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REVIEW ARTICLE

YOGA AND PERIODONTAL HEALTH - A HOLISTIC VIEW

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ABSTRACT

The current lifestyle changes has made the human community more prone to a diverse psycho-somatic disorders. Periodontal inflammation is one such oral disease, which has a multiple etiologic factors. Though the primary cause of the disease is microbial, the other factors are local, psychological, systemic and environmental which can influence the pathogenesis of disease. The conventional oral health care system inclines towards the periodontal treatment procedures that involves prophylactic and surgical management. But yoga, the complementary and alternative medicine has a natural and drug free approach to general and oral health without risks and adverse effects. Yoga is also considered as a cost effective treatment modality in treating and preventing illness. Various forms of yoga are practiced - asana (postures), pranayama (rhythmic breathing) and dhyana (meditation). The benefits of yoga are categorised as physiological, psychological and biochemical. This paper discusses the effect of yoga on modifiable and non-modifiable risk factors of periodontal disease and how yoga can contribute in the disease prevention and progression. It also validates that yoga as a therapeutic field which needs more research in periodontal health.

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INTRODUCTION

Periodontitis is an inflammatory disease of the periodontal structures of the teeth that results in destruction of connective tissue and loss of bone support (Yousef and AlJehani, 2014). The incidence of periodontal disease is elevated world wide as a result of various modifiable and non-modifiable risk factors. Various reviews on prevalence of periodontal disease states that 50% Indians are affected by periodontal disease and is common among males, adults and economically weak population (Shaju *et al*., 2011). Though the key etiology of this pathology is microbial in nature, various other potential associated elements such as systemic and behavioural disorders have also been studied extensively (Page and Beck, 1997). The literature in the past states that the prevention of systemic disease will decrease the risk of periodontal disease as well. In developing countries like India, health care facilities are expensive and not affordable by everyone and surprisingly nowadays its a fact that the traditional therapies are gaining more attention. In such a scenario, the complementary and alternative medicine like yoga has been a proven cost effective aid in the physical, psychological and social well-being of an individual. Yoga, is a sanskrit word with the meaning of yoke or to join together, the ultimate destination being liberation (Ankerberg and Weldon, 1996). Pathanjali, the father of 3000 year old Indian yogic science divides yoga into 8 disciplines - 1. yama (social behaviour) 2. Niyama (inner discipline) 3. Asana (yoga postures) 4. Pranayama (control of breath) 5.pratyahara (control over human sense) 6. Dharana (concentration) 7. Dhyana (meditation) and 8. Samadhi (bliss). The common forms of yoga that are practiced includes asanas, pranayama and meditation (Madanmohan, 2011). Though yoga is considered alternative to regular physical activity, acute exercise and other relaxation methods like music etc., the literature data suggests that yoga is a cost effective natural remedy in stress reduction, which is the root cause of innumerable diseases (Kiecolt-Glaser *et al*., 2010). Yoga is a drug free natural remedy that rejuvenates and strengthens the immune system of an individual which results in the overall health of the system that includes periodontal health. The mechanism of yoga in disease is suggested that there could be a neurohormonal pathway with a selective effect in each pathology. Yoga cures various diseases by control of counter regulatory hormones or by increased receptor sites, alteration in

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sympatho- parasympathetic axis (Fig.1) (Chrousos, 1995). Nevertheless, yoga by its various limbs that extends to all disciplines of life including life style, food habits, personal habits and hygiene has direct and indirect effect on healthy periodontium. Since there are no sufficient scientific data till now, that has documented the effect of yoga on periodontal health, this review article analyses the effect of yoga on various modifiable and non-modifiable risks of periodontal disease and suggests research in future.

Yoga and modifiable risk factors

Micro-organisms

The essential causative factors for periodontal disease are bacterial plaque, microbial by-products and host immune response. More than 700 different bacterial species are found in oral cavity (Aas *et al*., 2005). Potent periodontal pathogens can be isolated from control as well as pathologic subjects (Haffajee and Socransky, 2000). But the pathologic outcome of the virulent periodontal pathogens are determined and can be influenced by the immune / host response of an individual. Oral hygiene is a hurdle for the microbial community in the dental plaque. The first discipline of yogic science is niyama otherwise called as saucha which stands for individual ethics insists on internal and external cleanliness (Pallav Sengupta, 2012). This personal oral hygiene prevents the bacterial plaque formation, which is the initiaton stage in the pathogenesis of periodontal diaease. When this cheque for colonization of organism is escaped the next will be the release of microbial by-products like cytokines and enzymes defended by the host immune response. These second and third stages occur together and also may be aggrevated by the psychological factors, systemic disease and tobacco habits. The cytokines interleukin-1(IL-1), interleukin-6(IL-6), interleukin-8(IL-8) and tumour necrosis factor (TNF-α) induces inflammation resulting in destruction process (Guthmiller and Novak, 2002). IL-6 stimulates osteoclast formation and bone resorption. The elevated cytokines and enzymes increases the release of reactive oxygen species (Sculley *et al*., 2002). The innate immune system with the help of immunoglobulins and antimicrobial factors breaks the cascade of inflammation. So, in this various stages of inflammation, yoga has been witnessed as a guard in the past literature. The antimicrobial peptide found in the salivary secretion has a vital role against the periodontal pathogens. According to Nobuhiko Eda (2013) human salivary defensin 2, a potent antimicrobial peptide secreted in saliva has been proved to be increased after a session of yoga stretching programme in elderly people (Eda *et al*., 2013) (Fig:1). In the same study, it was also observed that there was an increase in the salivary flow rate which is essential for oral hygiene (Eda *et al*., 2013). These antimicrobial peptides prevents the bacterial colonization contributing to the defence of periodontium. The previous research documentation by Sinha (2007) in a study group who performed asanas, pranayama, meditation and prayers for a period of six months had a significant increase in total antioxidant status than the control group who practiced physical exer cise (Sinha *et al*., 2007). Similarly, Sharma *et al*. (2008) implies that sudharshan kriya, a form of pranayama energizes the innate immune system resulting in decreased lactate levels and increased anti-oxidant levels which challenges the ROS (Sharma *et al*., 2003). Interestingly it is also recorded that a comprehensive yoga programme (asana, pranayama and meditation) has a positive effect on inflammation that was substantiated by the decrease in inflammatory markers like IL-6, IL-8, TNF, CRP (Pullen *et al*., 2008). Su Qu (2013) did a gene expression profiling in the pheripheral blood mononuclear cells of pranayama practitioners and there was a multifold increase in expression of genes AVIL/ADVILLIN that is essential for the cytotoxic fuction of NK cells, increase in expression of COX-2 and BCL-2 that inhibits apoptosis (Qu *et al*., 2013). Hence yoga can delay or prevent apoptosis of gingival epithelial cells, gingival fibroblasts and osteoblasts, thus yoga can be considered as best antitode for initiation and the progression of the periodontal disease.

Tobacco smoking

Smoking is a major preventable cause in oral disease from periodontitis to cancer. Nicotine content in tobacco is the prime component which play an important role in periodontitis by its action of modified host response to bacteria, vasoconstriction, inflammation (Bergström, 1990). A major sector of adult smokers (69%) take an effort to quit smoking but only 6.2% are abstinent after one year (Carim-Todd *et al*., 2013). However the pharmacological treatments in smoking cessation cause adverse effects like depression and cardiovascular disease which are in turn again a risk factor of periodontitis (Mitchell *et al*., 2012). Survey in the past prove that the mind body therapy that involves meditation makes smoking cessation possible by improving cognitive control, decreasing reactivity to smoking cues and nicotine withdrawal, helping to cope with stress and cigarette craving, improving mood and quality of life. Studies has also observed changes in smoking behaviour like abstinence, decreased frequency of smoking (Carim-Todd *et al*., 2013). Meditation makes the addicts to realize the impermanence of human life and helps them to exert positive influence on addictive behaviours. Yogic practices, transfers them from disrespect towards their bodies to more respectful, caring, and loving behaviours and habits (Woodyard, 2011).

Systemic diseases

Diabetis mellitus, cardiovascular disease and drugs associated with the diseases also pro-act in the pathogenesis of periodontal diseases. Interestingly there are numerous studies on yoga as a promising antihypertensive tool (Murugesan *et al*., 2000; Anand, 1999). Yoga practice restores baro-receptor sensitivity causing a reduction in the blood pressure. Scientific documentations substantiate that yoga can significantly decrease the risk of CVD by maintaining the BMI, decreasing lipid profile (Mahajan *et al*., 1999; Bera and Rajapurkar, 1993). Surprisingly yoga has also regressed and retarded the progression of atherosclerosis (Manchanda, 2014). Lipid lowering and plaque stabilisation by yoga intervention were found to be equalent to statin drugs (McDermott *et al*., 2003). The results of yoga and hypertension are mixed but few studies has shown that transcendal meditation reduces systolic and diastolic BP[23] (Fig:2). Diabetes mellitus is one disorder that was proved to be managed with practice of yoga which makes the B cells of pancreas more sensitive to glucose signalling[28,] (Manjunatha *et al*., 2005).

Stress

Stress as defined by Hans Selye (1936) is a condition – a response to a physical threat or psychological distress that generates a host of chemical and hormonal reactions in the body (Goyal *et al*., 2013). The systemic disorders in response

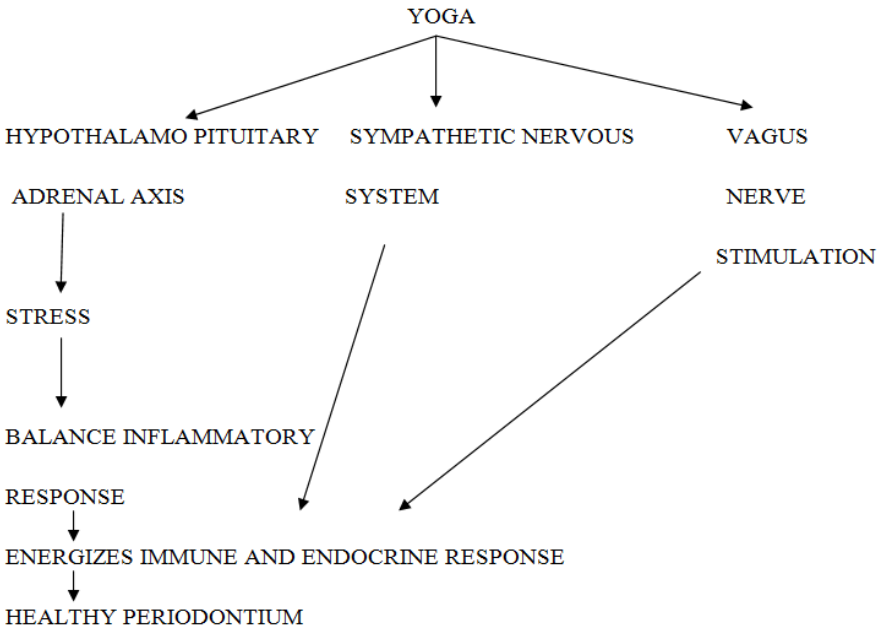

Fig.1. Postulated mechanism of yoga on periodontal health (Ankerberg and Weldon, 1996; Saatcioglu, 2013)

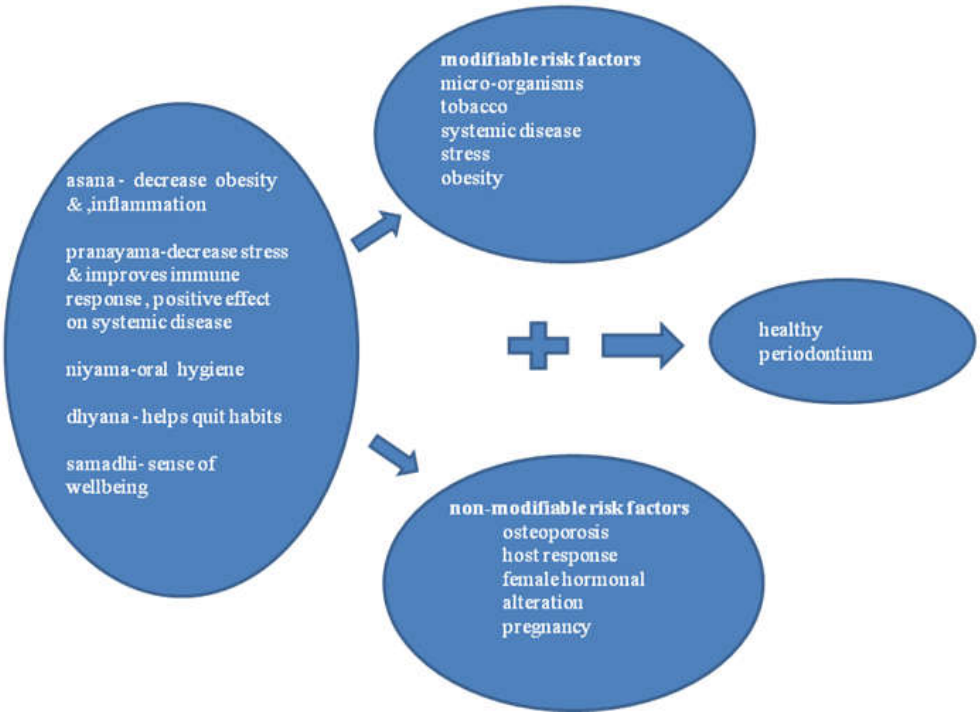

Fig.2. The effect of various limbs of yoga on the risk factors of Periodontitis (Yousef A. AlJehani *et al*., 2014; Chrousos *et al*., 1995; Woodyard *et al*., 2011; Loren M. Fishman *et al*., 2009)

to stress are cardiovascular disease, diabetes mellitus, preterm delivery, osteoporosis, rheumatoid arthritis, inflammatory bowel disease, systemic lupus erythematosis etc (Goyal *et al*., 2013). Stress can influence on factors like endocrine changes, poor oral hygiene, dietary intake, smoking, change in salivary flow and components which leads to periodontal disease (Peruzzo *et al*., 2007). There are strong scientific datas to prove that the stress is eradicated by yoga with the evidence of decreased cortisol levels, a stress biomarker (McCall, 2007; Thirthalli *et al*., 2013). Stress increases the glucocorticoid secretion that depresses the immune function, increases insulin resistance that results in increased risk of periodontitis. It is stated that stressed individuals are at a 43% increased risk of getting periodontitis (Merchant *et al*., 2003). Stress can act on the mitogen stimulation, decreased antibody production, decreased cytokine production and decreased NK cell activity of the oral epithelial cells. Yoga makes the cytokines (IL-1,IL-8,TNF) stimulate the phagocytes to clear away damaged tissues and regulate the rebuilding of fibroblasts and epithelial cells and hence enhancing the periodontal health (Rozlog *et al*., 1999).

Obesity

Obesity defined as BMI > 30.0 kg /m^2 manifested as abnormal or excessive deposition of fat in adipose tissue (Jagannathachary and Kamaraj, 2010). The changing lifestyle have significantly led to increase in prevalence of obesity

among Indian men and women. According to the national health and nutrition examination survey the prevalence of obesity in adults and children are increasing (Jagannathachary and Kamaraj, 2010). The adverse effects of obesity results in increase in oxidative stress that leads to increase in proinflammatory (TNF-alpha, IL-6) cytokines that causes periodontitis, along with other co-morbidities like hypertension, type 2 diabetes, dyslipidemias and coronary heart disease (Beck and Offenbacher, 2005). Obesity has a positive association with periodontal disease commonly in younger adults attributed to their eating disorder and is the second risk factor following smoking (Neiva *et al*., 2003). The pathogenesis of periodontitis in obese people is multifactorial. Dhananjai *et al*. (2013) in his review on yoga and obesity has concluded that yoga alone without diet restriction can effectively decrease obesity (Dhananjai *et al*., 2013). On a short term yoga intervention emphasizing breathing techniques (pranayama) by Telles (2010) with low fat, high fibre vegetarian diet change it was proved that there was a decrease in BMI and total cholesterol (Telles *et al*., 2010). Along with weight reduction yoga has also been a weapon in declining inflammation with the scientific evidence of decreased levels of IL-6, IL-8, C-Reactive Protein (CRP).

The non modifiable risk factors

Osteoporosis

Osteoporosis is characterized by decreased bone density that leaves bone fragile and highly susceptible to fracture. One in 3 women and 1 in 5 men older than 50 suffer from osteoporosis (Smith and Boser A. Yoga, 2013). Osteoporosis has a strong association with periodontal disease. It outcomes as dental osteopenia involving particularly mandible that results in alveolar crestal bone loss (Loren and Fishman, 2009). Post menopausal osteoporosis is caused by cessation of oestrogen production. Though Estrogen Replacement Therapy (HRT) is more effective, according to Women's Health Initiative (WHI) and Heart And Estrogen/Progestin Replacement Study (HERS), HRT has an increased risk of breast cancer, uterine cancer and cardiovascular disease (Vaze and Joshi, 2010). Hence yoga is the current recommended hormonal, non-pharmacological therapeutic measure in treating the hormonal imbalance. Fishman LM (2008) in his pilot study, 117 patients with osteoporosis and osteopenia were taught asanas for 2 years and bone mineral density found to be increased by 54% than the control (Loren and Fishman, 2009). Various studies state that yoga postures, produce tensile, isometric, compressive force that activates the osteocytes in its formative function. It is also quoted that "at first : medicine is felt like heaven, but it eventually resemble poison : whereas yoga may be felt like poison at first, but eventually resembles heaven" (Loren and Fishman, 2009).

Female hormonal alteration and pregnancy

Periodontal health of women is disturbed during the various stages of hormonal changes like puberty, menstrual cycle, pregnancy and menopause. This hormanal variation can also lead to preterm low birth weight infants (Gazolla *et al*., 2007). The cause behind this pregnancy periodontitis is considered to be the effect of inflammatory markers such as PGE-2 and TNF. Yoga can tune and balance the neuro-endocrine axis that can result in optimal changes in hormones (Schmidt *et al*.) (Schmidt *et al*., 1997). Narendran *et al* (2005) found yoga including asana, pranayama and meditation practice during pregnancy has led to increase in birth weight, decrease in preterm labour etc (Narendran *et al*., 2005).

Conclusion

Excluding the modifiable and non-modifiable risk factors of periodontitis, age, sex, socio-economic status, education /race and genetic impact are other considerable factors that has an influence on the periodontal health. So, the literatures reviewed in this article declares yoga as a versatile equipment in modulating the modifiable and non-modifiable risk factors of periodontal disease (Fig :2).

The therapeutic effects of yoga is based on the four basic principles (Desikachar *et al*., 2005)

1. Human body is a holistic entity of interrelated dimensions, where the illness of one will affect the other
2. Each human being and his/her needs are unique which should be approached individually and custom made accordingly.
3. Yoga energizes the healing system of the learner from him/her self and not from outside to reach the destiny of health.
4. Only person with a positive state of mind will heal quickly

The effect of yogic/meditative practices extend to have a positive impact on humoral factors, nervous system and immune system enabling the healing process from his/her own self. Hence yoga can abort the modifiable and non-modifiable risk factors of periodontal disease, there by maintaining the better periodontal health. So the ancient yogic science will help the modern man to survive with oral wellbeing. The more it is practiced the more it is beneficiary. Despite there are numerous studies on the clinical effect of body-mind treatments on various systems of the body, research work on yoga and periodontal health is very minimal. The authors of this review are currently in the documentation of the therapeutic effects of yoga on periodontal health.

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