DOI : 10.35124/bca.2020.20.S1.3087

*Biochem. Cell. Arch.* Vol. 20, Supplement 1, pp. 3087-3090, 2020 | www.connectjournals.com/bca | *ISSN 0972-5075*

# ADDITION OF ZINC OXIDE NANOPARTICLES IN TYPE II GLASS IONOMER CEMENT TO THE ADHESION OF *STREPTOCOCCUS MUTANS*

**I Nyoman Dhana Sudiartha[1], Intan Nirwana[2] and Titien Hary Agustantina[2]**

[1]Department of Dental Medicine, Faculty of Dental Medicine, Universitas Arlangga, Surabaya, Indonesia.
[2]Department of Dental Materials, Faculty of Dental Medcine, Universitas Airlangga, Surabaya, Indonesia.
*e-mail: intan-n@fkg.unair.ac.id

**(Received 7 March 2020, Revised 5 May 2020, Accepted 11 May 2020)**

**ABSTRACT : GIC, as a restoration material has rough and brittle physical properties. The addition of nanoparticles to glass ionomer cement is needed to improve the physical properties of glass ionomer cement. Zinc oxide (ZnO) nanoparticle is an option because it reduces surface roughness and increases the release of fluoride, so the adhesion of *S. mutans* decreases. The aim of this study is to investigate the effect of ZnO nanoparticle application in different powder weight (0,1 gr, 0,5 gr and 1 gr) on type II GIC decrease the adhesion of *S. mutans*. This study, a sample made of type II GIC added with ZnO nanoparticles 0.1 gram, 0.5 gram and 1 gram then mixed with liquid of GIC. The sample is placed on an ebonite mold that has been perforated with a diameter of 6 mm and a thickness of 2 mm. Samples were immersed in *S. mutans* cultures. Samples that have been immersed are then washed and soaked in liquid media and then vibrated. Vibration results are planted on TYC and calculated using a colony counter then analyze with one way ANOVA. The results of this study showed the adhesion of *S. mutans* in the control group 78.20 CFU, group I 25 CFU, group II 12 CFU and group III 40.60 CFU. The addition 0.5 grams of ZnO nanoparticles on type II GIC optimally reduced the adhesion of *S. mutans*.**

***Key words :*** Type II glass ionomer cement, zinc oxide nanoparticles, *Streptococcus mutans*, medicine.

## INTRODUCTION

Caries or cavities is an infectious disease that results from the interaction of hosts and bacteria and the environment in the oral cavity (Hiranya *et al*, 2011; Mufida *et al*, 2019). Dental caries are formed due to the attachment of plaque which causes the demineralization process of bacterial interactions on the tooth surface (Indrawati, 2018; Pribadi *et al*, 2017). *Streptococcus mutans* is one of the acid-producing bacteria that can cause tooth enamel damage so that cavities (Hiranya *et al*, 2011; Hiranya *et al*, 2011; Nazliniwaty and Laila, 2019).

Glass ionomer cement (GIC) is a dental restoration material first introduced by Wilson and Kent (1969). This material consists of calcium aluminosilicate glass powder combined with a polymer in water. Glass ionomer cement is generally used for patients with high caries risk because glass ionomer cement can release fluoride ions to prevent caries (Anusavice *et al*, 2013). The use of GIC as a restoration material is still limited to areas with low mastication load because GIC has a low resistance to fracture, the surface of the restoration is less smooth, porous and easy to abrasion (McCabe and Walls, 2008). This can occur to GIC because of the large particle size. Large particle size also causes physical properties such as roughness on the surface also increases making it easier for bacteria to stick to the surface (Kishen, 2015).

Bacterial adhesion to teeth is influenced by the surface roughness value of all hard surfaces in the oral cavity, which value is less than or equal to 0.2 µm (Hamouda, 2011). The initial formation of S. mutans colonization on the enamel surface starts from irregular surfaces such as cracks and hollows, because in that area bacteria can protect from shear force and have protective mechanisms in the oral cavity (Bollen *et al*, 1997).

Zinc oxide (ZnO) can be an option as an additional material to improve the mechanical and physical properties of SIK (Adam *et al*, 2019; Amaliyah *et al*, 2015). Nano-sized zinc oxide can be an option because nano-based particles of salt or oxide can react with polyacrylic acids in the matrix and increase the durability of the glass ionomer cement material as a whole (Anusavice *et al*, 2013; Kishen, 2015). The addition of 0.1 gram and 0.5 gram ZnO nanoparticles decreased GIC7 roughness.