

Garcinia mangostana as an adjunct to Non-Surgical Therapy on Chronic Schizophrenic patients with Periodontitis - A Miracle fruit

*S.Catherine Jean¹, Kiran Joseph Fernandez¹, Snophia Suresh², Uma Sudhakar³, Sruthi Ramesh¹, Archana Balakrishnan¹

¹ Post Graduate, Department of Periodontics, Thai Moogambigai Dental College & Hospital, Golden George Nagar, Mogappair, Chennai, Tamil Nadu – 107

² Professor, Department of Periodontics, Thai Moogambigai Dental College & Hospital, Golden George Nagar, Mogappair, Chennai, Tamil Nadu – 107

³ Professor and H.O.D, Department of Periodontics, Thai Moogambigai Dental College & Hospital, Golden George Nagar, Mogappair, Chennai, Tamil Nadu – 107

Abstract

Background: Patients with mental disorders like schizophrenia are subjected to a higher risk of periodontal disease due to poor dental hygiene. *Garcinia mangostana*, commonly known as mangosteen fruit is known for its high antioxidant, anti-inflammatory and antibacterial properties.

Aim: The objective of this study was to evaluate the therapeutic effect of mangosteen fruit as an adjunctive therapy to scaling and root planing in chronic schizophrenia patients with periodontitis.

Methods: Sixty chronic schizophrenia patients with periodontitis were selected and randomly allotted to test (N = 30) and control (N = 30) groups. Scaling and root planing (SRP) was done and clinical parameters such as Plaque Index, Gingival Index, Probing Pocket Depth and Clinical Attachment Level were measured at baseline. The test group consumed 2 mangosteen fruits twice daily for 2 months and all the clinical parameters were re-evaluated at the end of 3 months.

Results: Intergroup comparison showed statistically significant reduction in Gingival Index in Group II compared to Group I.

Conclusion: Consumption of mangosteen fruit as an adjunctive therapy to scaling and root planing can be used to effectively reduce periodontal inflammation in chronic schizophrenia patients with periodontitis.

Keywords: Adjunctive therapy, Chronic Schizophrenia, *Garcinia mangostana*, Periodontitis

INTRODUCTION

Periodontal disease is a multifactorial, chronic inflammatory disease of the periodontium leading to destruction of the tooth-supporting apparatus and eventually tooth loss. The interaction between microbes present in dental plaque and host immune response is a major determinant of progression and clinical manifestations of periodontal disease [1]. However, there are multitudes of factors like systemic, environmental and genetic which directly or indirectly influence this association at multiple levels [2]. Nonsurgical periodontal therapy consisting of deep scaling and root planing (SRP) is a first-line and cost-effective treatment to manage periodontal infections [3]. SRP is a mechanical process that removes bacterial pathogens that have invaded into the periodontal tissues, thus removing the etiological agent of the disease. As tissue destruction subsides, healing can take place and some reattachment of teeth can occur [4]. The retention of natural teeth depends on the success of periodontal therapy; therefore, there is a need to develop strategies to increase its effectiveness. Because periodontal healing depends on the resolution of inflammation and Reactive Oxygen Species, dietary strategies may prove effective in optimizing periodontal healing after SRP [5]. Schizophrenia is a mental disorder characterized by a disintegration of thought processes and of emotional responsiveness [6]. Potential causes of schizophrenia are not sufficiently clear and there is no single cause, but it seems that schizophrenia is the result of a complex interaction of genetic, biological, psychological and social

factors [7]. Studies of schizophrenia etiology are focused on neurobiological processes, considering a change in gene expression, neuro-immunological background or toxic brain damage (prenatal and postnatal) [8].

It is often associated with positive and negative symptoms. Hallucinations, conversing voices with or about the patient, and paranoid delusions are few of the positive symptoms whereas 'negative' symptoms are flattened affect, loss of a sense of pleasure leading to social withdrawal, isolating the patient who eventually loses the will or drive to perform routine activities [9]. Presently, the diagnostic criteria put forward by the World Health Organization and the American Psychiatric Association are widely used for the diagnosis of schizophrenia. Few signs and symptoms considered essential for confirming the diagnosis include symptom duration of 6 months, delusions, hallucinations, disorganized speech or behaviour, affective flattening, alogia, and avolition, social and occupational dysfunctions [10]. Moreover, cognitive defects in people with schizophrenia, like poor memory and decrease of attention, reduce their ability to recognize problems of their own oral health and needs for regular and proper oral hygiene practice [11].

Mangosteen (*Garcinia Mangostana Linnaeus*) is a fruit plant that grows in tropical rainforest countries such as Southeast Asia. It is moderately low in calories (63 calories per 100 g) and contains no saturated fats or cholesterol. It is rich in dietary fibre (100 g provides about 13% of RDA). Mangosteen is good source of vitamin-C and provides about 12% of RDA per 100

g.[<https://www.nutrition-and-you.com/mangosteen.html>]. Several studies show that Mangosteen is rich in xanthenes that has antioxidant, anti-inflammatory, anti-allergy, antibacterial, anticancer, and antifungal effects [12]. Previous cross-sectional as well as longitudinal research suggests that diet may play a role in preventing periodontal disease [13]. In addition, high-fibre foods, specifically fruit and grains, reduce periodontal disease progression, especially among older adults [14]. A pilot intervention study by Kondo, K. et al among 21 participants shows that high-fibre diets improve periodontal disease in high-risk subjects [15]. The aim of the study was to assess the effectiveness of consuming mangosteen fruit as an adjunctive to scaling and root planning and to evaluate its role in periodontal inflammation in Chronic Schizophrenic patients with periodontitis.

MATERIALS AND METHODS

A total of 60 patients aged 30 to 55 years diagnosed with Chronic schizophrenia were selected from Dr. Fernandez home for schizophrenia and the study was carried out for a period of 3 months (August to December 2019). In accordance with the principles of the Helsinki Declaration 1975, the study design was approved by the Institutional Ethics Committee, Dr. MGR University & Research Institute, Chennai. Written consent was obtained from each patient after a detailed explanation of the procedures. Medical and Dental history were recorded for each patient. Inclusion criteria were (1) Patient diagnosed with Chronic schizophrenia and were under antipsychotic medication for at least 2 years with similar positive and negative syndrome (2) Patients with periodontitis with Periodontal Pocket Depth (PPD) of 4-5 mm in >30% of the sites (3) Patients over 20 years of age were recruited for this study. Patients with medical disorders/learning disabilities, Risk of harming themselves and others, Initial Periodontal Therapy in the previous 6 months, Digestive problems, known allergy to mangosteen fruit or latex, Smokers and patients who were under antibiotics and NSAIDs for the past 6 months were excluded from the study.

METHODOLOGY:

Based on the inclusion and exclusion criteria, patients were randomly divided into two groups:

Group I (Control Group): Thirty Patients to receive only SRP.

Group II (Test Group): Thirty Patients to consume two mangosteen fruits per day as an adjunct to SRP.

Complete supragingival Ultra Sonic Scaling followed by thorough subgingival Scaling and Root Planning was done using sterile Gracey curettes for all the patients. Group II (test group) patients were provided with mangosteen fruit (approximately 200mg per day) and were instructed to consume it twice daily as a whole fruit without the addition of any other ingredients until the study period and each patient was monitored. Dietary habits were not changed in both groups. A diary was maintained to note the daily intake of mangosteen fruit during the entire study period. Periodontal clinical parameters namely Plaque Index - Silness and Loe 1964 (PI) [16], Gingival Index - Löe H 1967 (GI) [17], Periodontal Probing Depth [PPD] and Clinical Attachment Level [CAL] were recorded using a Williams probe at baseline and 3 months after treatment.

Statistical analysis:

Intra-group comparison of clinical parameters at baseline and three months after treatment was done using Student's Paired t-test and Inter-group comparison was done using Independent t-test. All statistical analysis was performed using the Statistical Software Package SPSS version 22. p-value < 0.05 was considered statistically significant.

RESULT:

Inter-group comparison of clinical parameters in both the groups at baseline [Table 1] and after treatment [Table 2] indicated a statistically significant reduction in bleeding on probing three months after treatment [Table 2]. Table 3 shows the Intra-group comparison of Group I obtained at baseline whereas Table 4 shows a significant reduction in the Bleeding Index values (p<0.01) in Group II compared to Group I after consumption of mangosteen for three months.

Table 1 – INTER GROUP COMPARISON OF CLINICAL PARAMETERS AT BASE LINE

	Group 1	Group 2	P Value
Plaque index	2.42	2.41	0.97
Bleeding index	2.64	2.62	0.94
PPD	5.21	5.26	0.85
CAL	4.90	4.88	0.94

TABLE 2 – INTER GROUP COMPARISON OF CLINICAL PARAMETERS AFTER SRP IN GROUP 1 AND SRP AND MANGOSTEEN CONSUMPTION IN GROUP II.

	Group 1	Group 2	P Value
Plaque index	0.9	0.8	0.70
Bleeding index	1.05	0.56	0.05 ^a
PPD	4.74	4.50	0.38
CAL	4.43	4.12	0.26

a. Significant difference between test and control group $P \leq 0.05$ in relation to Bleeding Index

TABLE 3 - INTRA GROUP COMPARISION GROUP 1

	PLAQUE INDEX	BLEEDING INDEX	PPD	CAL
PRE-OPERATIVE/BASELINE	2.4	2.64	5.21	4.90
POST-OPERATIVE	0.9	1.05	4.74	4.43
P VALUE	0.27	0.34	0.51	0.82

TABLE 4 - INTRA GROUP COMPARISION GROUP II

	PLAQUE INDEX	BLEEDING INDEX	PPD	CAL
PRE-OPERATIVE/BASELINE	2.14	2.62	5.26	4.88
POST- OPERATIVE	0.8	0.56	4.50	4.12
P VALUE	0.90	0.01 ^a	0.42	0.79

a. Bleeding Index showing significant difference compared to baseline P < 0.01

DISCUSSION

Schizophrenia ranks among the top 10 causes of disability in developed countries worldwide [18]. A significant correlation between some psychosocial factors and chronic periodontal disease was found. Psychosocial factors, stress at work, depression, unemployment, or negative life events are well-known risk factors for periodontal destruction [19] which proves that oral health has a significant part in mental health [20]. Psychiatric patients do not apply proper brushing techniques [21, 22] and do not usually have oral hygiene aids [23] to maintain their oral health apart from which psychosocial factors and stress also associates with the progression of periodontal disease [19].

It is known that there is a close connection between the general health of an organism and the health of oral mucosa, which is especially evident in cases of psychosomatic disorders and psychiatric illness, which include schizophrenia [24]. Dental treatment of psychiatric patients is not an easy task, primarily because they avoid regular visits to dental offices and neglect maintaining adequate oral hygiene. Even more, psychiatric patients are often incapable to establish true cooperation, scared of dental interventions, and have financial hardship [23, 25].

The use of mangosteen fruit has been gaining importance both in the medical and dental fields over the last few decades. A review article by Melanie M. Ashton et al has compiled many studies that have tested the use of mangosteen as an adjunctive in treating clinically induced psychotic disorders in rats and have demonstrated favourable pharmacotherapeutic benefits with respect to these disorders, the review concludes that future research requires human clinical trials to explore the risks and benefits of treatment and few among which are already in trial [26].

In this study, sixty Chronic Schizophrenic patients with generalised Periodontitis were selected and randomly allotted into two groups. All the Clinical parameters such as PI, GI, PPD, and CAL were recorded at baseline. Group I received SRP alone and Group II received SRP with consumption of mangosteen fruit twice daily for 3 months. Mangosteen fruits were provided to each patient in Group II by an attender every day. At the end of the study period,

all the clinical parameters were reassessed and compared with the baseline values which showed a remarkable reduction in Bleeding on Probing. This result is in accordance with the studies done by Graziani F et al [27] in 2018 which concluded that daily kiwifruit consumption determined a significant reduction of gingival inflammation in untreated periodontal disease and another study was done by Staudte H et al [28] stated that daily intake of grapefruit leads to an increase in plasma vitamin C levels and improves sulcus bleeding scores.

The decrease in bleeding score in this could be due to the contents such as Vitamin C [29], Xanthones (anti-oxidant) levels [30], anti-bacterial and anti-inflammatory property [31] present in the fruit.

Vitamin C is a potent antioxidant essential for maintaining the integrity of connective tissue, osteoid tissues, and dentine. Even though low Vitamin C intake does not cause periodontitis, its severe deficiency tends to results in acute spontaneous gingival bleeding seen in scurvy [32]. Xanthones are considered the major phytochemical compounds that have contributed to mangosteen's antioxidant capacity. Studies have shown that xanthone-rich beverage effectively increased the peroxy radical scavenging capacity of human plasma after a few hours of consumption [33, 34] and remain in plasma for as long as 24 hours [30].

C- reactive protein (CRP) is considered one of the measures to provide an overall estimate of inflammatory status [35]. A study done by Zhuohong Xie et al showed the anti-inflammatory effect of the mangosteen - rich beverage in which CRP levels of the mangosteen group was decreased significantly from 2.9 mg/L on day 1 to 1.6 mg/L on day 30 after consumption of the mangosteen product. The change of CRP level in the placebo group was minimal and not statistically significant [36]. γ - Mangostin has been reported to suppress inflammation in vitro by inhibiting the spontaneous PGE2 release and inhibit the expression of COX- 2 [37, 38].

Research conducted by Poeloengan to test the antibacterial activity in mangosteen rind extract in vitro showed that the content of phenol compounds in mangosteen rind extract which was able to inhibit the growth of gram-positive and gram-negative bacteria [39]. According to Widyanman AS et al 2019, Mangosteen peel extract is effective at

inhibiting the growth of *S. mutans* and *P. gingivalis* in biofilms [40].

A clinical trial demonstrated that the local delivery of 4% *Garcinia mangostana* (MGA) gel into the periodontal pockets of chronic periodontitis patients significantly reduced the PPD, PI, and Bleeding Index, and increased CAL. The MGA gel also demonstrated a significant reduction in the microbial load of *Treponema denticola* at the third month [41].

Blihnaut and Grobler, in a study including 479 fruit pickers in South Africa, assessed the relationship between periodontal health (evaluated on the basis of CPITN) and the intake of fresh fruit (including citrus fruit, apples, grapes, and mixed fruit). The recommended daily fruit intake was established as at least 8 apples, 8 bunches of grapes, 8 oranges or mandarins, or 11 fruits being a mixture of different kinds. In individuals eating citrus fruit, PD \geq 4 mm was diagnosed less often. Healthy periodontal sextants (code 0) were significantly less in the citrus group (P less than 0.05) compared to the other groups. However, this group also showed a significantly (p less than 0.05) lower prevalence of deep periodontal pockets than the other groups [42].

Effect of noni juice on patients with gingivitis/periodontitis revealed that although clinical improvement could be observed during four weeks after the performance of a standard hygiene protocol only, the results were more pronounced after additional treatment with 30 ml of noni Juice plus 30 ml water which was rinsed in the mouth for 2 minutes with subsequent swallowing (locally and systemically) showed “highly significantly” improvement in the papillary bleeding index. The reason for the effect caused by noni juice could be either a reduction of the bacterial situation of the gingiva and/or of the inflammation associated with gingivitis/periodontitis [43].

Triphala (the three fruits) is an ayurvedic formulation of Terminalia chebula Retz contains Tannins, Quinones, Flavones, Gallic acid, and Vitamin C, which has anti-inflammatory, anti-microbial, anti-oxidant and anti-collagenase activity is said to be effective in treating periodontal problems [44]. On the basis of research a systematic review done by Skoczek-Rubińska. A. in 2018 concluded that the consumption of at least 5 servings of Fruits & Vegetables per day may prevent the progression of periodontal diseases, especially periodontitis, and even tooth loss [45].

Considering the positive outcome of natural fruit consumption on periodontal tissues, Mangosteen - “Queen of all Fruits” was selected in this study particularly because of its rich nutritional contents and the successful results that were obtained in numerous studies which used Mangosteen to treat either one of these inflammatory conditions - Schizophrenic or Periodontal diseases.

Greenstein. G in a literature review stated that the absence of bleeding in previously inflamed tissues can be interpreted that there has been an improvement of the periodontal status [46], which is in agreement with the present study which shows that consuming mangosteen as a whole fruit regularly for 3 months after SRP might

reduce bleeding on probing in Chronic Schizophrenic patients with periodontitis thereby demonstrating a stable improvement in periodontal health. The limitation of the study was the smaller sample size

CONCLUSION:

This study proves that daily consumption of Mangosteen fruit can be used as an adjunctive to scaling and root planing, in patients diagnosed with Chronic Schizophrenia because it can reduce periodontal inflammation by reducing bleeding effectively. Regular oral hygiene maintenance and dental visits may be impossible for schizophrenic patients, this can be overcome by identifying superlative substitutes which should be easy to implicate regularly, both by the patient as well as the care provider. Although the present study shows positive effect of mangosteen fruit, further studies are still needed to verify the possible changes in biochemical parameters with larger sample size.

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