

**DENTINO**  
**JURNAL KEDOKTERAN GIGI**  
**Vol III. No 2. September 2018**

**CARIES RISK EVALUATION USING CARIOGRAM IN MANAGEMENT OF  
CHILDREN RAMPANT CARIES**  
**(Case Report)**

Nurdiana Dewi<sup>1</sup>, Siti Bale Sri Rantinah<sup>2</sup>, and Al Supartinah<sup>2</sup>

<sup>1</sup>Resident of Pediatric Dentistry Study Program, Faculty of Dentistry UGM

<sup>2</sup>Lecturer of Pediatric Dentistry Department, Faculty of Dentistry UGM

**ABSTRACT**

**Background:** The prevalence of rampant caries in children is still high. Management of caries should be done immediately to maintain the function of the teeth. Evaluation of rampant caries management may be performed with the cariogram. Cariogram describes the cause and sequence of caries risk. **Objectives:** The aim of this case report was to report the results of the evaluation of rampant caries management using cariogram in 6-year-old girls at Pediatric Dentistry Clinic of RSGMP Prof Soedomo. **Method:** A 6-year-old girl accompanied by her mother reported to Pediatric Dentistry Clinic of RSGMP Prof. Soedomo Faculty of Dentistry UGM with the chief complaint of multiple decayed teeth. Based on anamnesis and clinical examination, it can be concluded that the patient had rampant caries. A cariogram was performed at initial treatment, followed by DHE and topical application fluor. Treatment was performed by restore 53, 62, 63, 64, 65, 74 and 84 using Glass Ionomer Cement (GIC). Pulpectomy were performed at 75 and 85. Teeth 52 and 54 were extracted. Crown and loop space maintainer was performed to restore 55 and obtain the space of 54. **Result:** Evaluation of treatment using cariogram was performed at 3<sup>rd</sup> months and 6<sup>th</sup> months evaluation. **Conclusion:** It was concluded that there were decreased in the magnitude of caries risk factors. The highest decreased of risk factors occurred in susceptibility and bacterial factors.

Keywords: Caries, cariogram, rampant caries, management

Correspondence: Nurdiana Dewi, Resident of Pediatric Dentistry Study Program, Faculty of Dentistry UGM, Indonesia; Yogyakarta. Email : [nurdianadewi@gmail.com](mailto:nurdianadewi@gmail.com)

**INTRODUCTION**

Caries is a biofilm (plaque)-induced acid demineralization of enamel or dentin and mediated by saliva.<sup>1</sup> Rampant caries is a term used to perform

dental caries that suddenly appear widespread, and rapidly burrowing, resulting in early involvement of the pulp and affecting those teeth which usually regarded as immune to ordinary decay.

The mechanism of the decay process is similar to that of caries in general, but decay in rampant caries can occur suddenly in teeth that were previously sound for many years. This sudden onset of the disease suggest that an overwhelming imbalance of the oral environment has occurred, and some factors in the caries process seem to accelerate it so that it becomes uncontrolled.<sup>2</sup>

Management of rampant caries should be carried out comprehensively. Treatment of ECC can be accomplished through different types of intervention, depending on the progression of the disease, the child's, as well as the social, behavioral and and child's medical history.<sup>3</sup> The risk assessment of caries is one of the most important things to be done in a comprehensive management of rampant caries. This assessment may be performed in early treatment as well as during the treatment. Predicting the caries risk can help determine the precautions for new caries. If the major etiological factors are known, individual treatments can be performed with good results. The aims of assessment of risk factors during treatment is to evaluate treatment success.<sup>4-6</sup>

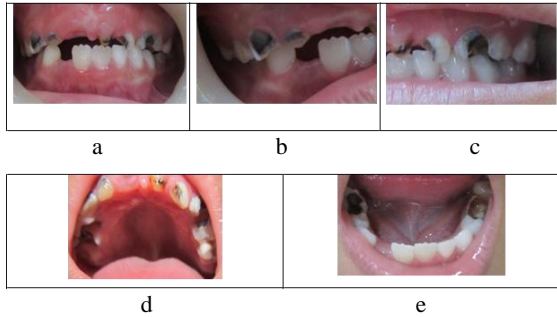
Assessment of caries risk can be done with a cariogram. Cariogram is an interactive computer-based tool for caries risk assessment in the dental clinic. Cariogram analyze the data including caries experience, related diseases, diet contents and diet frequency, amount of plaque, mutans streptococci, fluoride program, saliva secretion and saliva buffer capacity. These etiologic factors are assessed and then the risk is calculated. The possibility of new caries are also calculated with this tool.<sup>6-8</sup>

This case report describes the results of the evaluation of rampant caries management using cariogram in 6-year-old girls at Pediatric Dentistry Clinic of RSGMP Prof Soedomo, FKG UGM, Yogyakarta.

## CASE REPORT

A 6-year-old girl came to Pediatric Dentistry Clinic of RSGMP Prof Soedomo FKG UGM with chief complaint of multiple decayed teeth. Her oral hygiene status was poor. Based on the Frankl Behavior Scale, child behavior was positive. Children had the habit of drink milk in bottle until the age of 4. The bottle used as a pacifier. The patient had no complaint about her general health. The results of dietary records showed that patient often consume foods that contain high carbohydrates and consume snacks between meals.

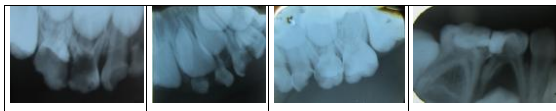
On clinical examination it was found caries at teeth 55, 53, 62, 63, 64, 65, 74, and 84; mobility at teeth 52; radix at teeth 61 (Figure 1). Based on anamnesis and clinical examination, it was determined that patient had rampant caries. Orthopantomogram (OPG) and periapical radiographs were performed to support the diagnosis and treatment plan (Figures 2 and 3). Radiograph revealed pulpal involvement of teeth 75 and 85 and apex resorption of 54.



Picture 1. Intraoral photo before treatment. a. anterior; b. right side; c. left side; d. maxillary occlusal; e. mandibular occlusal



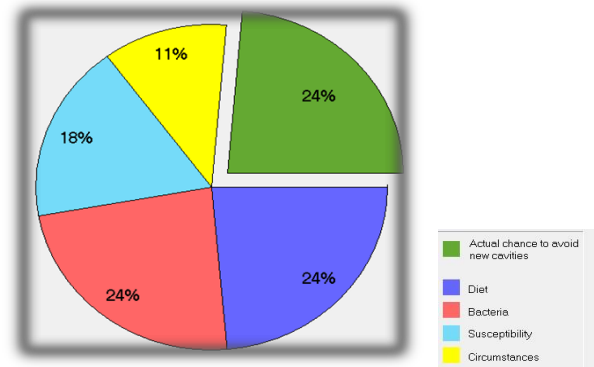
Picture 2. Orthopantomogram (OPG)



Picture 3. Periapical radiograph. a. teeth 55, 54; b. teeth 61, 62; c. teeth 64, 65; d. teeth 84, 85

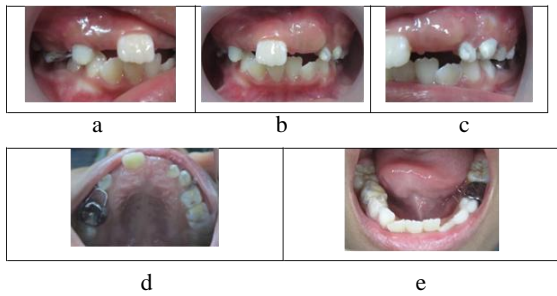
On the first visit, a carious risk assessment using cariogram was performed. The cariogram result shows the possibility to avoid new caries 21%, with caries factors were diet 23%, bacteria 23%, susceptibility 23%, and circumstances 11% (Figure 4). Dental Health Education (DHE) to the patients and parents was done based on cariogram results. Patient was recommended to reduce the consumption of sweet foods and drinks between meals and reduce cariogenic foods. Patient was also recommended to brush her teeth well using fluoride

toothpaste. On this visit also applied topical fluoridic application using APF Gel 1.23% (Fluocal, Septodont, France).



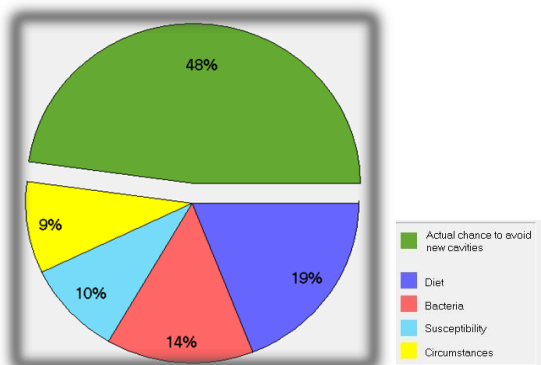
Picture 4. Cariogram before treatment

Treatment of caries was first done in second visit using block modification method. The treatment starts from anterior maxillary region then left posterior maxillary region, left posterior mandibular region, right posterior mandibular region and right posterior mandibular region. On the second visit, teeth 53, 62 and 63 were restored using Glass Ionomer Cement (GIC). On the third visit, 74 was restored using GIC and pulpectomy was performed at 75. At the fourth visit, 84 was restored using GIC and pulpectomy was done at 85. Obturation of root canals was performed using calcium hydroxide-iodoform paste (Metapex®, META Biomed Co. Ltd., Korea). Restoration of teeth 75 was performed using Stainless Steel Crown (SSC) and 85 using with GIC. Extraction of 54 was performed on subsequent visit under infiltration anesthesia, and at the last visit a crown and loop space maintainer was performed to restore 55 and retain the space of 54 (Figure 5).



Picture 5. Intraoral photo after treatment. a. anterior; b. right side; c. left side; d. maxillary occlusal; e. mandibular occlusal

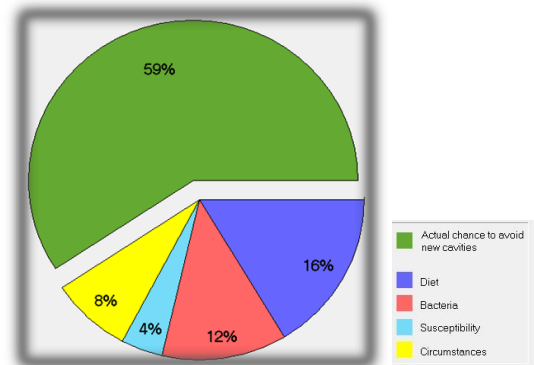
At the 3<sup>rd</sup> months evaluation, restoration and space maintainer were still good. Evaluation of caries risk was re-established using cariogram. The cariogram result showed the possibility to avoid new caries by 48%. It means there had been an increase of 24% when compared to the first visit. The highest caries risk factor was diet by 19%. Another caries risk factors were bacteria by 14%, susceptibility by 10%, and circumstances by 9% (Figure 6). Dental Health Education (DHE) was performed again to the patient and her parents by recalling to avoid cariogenic foods and control the frequent of snacks and meals and brushing the teeth regularly.



Picture 6. Cariogram at 3<sup>rd</sup> months evaluation

At the 6<sup>th</sup> months evaluation, restoration and space maintainer were still

attached properly. Assessment of caries risk using cariogram was performed again. The cariogram result showed the possibility to avoid new caries by 59%. It means there had been an increase of 35% when compared to the first visit and 11% compared to the first evaluation. The highest cause of caries was still the same as the previous visit ie diet by 16%. The decrease in dietary factors only 3%. The next causative factor of caries was the bacteria by 12%, susceptibility by 4%, and circumstances by 8% (Figure 7). Dental Health Education (DHE) performed again to the patient and parents to continue regulate dietary habit and maintain oral hygiene. Topical fluoride applications were performed again at this visit.



Picture 7. Cariogram at 6<sup>th</sup> months evaluation

## DISCUSSION

Cariogram is a graphical picture that illustrates the risk of new caries with various etiologic factors. The purpose of the cariogram is to determine the caries risk graphically, exemplify to what extent different factors affect this chance, and to encourage the introduction of preventive measure before new cavities could develop. This cariogram can be used in a dental clinic or used as an education program.<sup>6-7</sup>

The caries risk calculated by including the causal factors of caries so there are five color sectors: green, dark blue, red, light blue and yellow. This color sector indicates factors related to dental caries. The green sector shows an estimation of the actual chance to avoid new cavities. The dark blue sector indicates dietary factor based on a combination of diet contents and diet frequency. The red sector indicates bacterial factor based on a combination of amount of plaque and mutans streptococci. The blue light sector indicates susceptibility based on a combination of fluoride program, saliva secretion, and saliva buffer capacity. The yellow sector indicates circumstances based on a combination of past caries experience and related diseases.<sup>6-8</sup>

In this case report, caries risk assessment using cariogram was performed at initial treatment, 3<sup>rd</sup> months evaluation and 6<sup>th</sup> months evaluation after treatment. Cariogram results at initial treatment showed the possibility to avoid new caries only 24%. This was due to factors that affect the occurrence of caries was still high with the dominant factor was diet and bacteria factors. As recommended by cariogram, the first treatment performed was fluoride application. Fluoride application in this case was done topically. In addition through topical fluoride application, patients also got fluoride from GIC. Glass Ionomer Cement release fluoride so it could increase fluoride levels in saliva, plaque, and hard tissue.<sup>10</sup>

Fluoride can inhibit caries development because fluoride has antimicrobial effect, induced the remineralization and inhibited demineralization. Fluorides inhibit the

growth of plaque bacteria by blocking enolase enzymes during glycolysis, inhibit demineralization when dissolved in saliva, stimulate remineralization by forming fluoroapatite when dissolved in saliva, as well as affecting tooth morphology by making pits and fissures flatter so it is not susceptible to caries.<sup>11-12</sup>

At 3<sup>rd</sup> months follow-up, the possibility of avoid caries increased to 48%. This was due to the decrease in risk factor. The highest risk factor decrease occurs in bacterial and susceptibility factors. This was probably caused by the application of topical fluoride and the ability of patient to maintain oral hygiene was better before initial treatment after Dental Health Education (DHE). The patient then instructed again to always clean the teeth and mouth with a toothpaste containing fluoride.<sup>13</sup>

There were only a few decrease on diet factor. This is likely caused by the patients that had not been able to maintain her diet well, although DHE had been given to reduce the consumption of sweet snacks and drinks. Patients still had a habit of consumption of sweet snacks between meals. Changes in children's habits in dietary behavior take a long time.<sup>14</sup> Consumption of sweet snacks or drinks between meals could increase the risk of caries. The increased of frequency of eating is followed by the increased of caries risk. This is due to a recurrent pH reduction after consumption of cariogenic foods. Consumption of sticky and sugar-containing foods such as sweet biscuits and crackers also causes a prolonged pH reduction.<sup>15-18</sup>

The patient's parents also explained that the patient did not like to eat fruits and

vegetables. Fruits and vegetables are needed for caries prevention. Consumption of fruits and vegetables will increase salivary flow. Most fruits and vegetables are not cariogenic because of the content of polyphenols. The fruits that are cariogenic are bananas and kiwis. Banana has a high Caries Potential Index (CPI) and kiwi has a low pH.<sup>17-19</sup> Based on this case report, it can be concluded that there were decrease in the magnitude of caries risk factors. The highest decreased of risk factors occurred was in susceptibility and bacterial factors.

## REFERENCES

1. American Academy of Pediatric Dentistry. Definition of early childhood caries. 2008. Available from [http://www.aapd.org/assets/1/7/d\\_ec\\_c.pdf](http://www.aapd.org/assets/1/7/d_ec_c.pdf). Accessed January 3<sup>rd</sup>, 2018. p.15
2. Chin JR, Kowolik JE, Stookey GK. Dental Caries in the Child and Adolescent. In Dean JA, Avery DR, McDonald RE. Dentistry for the Child and Adolescent. Missouri: Mosby Elsevier; 2010. p.180-3
3. Çolak H, Dülgeril ÇT, Dalli M, Hamidi MM. Early childhood caries update: A review of causes, diagnoses, and treatments. *J Nat Sci Biol Med* 2013; 4(1): 29-38
4. American Academy of Pediatric Dentistry. Guideline and caries risk assessment and management for infants, children, and adolescent. Reference Manual 2014;37(6): 132-39
5. Tsang P, Qi F, Shi W. Medical approach to dental caries: Fight the disease, not the lesion. *Pediatr Dent* 2006; 28(2): 188-98
6. Bratthall D, Petersson GH, Stjernswärd JR. Cariogram manual. Cariogram Internet Version, 2004. Available from [https://www.mah.se/upload/FAKUL\\_TETER/OD/cariogram%20program%20caries/cariogmanual201net.pdf](https://www.mah.se/upload/FAKUL_TETER/OD/cariogram%20program%20caries/cariogmanual201net.pdf). Accessed November 8<sup>th</sup> 2017. p. 1-50
7. Anup N, Vishnani P. Cariogram - A multi-factorial risk assessment software for risk prediction of dental caries. *International Journal of Scientific Study* 2014; 1(4): 58-61
8. Koch G, Poulsen S, Twetman S. Caries Prevention. In Koch G and Poulsen S. Pediatric Dentistry a Clinical Approach. 2<sup>nd</sup> ed. West Sussex: Wiley Blackwell. 2009. p 91-108
9. Celik EZ, Gokay N, Ates M. Efficiency of new caries risk assessment in young adults using cariogram. *Eur J Dent* 2012; (6): 270-79
10. Mousavinasab SM and Meyers I. Fluoride release by glass ionomer cements, compomer and giomer. *Dent Res J (Isfahan)* 2009;6(2): 75-81
11. Rosin-Grget K and Lincir I. Current concept on the anti caries fluoride mechanism of the action. *Coll. Antropol* 2001;25(2): 703-12
12. Deery C and Toumba KJ. Diagnosis and prevention of dental caries. In Welbury R, Duggal MS, Hosey MT (editor). *Paediatric Dentistry*. 4<sup>th</sup> ed. Oxford: Oxford University Press. 2012. p 85-104

13. Levine R. Advancing the scientific basis of oral health education. *Community Dental Health* 2015; 32:66-67
14. Short SE and Mollborn S. Social determinant sand health behaviors: conceptual frames and empirical advances. *Curr Opin Psychol* 2015; 5: 78-84
15. American Academy of Pediatric Dentistry. Policy on Early Childhood Caries(ECC): classification, concequences, and preventive strategies. *Reference Manual* 2016; 39(6): 59-61
16. Punitha VC, Amudhan A, Sivaprakasam P, Rathanaprabu V. Role of dietary habit and diet in caries occurrence and severity among urban adolescent school children. *J Pharm Bioallied Sci* 2015; 7(Suppl 1): S296-300
17. Touger-Decker R and van Loveren C. Sugar and Dental Caries. *Am J Clin Nutr* 2003; 78(suppl): S881-92
18. Gupta P, Gupta N, Pawar AP, Birajdar AA, Natt AS, Singh HP. Role of sugar and sugar substitutes in dental caries : a review. *ISRN Dent* 2013; 2013:1-5
19. Lee KS, Kim N, Lee E, Cho J. Cariogenic potential index of fruits according to their viscosity and sugar content. *Int J Clin Prev Dent* 2014; 10(4):255-25.

