

“Evaluating Salivary pH, Uric acid, & C-Reactive Protein levels in Completely Edentulous patients before and after wearing Complete dentures incorporated with and without 7.5% Chitosan nanoparticles” – An Interventional Study

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Abstract: Background: Saliva plays major part in oral well-being of complete denture users and also considered a very important biomarker for overall body health and indicates several biomolecules just like blood to give useful information and monitoring of diseases and health .Denture stomatitis is a common finding in complete denture wearers and analysing salivary ph, Uric acid & C-reactive protein levels through saliva collection will help in its early diagnosis and treatment. Chitosan, a biomaterial nanoparticle incorporated into dentures gives it antifungal and antimicrobial effect. Having antimicrobial and regenerative properties it is of interest in dentistry and already being used in toothpastes, mouth rinses and dental dressings.

Objectives: To evaluate salivary ph , Uric acid & C-Reactive protein levels before and after complete denture insertion with and without addition of Chitosan nanoparticles & Comparatively evaluate the outcome.

Method: 15 complete denture patients incorporated with Chitosan nanoparticles will be tested for salivary ph, C-Reactive protein & Uric acid levels. Saliva samples will be collected from subjects immediately before the insertion of complete dentures and after 24 hrs and compared with Control groups not containing Chitosan.

Results: This study shows antifungal and antimicrobial effect of Chitosan in Complete dentures which implies less fungal activity post denture insertion leading to less denture stomatitis cases proving effectiveness in preventing Denture stomatitis.

Conclusion: *With this incorporation of Chitosan nanoparticles into Complete Dentures there is prevention of denture stomatitis in complete denture wearers due to antibacterial effect of added Chitosan nanoparticles*

Keywords: *Salivary pH, C - reactive protein, Uric acid, Chitosan nanoparticles*

INTRODUCTION:

Complete edentulism treatment modality includes removable complete dentures widely. They are fabricated by use of acrylic resins because of satisfactory features and show advantages over all materials advocated earlier.^[1]Saliva is considered a very important biomarker for overall body health and indicates several biomolecules just like blood to give useful information and monitoring of diseases and health^[2]Saliva sample collection is helpful because it is noninvasive, painless, convenient and can be taken multiple times^[3]Saliva plays major part in oral well being of complete denture users, Antioxidants present in Saliva fight against free radical oxidative stress, one of dominant antioxidant is uric acid in saliva^[4]Evaluating Uric acid levels before and after complete denture insertion will help in determining the antioxidant capacity in oral cavity^[5]C-Reactive protein levels in saliva are useful biomarkers for inflammation but their extensive tests and analyzing has not yet been carried out and studied^[6]. pH changes in oral cavity influence the onset of diseases so saliva helps in maintaining optimum pH required for healthy oral functions, pH levels in saliva after wearing complete dentures will give idea of condition of buffering capacity of oral cavity^[7]Denture stomatitis is common finding with removable dentures related with colonization with microbes, prevention of growth of microbes is one of important factors^[8]Chitosan, a semisynthetic amino polysaccharide is of interest in many applications as a biomaterial^[9]Having antimicrobial and regenerative properties it is of interest in dentistry and already being used in toothpastes, mouth rinses and dental dressings^[10]The present study will be done to find out significant changes in completely edentulous individuals due to wearing Chitosan incorporated dentures by evaluating oxidative stress indicators, inflammation and salivary buffering capacity. By proving the antimicrobial effects of Chitosan through salivary biomarkers denture stomatitis patients can be treated with good prognosis.

AIM: To evaluate and compare the effect of 7.5 % Chitosan incorporated complete dentures and conventional complete denture on levels of Salivary uric acid, C reactive protein and salivary pH before and after complete denture insertion.

OBJECTIVES:

- 1) To evaluate salivary pH before and after complete denture insertion with and without addition of Chitosan nanoparticles
- 2) To evaluate salivary uric acid before and after complete denture insertion with and without addition of Chitosan nanoparticles
- 3) To evaluate salivary C - reactive protein before and after complete denture insertion with and without addition of Chitosan nanoparticles

4) Comparative evaluation of salivary pH, uric acid and C reactive protein before and after complete dentures use with and without addition of Chitosan nanoparticles

METHODOLOGY AND STUDY DESIGN

This is a type of Interventional study. This study will be carried out at Department of Prosthodontics, Sharad Pawar Dental College, Sawangi (Meghe) DMIMS DU, Wardha. All the patients reporting to OPD with completely edentulous arches will be included in this study

Both Control group and Case group will be treated with Conventional Complete dentures, the study group will receive dentures incorporated with 7.5% Chitosan nanoparticles. Both Control and Case groups will be tested for salivary pH, Uric acid & C-Reactive Protein levels before insertion and after one month of denture insertion after period of 1 month:

COLLECTION OF SALIVA SAMPLES: Saliva samples will be collected from subjects immediately before the insertion and 24 hrs. after recall & one month of denture use to collect again saliva sample. Passive drooling method will be used and stored in ice chilled polypropylene vials.

ESTIMATION OF SALIVA PH: Salivary pH will be evaluated by pH strips

ESTIMATION OF SALIVA URIC ACID: Collected saliva samples will be centrifuged at 3000rpm for 15mins and analyzed by using VITROS uric slides in VITROS Chemistry Systems Automated Analyzer

ESTIMATION OF SALIVA C-REACTIVE PROTEIN: Supernatants will be used for CRP estimation by Enzyme Linked Immunosorbant Assay(ELISA) method

MATERIALS REQUIRED -

- Impression compound and stock edentulous impression trays
- 7.5 % Chitosan nanopowder
- Polypropylene vials
- pH strips(Bright B. Rose, Chemocraft)
- Reagent Vitrous Microslides Uric Acid
- Salivary CRP ELISA Kit
- Heat cure acrylic resin

PARTICIPANTS –Two groups will be made

- 1- Patients with Complete dentures without Chitosan nanoparticles
- 2 - Patients with Complete dentures incorporated with Chitosan nanoparticles

INCLUSION CRITERIA- Completely edentulous patients

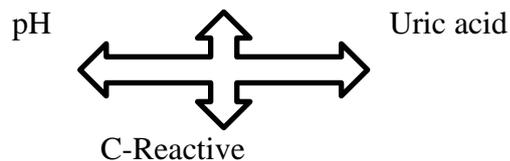
- 35-75 years of age
- Mixed gender

EXCLUSION CRITERIA – Patients with systemic disorders

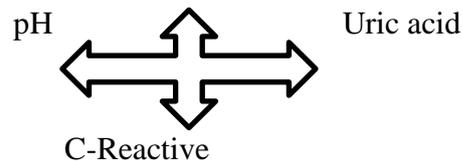
- Patients with oral disorders and adverse habit
- Patients with active infections and inflammatory conditions
- Patients with surgery procedures and traumatic incidents

SAMPLE SIZE – 15 PER GROUP

[15 Patients with Chitosan (pre & post)]



[15 Patients without Chitosan (pre & post)]



EXPECTED OUTCOME- It is expected that this study would result in increase in saliva pH and saliva uric acid levels due to antibacterial effects of Chitosan nanoparticles, which implies less fungal activity post denture insertion leading to less denture stomatitis cases

DISCUSSION:

Carlsson J, Soderholm G et al (1969): They carried out a study to evaluate the presence of Streptococcus S. and Streptococcus M. in patients wearing full dentures, 20 edentulous patients were evaluated and it was found that Streptococcus S. could be retrieved from 17 subjects and Streptococcus M. from 14 samples, Streptococcus salivarius was found in all 20 samples.^[11]

Christodoulides N, Mohanty S et al (2005): Measured the salivary C reactive protein in humans by using microchip assay system, found that increased responsiveness of microchip system (10pg ml of CRP with 1000 times dilution of saliva) is due to its intrinsic increased signal to noise rate resulting from higher beading surface stating chronic periodontitis maybe related with greater levels of salivary CRP^[12]

Nikolopoulo F, Tzortzopoulu E et al (2007) : studied the variation of resting salivary pH before and after Prosthodontic treatment in implant supported denture wearers, and found that there were statistical differences in ranges of pH of saliva after 15 days of use of dentures and significant difference in groups of implant over dentures.^[13]

T Arai, T Ueda et al (2009) : did studies on inhibition of adherence of microorganisms to titanium dioxide coated denture base acrylic resin by comparing two categories, non-coated and coated and incubating for 24hrs to evaluate biofilm formation, they concluded that coating a denture base acrylic resin with tiO₂ resulted in preventive effect on attachment of DS. Sanguis and alteration of C albicans^[14]

Zahra Atai, Mohammad Atai et al (2016) : Studied the antimicrobial effects of low molecular weight Chitosan solution on Candida Albicans in comparison with nystatin solution, 40 patients divided into two categories one was given nystatin and other given Chitosan for 2 weeks were analyzed, disclosing that the Chitosan solution greatly reduced erythematous surface, inflammatory sensation and number of blastophores and mycelia^[15]

Mieszko W, Eric wolf et al (2017) : analyzed the uniform thickness and attachment strength of Chitosan layering on denture bases made of polymethylmethacrylate using 20 PMMA cylinders, attachment strength was evaluated by enacting tooth brushing and removal of chitosan layers was measured quantitatively, the layering technique described proved chitosan layers with good attachment strength but varying thickness, 4% chitosan coating allowed uniform thickness and very well be used in oral medicine and dentistry^[16]

Different Studies related to treatment modalities in edentulous patients were reported by Mzezewa et al ^[17], Panchbhai ^[18] and Rai et al ^[19] Chaturvedi et al ^[20].

CONCLUSION: With this incorporation of Chitosan nanoparticles into Complete Dentures there is prevention of denture stomatitis in complete denture wearers due to antibacterial effect of added Chitosan nanoparticles. Also the improved surface characteristics and properties of prosthesis material accounts for further harmonious Oral health and long term acceptance of the denture.

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