ABSTRACT

Dental caries or tooth decay is one of the most common chronic diseases in the world. *Streptococcus mutans* is the major etiological agent of caries. At present, antibiotics like penicillin, vancomycin are administered to treat caries. Fluoride in various preparations is also the mainstay for caries management. Chlorhexidine and triclosan are given in mouthrinses and gels in the treatment and prevention of caries. Fluorine possesses high levels of toxicity. The concentration of fluoride used in various preparations is alarmingly high. Fluoride varnish is highly toxic containing 26,600 ppm fluoride. Fluoride and chlorhexidine are not recommended for children below 6 years. The prevalence of dental caries is very high in children below 6 years. As such there is no complete treatment available for caries especially to children.

Natural antibiotics are products obtained from plants which have been used in folk medicines for the treatment of various ailments. *Propolis* is a complex resinous material collected by *Apis mellifera* honey bees from various plant sources and mixed with secreted beeswax. Honeybees use propolis to coat and also to seal cracks and crevices in the hive. Propolis possesses antimicrobial activity against several microorganisms including *Streptococcus mutans*. Propolis is non toxic and gives several health benefits. *Nutmeg* is a spice from the tree *Myristica fragrans* that has long been prized for its medicinal properties. Nutmeg is known for its antimicrobial properties. *Nutmeg oil* has also been reported to have antimicrobial properties. *Xylitol* is a five-carbon sugar alcohol that occurs naturally in certain fruits and that has been widely used as a sweetener, mainly in chewing gums. Xylitol is non cariogenic and also anti cariogenic since it inhibits the growth of *Streptococcus mutans*.

In our study we extracted propolis from bee hives by ethanol extraction. We purified the ethanol extract of propolis by Sephadex column chromatography, HPLC and identified the antimicrobial ingredient as apigenin by NMR. We obtained methanol extract of nutmeg, purified the extract by silica gel column chromatography, and identified the active ingredient as macignan by NMR. We extracted nutmeg oil by steam distillation of crushed nutmeg seeds. We performed the phytochemical screening of propolis and nutmeg. We isolated 250 strains of *Streptococcus mutans* from patients suffering from caries who attended the outpatient clinic of our hospital. *Mitis salivarius bacitracin* agar was used for the primary isolation. We tested the antimicrobial effect of ethanol extract of propolis, methanol extract of nutmeg, nutmeg oil and xylitol on the clinical strains of *strep.mutans* by disc diffusion method. We determined the minimum inhibitory concentration of the natural antibiotics by broth dilution method. We also tested for synergistic activity of propolis with chlorhexidine by the disc diffusion method. We have observed that all the 250 strains of *Streptococcus mutans* isolated from patients with dental caries were inhibited by all the test reagents, propolis, nutmeg, nutmeg oil and xylitol. Bacterial strains from 66.4% of the patients were inhibited at a very low concentration of 100 µg / ml of propolis.. The strains from 64.8 % of the patients were inhibited at concentration of 31.25 µg / ml of nutmeg. The strains from 56.8% of the patients were inhibited by xylitol at concentration of 62.5 µg / ml. The MIC for nutmeg oil to 58% of the strains is very low at 6.25 µg / ml. We have also observed that propolis has synergistic activity with chlorhexidine. We hereby report that ethanol extract of propolis, methanol extract of nutmeg, nutmeg oil and xylitol have high inhibitory activity against the clinical strains of *Streptococcus mutans*. 