Effectiveness Test of Powder made of Shrimp Shell Vannamei (Litopaneus vannamei) as Oral Prophylaxis Material

by Admin Admin

Submission date: 21-May-2021 12:49PM (UTC+0700)
Submission ID: 1130801680
File name: Effectiveness_Test_of_Powder_made_of_Shrimp_Shell_Vannamei.pdf (309.73K)
Word count: 2665
Character count: 14472

Sys Rev Pharm 2020;11(11):6-9
A multifaceted review journal in the field of pharmacy

Effectiveness Test of Powder made of Shrimp Shell Vannamei (*Litopaneus vannamei*) as Oral Prophylaxis Material

Asmawati[1*], Besse Khusnul Ayulisa[1], Bahruddin Thalib[2], Fajriani[1], Al'qarama Mahardhika Thalib[4], Rafikah Hasyim[1], Nurhayati Natsir[5]

[1] Department of Oral Biology, Faculty of Dentistry, Hasanuddin University, Makassar, Indonesia
[2] Department of Prosthodontic, Faculty of Dentistry, Hasanuddin University, Makassar, Indonesia
[3]Department of Pediatric Dentistry, Faculty of Dentistry, Hasanuddin University, Makassar, Indonesia
[4] Department of Dental Material, Faculty of Dentistry, Hasanuddin University, Makassar, Indonesia
[5] Department of Conservative Dentistry, Faculty of Dentistry, Hasanuddin University, Makassar, Indonesia

Corresponding Author: asmaamin68@yahoo.com

ABSTRACT

Oral prophylaxis is the most widely used procedure before fissure sealant and topical application fluor. This procedure was done by application of prophylaxis pumice and paste by rubber cup in the low-speed handpiece to the dental crown. Pumice is an abrasive oral prophylaxis material that is commonly used and has been clinically tested for its effectiveness in removing enamel stain. Vannamei shrimp shell is a waste product that has advantages for its chitosan content. Shrimp shell is widely available and has a chitin compound that can be converted into chitosan powder, which can be used as an abrasive powder to clean and polish the surface of teeth enamel. The objective of this study is to determine the potential of shrimp shell vannamei-based powder as a material of oral prophylaxis. This study was a laboratory experiment with a pretest and posttest with a control group design. Twelve post-extracted teeth were used as a sample in this study, divided into two groups, six samples in Group A (pumice powder) and 6 samples in Group B (chitosan powder made of shrimp shell vannamei) for 30 seconds and 60 seconds each group. The sample was observed with the Surface Roughness Tester device, and data were analyzed with a t-test. The result of this study showed a significant effect in Group A (pumice powder) for 30 seconds and 60 seconds, while Group B (chitosan powder made of shrimp shell vannamei) showed significant results for 60 seconds. Based on the study conducted, chitosan powder made of shrimp shell vannamei is effective as oral prophylaxis material.

Keywords: Oral prophylaxis; Pumice; Vannamei shrimp (*Litopaneus vannamei*)

Correspondence:
Asmawati
[1]Department of Oral Biology, Faculty of Dentistry, Hasanuddin University, Makassar, Indonesia
Corresponding Author: asmaamin68@yahoo.com

INTRODUCTION

Cavities or caries are the primary dental and oral health problems. Caries is often complained of by children and adults; it cannot be ignored because it can affect the quality of life.[1] Currently, there are many ways to prevent dental caries, which is primarily done in children. One of which is fissure sealants, a procedure of closing the pit and fissure on posterior teeth and topical application of fluorine (TAF) application.[2] The provision of fissure sealants, and TAF aims to prevent caries in the development phase of tooth enamel in childhood. TAF is usually given on the entire surface of the tooth, while the fissure sealant is given in the pit and deep fissure in the posterior teeth.[3]

The stage before the application of fissure sealants and TAF is dental prophylaxis; that is done because it is known that material alba, plaque and other natural coatings on tooth surfaces can be a barrier, inhibit the absorption of fluorine and consequently reduce the effectiveness of fluoride application.[4] Dental prophylaxis or commonly called oral prophylaxis is the procedure of removing plaque and stains from tooth structure (primary and transition, or permanent and transition) to control local irritation factors. Polishing is included in oral prophylaxis.[5] The administration of prophylactic pumice before the application of fissure sealants has changed. Cleaning the gap with pumice powder using a slow speed handpiece followed by etching does not remove all the pellicles and debris. Besides, the use of pumice can leave residues that can interfere with the acid etching process.[6]

Indonesia is a country with regional potential and tremendous marine products, especially fisheries. One of the fishery products is shrimp. Total production is around 500,000 tons per year, with 170 shrimp processing companies.[7] Vannamei shrimp (*Litopenaeus vannamei*) is Indonesia's flagship shrimp species, with 75% of the total weight of the shrimp being turned into waste. Shrimp waste is still not optimally utilized.[8] As much as 20-30% of the waste contains chitin compounds that can be converted into chitosan.[9] Chitosan is one of the latest biomaterials developed because it has various medical benefits and has been proven safe for humans. Chitosan has several special properties, including excellent biocompatibility, biodegradability, non-toxic, does not cause immunological reactions, and does not cause cancer. Therefore, chitosan is often used in biomedical

applications.[10] In the health field, chitosan can be a substitute for bone and teeth, can make wound healing effect, as an antimicrobial agent, and anticholesterol.[11] Chitosan from shrimp shells has many potential benefits for dental health. Thus, we need to investigate the potential of vannamei shrimp skin chitosan powder as an oral prophylactic ingredient.[12]

MATERIAL AND METHODS

This study was experimental laboratory research with a pretest-posttest with control group design. This study was conducted at the Oral Biology Laboratory, Faculty of Dentistry, Hasanuddin University; Microbiology Laboratory, Department of Biology, State University of Makassar (UNM); and CNC Laboratory, Makassar Industrial Work Training Center for roughness test. This study used a sample of 12 post-extraction teeth, six control samples with pumice (group a), and six samples treated with chitosan powder of shrimp vannamei skin (group B), treatment time of 30 seconds and 60 seconds. Sampling uses a Surface Roughness Tester. Data were analyzed with the paired t-test and Wilcoxon test.

Vannamei shrimp shells are turned into powder by blending after sifting using a 100-mesh sieve. Shrimp husk powder was then made into shrimp shell chitosan powder through a process of deproteinization, demineralization, and deacetylation. Polishing was done with a low-speed handpiece with an attached rubber cup that has been spread with pumice/chitosan powder made of shrimp shell, which has been mixed with water. Polishing was done on the entire surface of the tooth with a little pressure for 30 seconds and 60 seconds for every three samples. After that, rinse and dry using syringe water. Samples were observed by looking at changes in surface roughness using the Surface Roughness Tester (Surftest 301 Mitutoyo, Japan). This observation was carried out before and after polishing using pumice and chitosan powder of shrimp shells vannamei. Surface roughness measurement was done by placing the stylus on the tooth surface. After the gauge was started and stopped, the roughness measurement data can be seen on the monitor screen

RESULTS

The roughness measurement results obtained are presented in Table 1. Based on table 1, in group A using pumice with 30 seconds and 60 seconds observation, it has a significant value of $p < 0.05$, which means that there are significant differences between before and after treatment, or the surface becomes statistically smoother. Group B treatment using chitosan powder of vannamei shrimp shell 30 seconds observation, changes in the structure of tooth enamel surface roughness between pre and post administration of intervention had a significance value of $p > 0.05$ which means there was no significant difference between before and after treatment. In comparison, 60 seconds of observation had a significance value of $p < 0.05$ means that there are significant differences between before and after treatment, or the surface becomes statistically finer.

DISCUSSION

Polishing is called a prophylactic procedure, defined as the act of making a tooth surface smooth and shiny. Research conducted by Zoya and Ranjana using a scanning electron microscope (SEM) has shown that polishing can remove plaque, reduce bacterial accumulation, and smooth the surface of teeth.[11]

Dental prophylaxis procedures can be performed using various methods. Among the various polishing methods available, rubber cup with prophylactic pumice/paste is the most commonly performed method.[11,12] In this study, the polishing procedure used abrasive materials, pumice (group A) and vannamei shrimp skin chitosan powder (group B). Shrimp shell material has been made to be abrasive that matches the abrasive material criteria.

The polishing time carried out in this study is 30 seconds and 60 seconds. In accordance with Trish Jones's research, which did polish for 30 seconds and found that four µm of enamel can be removed using pumice within 30 seconds. According to Heintze, polishing for 60 seconds reduces surface roughness to levels below the critical threshold for bacterial accumulation.[13]

In this study, we found significant results in group A with 30 seconds and 60 seconds of polish time. In accordance with observations made by Neyran, who received a statistically significant reduction in the group using pumices with rubber cups. Neyran explained that application with a rubber cup was an effective choice in reducing surface roughness.[14]

Lutz, in his research on the enamel surface polish with pumice, explained that pumice particles could be left behind / embedded on the surface that can interfere with the chemical adhesion of restorative materials. Further research is needed to find out the role of pumice powder in a polish before applying the adhesive material.[14]

This study was slightly different from the previous study because it uses self-made abrasive material, chitosan vannamei shrimp shell powder. The results obtained by group B treated with vannamei shrimp shell chitosan powder had a more roughness reduction than the other two groups, meaning that group B had a smoother surface after the intervention using vannamei powder on the tooth enamel surface.

According to Sawai, in his journal, there are factors that influence the efficiency of tooth surface polishing, namely, rotation per minute (rpm), pressure or load of the rubber cup to the tooth, the time used for polish each part and the roughness of abrasive material.[15] Low-speed handpiece used on all groups is equal to a rotation speed of 2500-3000 rpm, which is the ideal speed for polishing. The pressure exerted on all groups is also the same as medium pressure. The time used is 30 seconds and 60 seconds, where significant results have been obtained at 60 seconds. The roughness of abrasive material can be seen from its size where the shrimp shell powder has a size of 149 µm, which is larger than the size of the pumice.

Pumice is a material produced from volcanic activity, with a Mohs scale of hardness of 6-7 where the enamel is 5-6.[16,17] The particle size of shrimp shell powder is larger than pumice, and it has been shown that the shape of shrimp shell powder is irregular with sharp edges, making the particles more abrasive, which can affect tooth surface roughness

CONCLUSION

From the discussion, it can be concluded that vannamei shrimp shell chitosan powder has the potential to become a prophylactic oral ingredient primarily as a polish which can make the surface of the teeth become cleaner and smoother and sufficient time for polishing is 60 seconds.

It is recommended to develop this by making finer chitosan vannamei shell powder. Further research is also needed to see the surface roughness of tooth enamel after polishing using Atomic force microscopes (AFM) or Scanning electron microscope (SEM).

REFERENCES

1. Tanu, L. O., Adhani, R., & Widodo, W. (2017). Comparison of caries index in permanent dentition under active UKGS and non-active UKGS Observation on elementary school sixth grade students or of the same level in Puskesmas Kertak Hanyar Kecamatan Kertak Hanyar Kabupaten Banjar's working area. *Dentino*, *2*(2), 215-220. http://dx.doi.org/10.20527/dentino.v2i2.4037
2. Liu, B. Y., Lo, E. C. M., Chu, C. H., & Lin, H. C. (2012). Randomized trial on fluorides and sealants for fissure caries prevention. *Journal of dental research*, *91*(8), 753-758. https://doi.org/10.1177%2F0022034512452278
3. Azarpazhooh, A., & Main, P. A. (2009). Efficacy of dental prophylaxis (rubber cup) for the prevention of caries and gingivitis: a systematic review of literature. *British dental journal*, *207*(7), E14-E14. https://doi.org/10.1038/sj.bdj.2009.899
4. Bridget Conway, R. D. H. (2008). Abrasion and Implications for Oral Health.
5. El Meligy, O. A., & Bakry, N. S. (2015). Evaluation of pumice, fissure enameloplasty, dentin adhesive and air abrasion on sealant microleakage. *J Dent Oral Care Med*, *1*(1), 105. http://dx.doi.org/10.15744/2454-3276.1.105
6. Mandri, M. N., Aguirre Grabre de Prieto, A., & Zamudio, M. E. (2016). In vitro comparative study of different methods of prophylaxis and conditioning of enamel in the adhesiveness of a pit and fissure sealant. Odontoestomatologia, *18*(28), 38-44.
7. Suptijah, P., Jacoeb, A. M., & Deviyanti, N. (2012). Karakterisasi dan bioavailabilitas nanokalsium cangkang udang vannamei (Litopenaeus vannamei). *Jurnal Akuatika*, *3*(1).
8. Galicia-González, A., Goytortúa-Bores, E., Palacios, E., Civera-Cerecedo, R., Moyano-López, F. J., Cruz-Suárez, L. E., & Ricque-Marie, D. (2010). Chemical composition and digestibility of three mexican safflower meals used as ingredients in diets for whiteleg shrimp, Litopenaeus vannamei. *Journal of the world Aquaculture Society*, *41*, 191-202. https://doi.org/10.1111/j.1749-7345.2010.00359.x
9. Asmawati, A., Thalib, B., Thalib, A. M., Reni, D. S., & Hasyim, R. Comparison of blood clam (anadara granosa) shell paste, shrimp (litopenaeus vannamei) shell paste and casein phosphopeptide-amorphus calcium phosphate (CPP-ACP) paste as teeth remineralization material. https://dx.doi.org/10.15562/jdmfs.v3i3.834
10. Asmawati, Hamrun N., Thalib B., Mappangara S., Thalib A M., Fajriani F., et al. (2019). comparison of shrimp (Litopenaeus vannamei) shell paste and casein phosphopeptide-amorphous calcium phosphate (CPP-ACP) paste as teeth remineralization material. Int J Appl Pharm. 11(4):1–4.
11. Chowdhary, Z., & Mohan, R. (2018). Efficiency of three different polishing methods on enamel and cementum: A scanning electron microscope study. *Journal of Indian Society of Periodontology*, *22*(1), 18. https://dx.doi.org/10.4103%2Fjisp.jisp_40_17
12. Fava, M., Frascino, A. V., Balducci, I., & Ramos, C. J. (2018). Comparative analysis of different prophylatic methods on primary teeth enamel roughness. *Brazilian Dental Science*, *21*(3), 335-340.
13. Trish Jones, R. D. H. (2016). Selective Polishing: An Approach to Comprehensive Polishing.
14. Nasoohi, N., Hoorizad, M., & Tabatabaei, S. F. (2017). Effects of wet and dry finishing and polishing on surface roughness and microhardness of composite resins. *Journal of Dentistry (Tehran, Iran)*, *14*(2), 69.
15. Tuzcel, N. Y., Akkaya, M., & Karacaoglu, F. (2018). A Comparative Evaluation of 3 Different Polishing Methods on Tooth Surface Roughness. https://dx.doi.org/10.4172/2254-609X.100046)
16. Bühler, J., Schmidli, F., Weiger, R., & Walter, C. (2015). Analysis of the effects of air polishing powders containing sodium bicarbonate and glycine on human teeth. *Clinical oral investigations*, *19*(4), 877-885. https://doi.org/10.1007/s00784-014-1317-z
17. Crofton, A. R., Hudson, S. M., Howard, K., Pender, T., Abdelgawad, A., Wolski, D., & Kirsch, W. M. (2016). Formulation and characterization of a plasma sterilized, pharmaceutical grade chitosan powder. *Carbohydrate polymers*, *146*, 420-426. https://doi.org/10.1016/j.carbpol.2016.03.003

Table 1. Changes in roughness structure of pre and post surface polishing of teeth enamel

Group		Pre (x̄ ± SD)	Post (x̄ ± SD)	*p-value*
Pumice (A)	30 seconds	1.07 ± 0.03	0.92 ± 0.04	0.047*
	60 seconds	2.22 ± 0.86	1.71 ± 0.70	0.034*
Chitosan powder made of vannamei shrimp shell (B)	30 seconds	1.83 ±0.53	1.58 ± 0.41	0.075
	60 seconds	2.05 ±0.65	1.42 ± 0.43	0.044**

*** T-test**

****Paired T-Test; p<0.05; significant**

Effectiveness Test of Powder made of Shrimp Shell Vannamei (Litopaneus vannamei) as Oral Prophylaxis Material

ORIGINALITY REPORT

20%	20%	7%	7%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	sinta3.ristekdikti.go.id Internet Source	3%
2	jisponline.com Internet Source	2%
3	innovareacademics.in Internet Source	2%
4	ppjp.ulm.ac.id Internet Source	2%
5	Submitted to Institute of International Studies Student Paper	2%
6	zh.scribd.com Internet Source	1%
7	worlddentalcongress.co.uk Internet Source	1%
8	ep3.nuwm.edu.ua Internet Source	1%
9	garuda.ristekbrin.go.id Internet Source	1%

10	jdmfs.org Internet Source	1 %
11	repository.unhas.ac.id Internet Source	1 %
12	sysrevpharm.org Internet Source	1 %
13	www.nature.com Internet Source	1 %
14	Submitted to Universitas Hasanuddin Student Paper	<1 %
15	doczz.net Internet Source	<1 %
16	elibrary.almaata.ac.id Internet Source	<1 %
17	jehp.net Internet Source	<1 %
18	jurnal.unsyiah.ac.id Internet Source	<1 %
19	www.mdpi.com Internet Source	<1 %
20	lib.pt.cu.edu.eg Internet Source	<1 %
21	link.springer.com Internet Source	<1 %

22	worldwidescience.org Internet Source	<1%
23	snhrp.unipasby.ac.id Internet Source	<1%

Exclude quotes	On	Exclude matches	< 5 words
Exclude bibliography	On		