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A Comparative evaluation of the efficacy of Homeopathic (Sepia 200 CH/ Sepia 30CH), Ayurvedic (Neem extract), Commercial denture cleanser (Densive) and Antifungal drugs(Fluconazole) against Candida Albicans biofilm on heat cure acrylic resin - an in vitro study

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Abstract

Purpose: The aim of study was to compare and evaluate the antifungal efficacy of Homeopathy (Sepia 200CH / Sepia 30CH), Ayurvedic (neem extract), commercial denture cleanser (Densive) and antifungal drugs (fluconazole) against Candida albicans - an in vitro study. Here, the purpose is to develop a novel denture cleanser which is not only economical, palatable but is also equally effective and environmentally friendly.

Material and Method: For the experimental study,104 acrylic pieces and 8 types of medicine (Sepia 200CH, Sepia30CH, Neem, fluconazole 100 mg, Fluconazole 200mg, fluconazole 400 mg, Distilled Water) were taken. Each medicine was tested with 13 acrylic pieces for candida albicans biofilm eradication and optical density was calculated by digital photo colorimeter. These 104 samples were divided into 8 groups and individual groups contain 13 acrylic pieces.

Where :

n_a= 13 Acrylic pieces in Sepia dilution 200CH

n_b= 13 Acrylic pieces in Sepia dilution 30CH

n_c=13 Acrylic pieces in Neem extract preparation

n_d= 13 Acrylic pieces in Fluconazole 400mg

n_e= 13 Acrylic pieces in Fluconazole 200mg

n_f= 13 Acrylic pieces in Fluconazole 100mg

n_g= 13 Acrylic pieces in commercial denture cleanser

n_h= 13 Acrylic pieces in control as a water

The study was conducted in two parts. First, to stimulate the growth of fungal biofilm, a strain of C. albicans was cultured on acrylic pieces. These acrylic pieces were then submerged in a denture cleanser solution for 24 hours, while a control group of acrylic pieces immersed in distilled water. The second part of the study involved measuring fungus growth using the turbidimetric method with a photo colorimeter. Turbidity is expressed in form of Optical Density (OD) of the drug, measured by the photo colorimeter at 550 nm. The OD is directly proportional to fungal growth and inversely proportional to the efficacy of the drug. This decrease in OD was attributed to a reduction in the number of C. albicans cells in the solution, indicating the superior fungal lytic ability of denture cleansers and the greater efficacy of drugs. The biofilm eradication efficiency (%) of each denture cleanser was calculated using the formula-

$$\text{Biofilm eradication } (\%) = \left(\frac{\text{control OD}_{550\text{nm}} - \text{test OD}_{550\text{nm}}}{\text{control OD}_{550\text{nm}}} \right) \times 100$$

Data were entered into the Excel sheet & analyzed using the SPSS (Statistical Package for Social Sciences) 25.0 version. Data were also analyzed for probability distribution using the Kolmogorov-Smirnov test. Descriptive statistics was performed and data was described as median (inter-quartile range). The inter-group comparison was done using the Kruskal-wallis test, followed by post hoc analysis. P-value <.05 was considered statistically significant.

Results: The Optical Density (OD) of the drug, measured by the photo colorimeter at 550 nm.The ODof distilled water was 1.78 (1.775- 1.805). The optical density of drugs in decreasing order was Group c(Neem)> Groupg(Commercial denture cleanser)> Group b(Sepia30CH)> Group f(Fluconazole 100mg)> Group a(Sepia200CH)> Group e(Fluconazole 200mg)> Group d(Fluconazole400mg). The percentage biofilm eradication in decreasing order was Group d > Group e > Group a > Group f > Group b > Group g > Group c The percentage of biofilm eradication was found to differ significantly between the groups (p-value <.05). Post hoc analysis showed that the percentage of biofilm eradicated in Group d (fluconazole 400mg) was significantly greater than that in Groups a, b, c, f, g (p-value <.05) and The percentage of biofilm eradication in Group a (Sepia200CH) was significantly greater than that in Groups b, c, g, f (p-value <.05) but less effective compare to the group d and e(fluconazole 400 mg and 200mg).

Conclusion: With in the limitations of the present study, based on the results of this study the following conclusions were drawn; All denture cleansing solutions exhibited a significant decrease in Candida albicans biofilm on the denture base resins compared to the control group.Among them, fluconazole demonstrated the highest effectiveness. However, its efficiency is hindered by the emergence of drug-resistant Candida species. Homeopathic drugs were observed to be the second most effective in destroying the candida albicans. Therefore, they can serve as an alternative denture cleanser to allopathic and ayurvedic drugs. They possess antifungal activity, are eco-friendly, palatable, cost-effective, and exhibit fewer side effects.

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