' which '**reflects the systemic diseases.**' This is indeed true if one will but appreciates the subtle changes in oral tissues that may serve an important role in diagnosis even when the oral lesions are not diagnostically specific for a particular disease entity.

The proper management of diabetic patients in dental practice is extensively discussed in textbook and dental journals. In our study emphasis is placed on management of symptoms by oil pulling therapy in uncontrolled/newly diagnosed/undiagnosed patients and comparing them to controlled diabetic patients in order to explain the inadequacy of routine dental care in uncontrolled/newly diagnosed diabetic patients as well as to promote proper oral health behaviours and Ancient health care practices that limit the risk of complications in both groups.

Exacerbation of dental infection may throw a well controlled diabetic patient out of control. A dental emergency can rapidly become a medical emergency and can endanger the life of a patient. It is quite imperative that early recognition and control of diabetes, coupled with appropriate therapy constitutes the best available approach in the management of oral manifestations of diabetes mellitus.

Hence, the present study not only reviews many controversial aspects of signs and symptoms in controlled and uncontrolled Type II Diabetes mellitus patients,

but also is fully justified as it would give much of information, insight and help health care professionals to treat the oral changes of diabetes by oil pulling therapy in order to restore oral health for general health.

Among the Outpatients attending Department of Oral Medicine & Radiology, 50 patients that were previously diagnosed as diabetics by their physician/endocrinologist/stomatologist and were on prescribed oral hypoglycemics and adequate dietary control were kept as control group. On the other hand, fifty patients that were randomly diagnosed as diabetics with reference to their symptoms and oral findings were kept as uncontrolled group. For both the groups, controlled and uncontrolled, consent of the patients were obtained and their oral cavity was examined for various signs and symptoms. Oil pulling therapy with sesame oil was prescribed and patients were evaluated on their subsequent follow up.

As compared to 50 patients of controlled diabetic group, the detection of 50 patients of uncontrolled group in Department OPD suggests that many patients have diabetes without knowledge that they were suffering from it (diabetes). Therefore, oral physician in routine examination can detect the hidden diabetes and can institute appropriate treatment. In our study, uncontrolled/newly diagnosed Type II diabetes mellitus patients were also referred to Department of Diabetology for control of their blood sugar however oral manifestations were managed by appropriate ancient Oil pulling therapy. Moreover, patients were recalled on regular interval for comprehending the progress of treatment and its outcome.

The age range of controlled and uncontrolled diabetic patients in our study was from less than forty to above sixty years. The mean age for controlled diabetic group was 46.9 years and for the uncontrolled diabetic group was 48.02 years. In controlled group there were 14(28%) patients in <40 years, 22(44%) patients between 41-50 years, 11(22%) patients in 51-60 years and 3(6%) patients above 60 years of age. Maximum patients i.e. 22(44%) were in the age group of 41-50 years. However, in uncontrolled group of diabetic patients 14(28%) were less than 40 years of age, 16(32%) patients between 41-50 years and as well as 51-60 years and 4(8%) patients above 60 years of age. Maximum patients i.e. 16(32%) were in the age group of 41-50 and 51-60 years in uncontrolled diabetic group.

Among 50-controlled diabetic group 22(44%) patients were males and 28(56%) were female patients. In uncontrolled diabetic group 27(54%) patients were males and 23(46%) were females.

The present study records that among 50 controlled diabetic patients, 20(40%) patients had positive family history of diabetes in comparison to 8(16%) patients in uncontrolled diabetic group.

This helps to suggest the preventive measures for diabetes taken by patients of controlled group that protected oral tissues from further destruction in comparison to uncontrolled diabetics.

Regarding the oral symptoms and signs of diabetes-controlled and uncontrolled diabetic group they were managed by oil pulling therapy and their results are discussed as follows:

Altered Taste

Taste is a special function of tongue due to taste buds. Uncontrolled/newly-diagnosed NIDDM (Type II) patients have a blunted or altered taste sensation, which displays a degree of specificity to glucose, of partially reserved after correction of hyperglycaemia and is independent of somatic or autonomic nerve function. The taste abnormality may influence the pernicious choice of nutrients, with a preference for sweet-tasting foods, thereby exacerbating hyperglycaemia.

The management of altered taste which responded to oil pulling therapy in our study was also observed more in uncontrolled diabetic group of 28(56%) patients as compared to controlled group of 10(20%) diabetics and is also statistically significant with p value 0.00035.

Presence of altered taste in uncontrolled diabetics has been compatible with previous studies of Petros Perros et al (1996) and their reported p value being <0.05, however oil pulling has reversed back blunted taste sensation in diabetic patients which has been a striking feature in our present study.

Smoking is a known factor that is associated with impaired taste function. 26(50.1%) male patients in controlled diabetic group and 22(40.7%) male patients in uncontrolled diabetic group were smokers. Though, these differences did not reach statistical significance, but might have contributed to the impaired taste function in both controlled and uncontrolled diabetic group. On cessation of habit, patient counselling to quit smoking, there has been a better possibility that oil pulling therapy has helped in reversal of blunted taste sensation.

Numbness

This symptom was managed well more in 35 uncontrolled diabetic patients (70%) as compared to 10 controlled diabetic patients (20%) and is statistically highly significant with p value 0.00000.

Numbness as an oral symptom present in diabetic groups is also compatible with previous studies of Collin H.L. et al (2000) with their reported p value <0.001.

Numbness is due to neural changes because of high content of sugar and is therefore experienced more in uncontrolled or unaware diabetic patients. It could be attributed to neuropathy associated with hyperglycaemia. Oil pulling therapy might have slowed down neuropathy related changes and has been successful in alleviating oral numbness in diabetic patients.

Tingling Sensation

In this present study this symptom responded well to oil pulling technique in majority of uncontrolled diabetic patients 17(34%) as compared to controlled diabetic group 7(14%) and is also statistically significant with p value 0.0000. Tingling sensation in diabetic patients has been reported in literature that is in confirmation with the study of Gibson J al (1990). It could be supported that Type II diabetes mellitus manifest with oral symptoms other than polydipsia and

such oral symptoms should not be overlooked as that may be the primary or only manifestation of uncontrolled/undiagnosed non-insulin dependent diabetes mellitus patients and their reported p value was 0.00, oil pulling therapy helped significantly in reduction of tingling sensation of oral mucosa.

Burning Mouth

Diabetes is a likely cause of a burning sensation in the oral cavity. Insulin increases the rate of glycogen, lipid and protein synthesis and it maintains a balance between anabolic and catabolic process. It would seem possible that lack of insulin would encourage the catabolic process within the oral mucosa, making the tissues less resistant to wear and tear; thereby leading to glossopyrosis and stomatopyrosis.

In this present study it was recorded that oil pulling therapy had caused reduction in burning mouth sensation in 20(40%) patients with uncontrolled diabetes. In controlled diabetic patients, burning sensation of tongue was relieved due to oil pulling therapy in 8(16%) and was statistically significant with p value 0.0233.

Presence of burning mouth has been in concomitant with previous studies of Basker RM et al (1978)⁹, GibsonJ etal (1995)³⁷, Collin H L et al (2000)¹⁶ and their reported p value being 0.05; in which tongue was the single site which was most frequently involved. In a major breakthrough, oil pulling has been an effective in management of this symptom in diabetic patients.

Sialosis/Sialadenosis

Regarding the various signs, bilateral enlargement of parotid gland (choronic bilateral sialadenosis/sialosis) was recorded in 2(4%) controlled diabetic patients.

Sialosis as a clinical sign was also observed in 12(22%) of uncontrolled diabetic patients. the observation is in confirmation with previous studies of Russotto S.B. (1981), Murrah V.A. (1985), Quirino M R Set al (1995) with their reported p value being 0.00. However oil pulling therapy as such has no direct role in management of sialosis.

Parotid gland enlarges because of cellular hypertrophy and accumulation of fluid. This may be due to microangiopathy of blood vessels in which vessels constrict and there is less vascularity. The association between parotid gland enlargement in controlled and uncontrolled diabetes mellitus patients observed in our study was striking however, subjects were kept on constant follow up with their management.

Chronic Periodontitis

In the present study it was recorded that with oil pulling therapy controlled group of diabetic patients had reduction in periodontitis: 44% mild, 50% moderate, and 6% severe periodontitis was drastic improvement with oil pulling therapy;

whereas uncontrolled group of diabetic patients had 8% mild, 72% moderate and 20% reduction in severe periodontitis, and is statistically significant with p value 0.00049 and is compatible with studies of Rosenthal I M at al, Novaes A B and Heddie O Sedano (2000)⁴³, Sharath Asokan, Pamela Emmadi and Raghuraman Chamundeswari (2009) and their reported p value was 0.00.

Patients with diabetes mellitus have an increased susceptibility to periodontal disease. The mechanisms in explaining susceptibility of individuals with diabetes mellitus to periodontitis can be attributed to microangiopathy, alterations in gingival crevicular fluid, and alterations in collagen metabolism, altered host response along with altered subgingival microflora.

Moreover, when microorganisms enter in to periodontal structures like periodontal membrane and alveolar bone, the tissue sugar for multiplication of organisms and also alter the enzyme function of cells producing much destruction. Since, the periodontal membrane and alveolar bone are within the gums, even the general oral hygiene measures cannot help to prevent further damage but periodontal treatment with antibiotic cover can help to prevent further damage.

In this present study oil pulling therapy has shown a reduction in periodontitis. Sesame oil has three lignans – sesamin, sesamolin and sesaminol. Sesame oil has increased polyunsaturated fatty acids and lipid peroxidation is reduced thereby free radical injury to the tissues. The viscosity of the oil probably inhibits bacterial adhesion and plaque coaggregation. It could be attributed that there is a linear relationship between carbohydrate intolerance with hyperglycemia and widening of periodontal ligament along with alveolar bone loss. Uncontrolled diabetics are more prone to periodontoclasia as compared to controlled diabetics therefore diabetes is a metabolic stressor which decreases the resistance of periodontal tissues to local irritation and thereby influencing the prevalence and severity of periodontal destruction. Oil pulling therapy has thereby reduced periodontoclasia and helped in further periodontal breakdown.

Multiple Periodontal Abscesses

This is an important observation in diabetes mellitus patients and oral medicine experts can diagnose diabetes carefully with this observation.

In our study, it was found that oil pulling has thereby reduced potential complications in 5(10%) patient of controlled group and 20(40%) patients of uncontrolled group of multiple periodontal abscesses and it was statistically highly significant with p value 0.0027.

Periodontal abscess has been reported in association with diabetes and in confirmation with studies of Holdren T et al (1993)⁴⁶ and their reported p value was 0.00. Reassessment of patients on instituted oil pulling therapy have brought down complications associated with periodontal abscess.

This also that controlled group of diabetic patients were maintaining good oral hygiene with following correct therapeutic measures.

Management of the Severity of periodontal abscesses in uncontrolled diabetic patients occurs due to oil pulling and its effective factors like improvement in tissue resistance and preventing further reduction of tissue immunity.

Candidiasis

Oral candidiasis is a fungal infection caused by *Candida albicans*. It is an opportunistic infection that occurs in many diseases. In our study it was found that complications arising due to candida like redness, erythema had prevention in 2% of controlled diabetic group and 30% in uncontrolled diabetes group of patients with oil pulling therapy.

Though candida was tested positive on smear in cytological examination. Statistically reduction in oro-mucosal complications arising due candidiasis was found to be significant with p value 0.0000.

The reason for more fungal infection in uncontrolled diabetes mellitus patients could be attributed to the more accumulation of sugar in tissues that favours growth and proliferation of *Candida* fungus causing candidiasis. Thus, it is not only an opportunistic infection in immunosuppressant's, but also an opportunistic infection in cellular glucose metabolic dysfunction. Moreover, more than 50% of controlled and uncontrolled diabetic patents were having missing teeth and wearing either partial or complete prosthesis, on oral examination erythematous lesions on the palate of both groups were observed and might be related to the prosthesis, and were thereby diagnosed as denture stomatitis associated to candidiasis.

Oil pulling therapy has prevented bleeding gums, and has been equally effective in management in clinical and microbiological assessment. This observation was also found to be statistically significant (p value 0.00) with in concomitant with the studies of Q Auirino M R S et al (1995) and their reported p value were 0.00.

Lichen Planus

Lichen planus is a chronic inflammatory disease of skin and mucosa and the exact aetiology is not known but psychosomatic factors are attributed as one of its cause. In previous literature only in Grinspan's syndrome lichen planus was associated with diabetes mellitus and hypertension.

Through, it cannot be proved as a manifestation of diabetes, an attempt has been made to study the prevalence of lichen planus and thereby reducing the complications of this particular potentially malignant disorder. It was found that 1% of controlled diabetes group and 4% in uncontrolled diabetics group had lichen planus, which was confirmed on biopsy, through it was not found to be significant at the $p < 0.05$ level but the presence of lichen planus in diabetics had been discussed by Vandis M L et al .

It can be argued that lichen planus should not be taken as a factor for searching diabetes mellitus patients but it can be correlated with diabetes for academic interest and not for detection or confirmation of diabetes.

Pyogenic Granuloma

It is a common tumour like growth that is considered to be non-neoplastic in nature. Although it was originally thought to be caused by pyogenic organisms, it is now believed to be unrelated to infection. Instead, current consensus supports that it represents an exuberant tissue response to local irritation or trauma. Through, it cannot be proved as a manifestation of diabetes, however an attempt has been made to study and reduce the further oral complication associated with pyogenic granuloma in controlled and uncontrolled diabetic groups.

It was found that , with oil pulling therapy, pyogenic granuloma complication was prevented in 2% of controlled and 10% of uncontrolled diabetic groups through the results were not statistically significant with p value 0.12 Lesions of pyogenic granuloma were also confirmed on histopathological examination.

Coated Tongue

Finally, changes in tongue were also examined and it was seen that uncontrolled diabetic patients (40%) had response to oil pulling therapy towards reactionary changes like coated tongue as compared to controlled (16%) diabetes group and the result were found significant with p value 0.0233.

However, such reactionary changes of tongue have not been discussed elsewhere, but such finding could also be thought and kept in mind while diagnosing diabetes and management of coated tongue apart from other established signs and symptoms.

From this study, it is apparent that all the above signs and symptoms that present in both controlled and uncontrolled diabetic patients, can be managed and reduced with oil pulling therapy. Therefore, this study emphasizes on oral physicians, health care professionals have an absolute lead in managing known diabetic complications with Indian folk lore therapy. The medical profession is dependent in these instances on the astuteness shown by dental professionals and health care administrators. Therefore, the life of the patient depends on dental medical liaison which will suffice only at its best; the physician cannot control the metabolic error until the dental situation is in hand, and the dental situation cannot be brought in hand without simultaneous measures. With ancient Indian practices, the complications can be reduced and a better quality of life can be provided to patients.

Summary

The study evaluate effects of Oil pulling therapy in patient management of oro-dental symptoms in diabetic group. Study was conducted on patients reported with Oral manifestations in controlled and uncontrolled group of type II diabetes mellitus patients.

The present study has aimed to investigate Oil pulling therapy as an effective remedy in Oral manifestations of type II diabetes mellitus and reduction of oral complications in controlled and uncontrolled group of diabetic patients in order to

guide physicians, dental surgeons to make them aware of traditional Indian folk remedy. Oil pulling therapy has been very effective in suppression of opportunistic infections, such as candidiasis, minimise association of any reactionary changes like coated tongue, oral mucous membrane lesions in response to an injury of oral mucosa and reverse rather slow down process of the presence of abnormally advanced periodontitis in such patients.

The present study comprised of 100 diabetic subjects. There were 50 patients who were established diabetes, which were kept as control group and 50 patients who were uncontrolled diabetics or newly diagnosed diabetics. The subjects of both the groups were examined clinically and oral manifestations were also recorded and were compared. All the patients were subjected to diagnostic tests of diabetes like estimation of random, fasting, post-prandial blood sugar and determination of urine sugar and urine protein.

It is established through this study that certain manifestations appear as pathognomonic to oral diagnostician in routine examination and screening programme of oral cavity, so that dentist can diagnose a hidden and unaware diabetes among outpatient department.

To summarize:

1. Despite high prevalence of signs and symptoms of periodontal disease observed in uncontrolled diabetics as compared to the controlled diabetics. Uncontrolled diabetics had severe gingival redness, periodontal pockets and painful periodontal abscesses and all such effects has been minimised and reduced with oil pulling therapy.
2. Oil pulling therapy had drastically brought relief in numerous oral symptoms of diabetic patients. Various oral symptoms such as alteration of taste, numbness, tingling and burning mouth were significantly reduced and relief was observed especially more in uncontrolled diabetics as compared to controlled ones.
3. Signs of salivary gland enlargement mainly parotid were also present in majority of uncontrolled diabetics as compared to controlled diabetics and could be associated to the aggravated disease, however sialosis alone cannot be treated with oil pulling therapy, constant management of diabetes and further follow up can only bring symptomatic management.
4. Marked reduction in Candidiasis, symptomatic reduction in candida progression was prevalently observed along with coated tongue both diabetic study groups.
5. Pathognomonic oral lesions associated to diabetes do not seem to be very common and therefore, no pathognomonic lesions or alterations could be observed in relation to diabetes though had transient relief.
6. Other less frequent lesions as lichen planus, pyogenic granuloma were present in both controlled and uncontrolled diabetics patients but could not be correlated to their (patient's) systemic disease however redness, erythematous reaction arising due to such disorders were managed effectively with oil pulling therapy.
7. Regarding the different oral symptoms that were relieved from oil pulling therapy in controlled group of diabetic patients:

- (a) 20% were having less altered taste sensation as prior and managed well with oil pulling therapy.
- (b) 20% were having relief in oral numbness due to oil pulling therapy
- (c) 16% were managed by oil pulling therapy and reduced reported burning mouth sensation
- (d) 15% were also relieved from diabetic tingling sensation of oral mucosa.

Regarding the oral signs and various lesions which were treated by oil pulling therapy in controlled group of diabetic patients:

- (a) 44% with mild periodontitis, 50% reduction in moderate periodontitis, and 6% reduction with severe periodontitis.
- (b) 10% management of periodontal abscess
- (c) 2% management of candidiasis and candida manifestation with marked suppression and reduction .
- (d) 4% of subjects having sialosis were managed well with reduction in blood sugar
- (e) 2% lichen planus complications managed well with oil pulling therapy.
- (f) 2% had marked reduction in potential complications of pyogenic granuloma
- (g) 16% patients had symptomatic relief in their coated tongue.

Regarding the management of oral symptoms by Oil pulling therapy the following has been reported or observed in uncontrolled group of diabetic patients:

- (a) 56% were having reduction in altered taste sensation
- (b) 70% were having less numbness and oral sensation was also approached to normalcy.
- (c) 40% were having less symptoms in their burning mouth sensation.
- (d) 35% were having symptomatic relief in their tingling sensation of oral mucosa.

Regarding the oral and various lesions that were treated and had marked relief due to oil pulling therapy advocated in uncontrolled group of diabetic patients:

- (a) 8% were having reduction in mild periodontitis, 72% were having moderate reduction in symptoms and signs of periodontitis, and 20% were having marked relief in severe periodontitis
- (b) 40% were having gradual reduction from multiple periodontal abscess
- (c) 30% were having less erythema, and reduction of inflammation due to candidiasis
- (d) 24% were having sialosis and patient were subjected to therapy and blood sugar management.
- (e) 4% were having minimal complications arising due to lichen planus
- (f) 10% were having symptomatic relief in management of complications arising due to pyogenic granuloma

(g)40% were having marked reduction in coated tongue due to oil pulling therapy.

Conclusion

Priority of any health professional is to achieve the best positive patient care by understanding the underlying disease process and its effects. The mucous membrane of the oral cavity is a sensitive indicator of the general physical and metabolic disorder; conversely, diseases of the oral cavity may have a pronounced effect upon the body functions. These effects are readily understandable when it is realized that the condition of the oral cavity is influenced to a measurable degree by the same physiologic processes that influence other parts of the body.

In spite of all the advances in the field of health science, traditional healing methods still have a major role to play. These methods are born out of native wisdom of very high intellectualism. Hence, oil pulling is one such method which improves oral health and benefits various systems as well.

As type II diabetes mellitus has a slow onset and may remain undiagnosed for years. Approximately half of those who have type II diabetes are unaware of their disease. By the time many type II diabetics are diagnosed, diabetic complications have already begun. The mechanisms underlie the oral effects of diabetes share many similarities with the mechanisms that are responsible for the diabetic complications. Thus, observable evidence of diabetes in the oral cavity is very apt to be present even when the systemic substrate (diabetes) is minimally pathologic even at the time of its onset. With oil pulling therapy such possible diabetic complications can be prevented well in time.

This present study helped to familiarize with effect of oil pulling therapy in management of oral changes manifested in Type II diabetes mellitus patients. An attempt has been made to understand the possible complications in such groups.

The dentist and health care professional recognition or suspicion of a diabetic patient may be important from several different aspects:

1. The patient with such oral manifestations may be totally unaware of the condition, but comes to his dentist for periodic care, whereas he may see his physician only sporadically.
2. The patient may be aware of some oral changes related to his disease and thus seek dental treatment.
3. The patient may be aware of his diabetic status but still need routine or emergency dental care.

Oral manifestation of diabetes can be managed, abated or at least curtailed by early detection and prompt treatment, comprehended by patient education, motivation and supervised oral care, delivered with the help of competent health team including oral physician. Oil pulling therapy help in minimising the severity of oral manifestations necessitates regular surveillance and counselling in order to reassure the patient and improve the overall health of the patient.

From the present study it is evident that oral manifestations in uncontrolled diabetics were more severe as compared to the controlled diabetics and responded

well to oil pulling technique. Furthermore, intense monitoring of prevention as well as early treatment is necessary in both the controlled and as well as uncontrolled diabetics, and our ancient Indian practices has helped to prevent the ravaging effects of diabetes.

However, the findings of this study demand prudent interpretation due to small sample size and from a limited geographic area. An increased sample size could have probably provided a greater statistical significance for trends seen in management of oral manifestations by therapy. Further research involving a larger sample for a longer period is suggested to support the result of our study. Moreover, oil pulling therapy promises to be a better preventive therapy and has to be promoted in developing and developed countries across diabetic population in India and across the globe.

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