CHAPTER II

ESSAY

"Affectivity in Preventing Dental Caries"

2.1 INTRODUCTION

Dental caries is a public health problem in most countries. The current situation is that the prevalence of dental caries is declining in industrialized countries and increasing in less developed countries (Alice, 1996). Despite our ability to prevent this disease, dental caries is alive and well, not only in developing countries, but also in many industrialized countries.

In many countries, many people believe that pain and loss of teeth are a part of life. In many countries, the main method of treating dental caries is extraction of the tooth under emergency condition. In most industrialized countries, conventional restorative treatment of caries is practice, which require sophisticate and expensive equipment and extensively trained health care provider (Alice, 1996).

The interplay of the Etiological Factors in Dental Caries was shown as Figure 2.1 as follows

2.2 DENTAL CARIES

2.2.1 Meaning of dental caries

Dental caries is a disease of the mineralized tissue of the teeth, namely enamel, dentine and cementum, caused by the action of microorganism on fermentable carbohydrates (Kidd and Joyston – Bechal, 1987). This definition derived from the concept of chemicoparasitic or acidogenic theory that was advanced by Miller (McDonald and Avery, 1994). Dental caries is characterized by a decalcification of the inorganic portion and followed by a disintegration of the organic substance of the tooth because the outer surface of enamel is far more resistant to demineralization by acid than the deeper portion of enamel is, the lesion occurs in the subsurface and continues to enlarge, with the eventual collapse of the thin surface layer becoming a cavity. At the stage of demineralization on the incipient subsurface enamel, the lesion can be arrested or reversed by the process of remineralization (McDonald and Avery, 1994)

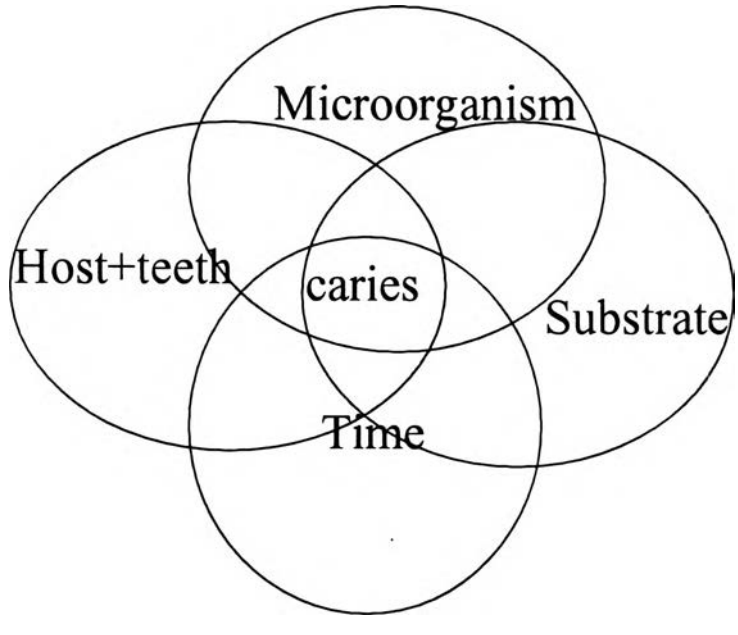
2.2.2 Etiology of dental caries

Dental caries is a multi-factorial disease. Numerous authors have recognized and described the caries process which is dependent upon the interrelationships of four main groups of factors. These groupings involve microbial, substrate, host and time factors (Menaker, 1980). Some plaque bacteria are capable of fermenting a suitable dietary carbohydrate substrate (such as sucrose and glucose) to produce acid, causing

the plaque pH to fall to below 5 within 1-3 minutes. Repeated falls in pH in time may result in the demineralization of a susceptible site on a tooth surface, thus initiating the carious process. The interplay of these four causative factors is sometimes represented diagrammatically by a number of overlapping circles (Figure 2.1). Only when all four factors are present caries will occur (Kidd and Joyston – Bechal, 1987).

The Interplay of the Etiological Factors in Dental Caries was shown as Figure 2.1 as follows:

Figure 2.1: The Interplay of the Etiological Factors in Dental Caries



2.3 EFFECTIVENESS

2.3.1 Definition

The effectiveness in dental caries prevention is the "caries-inhibiting effect" (Rijkom, Truim and Hof, 1997)

2.3.2 Measurement

Although there are many criteria for caries measurement, the WHO criteria will be used in this study. these criteria are as follow:

Decayed Crown : Caries is recorded as present when a lesion in a pit or fissure, or on a smooth tooth surface, has an unmistakable cavity.

Decayed root : Caries is recorded as present when a lesion feels soft or leathery to probing with the probe. If the root caries is discrete from the crown and will require a separate treatment, it should be recorded as root caries (WHO,1997).

In this study, fissure caries will be considered, therefore, only decayed crown criteria will be used.

2.4 CONTROL IN DENTAL CARIES

2.4.1 General information

Dental caries is a preventable disease. Theoretically on the basis of the etiology of the disease, the ways of preventing dental caries are :

- Limiting pathogen growth and metabolism.
- Increasing the resistance of the tooth surface to demineralization
- Elimination of bacterial plaque (Kidd and Joyston- Bechal,1987; Roberson, Heymann, Edward, and Swift, 2002).

Each of these requires the patient's cooperation. Four main preventive strategies have been developed over the years, namely, (a) fluorides, (b) pit and fissure sealing, (c) dietary choice, and (d) plaque control. Fluorides are having a major impact on smooth-surface caries,fissure sealing is very effective to occlusal caries, changing dietary practices seems to be having little impact. Plaque control, as practiced routinely by the majority of people, is not sufficient to result in caries reduction (O'Mullane, 1995)

The most effective and practical means of reducing caries demonstrated to date is the provision of optimal exposure to systemic and topical fluoride (Lone and Anthony, 1993).

2.4.2 Type of caries prevention

2.4.2.1 Fluoride

2.4.2.1.1 What is fluoride

Fluoride is a mineral that occurs naturally in all water sources, even the oceans, fluoride ion comes from the element fluorine. Fluorine, the 17th most abundant element in the earth's crust, is never encountered in it's free state in native. Fluoride is effective in preventing and reversing the early sign of dental caries. It makes the tooth

structure stronger and more resistant to acid attacks (http://www.ada.org/public /topics/fluoride/artcl-01.html,12/3/2002).

2.4.2.1.2 Type of fluoride

A. Systemic fluoride.

Systemic fluoride can be used in various forms

1. Fluoridation of school water supply

School fluoridation may be defined as the upward adjustment of the fluoride content of a school water supply to optimum level for prevention of dental caries (Dominick andGordon, 1981). A school-based water fluoridation program where the fluoride level is up to 5 ppm have been suggest (Ekstrand, Fejerskov and Silverstone, 1989)

Murray and Rugg- Gunn (1982) reported percentages of caries reduction observed in 95 studies on the effectiveness of controlled fluoridation in 20 countries, they found that the percentage of caries reduction ranging from 20% to 90%.

2. School dietary fluoride supplement program

School dietary fluoride supplement program may be defined as the use of a dietary fluoride supplement such as a pill, lozenze or chewable tablet which is ingested in the school setting, on a daily basis during the school year, approximately 150 to 200 days a year, for the prevention of dental caries (Dominick and Gordon, 1981)

Communal water fluoridation is the method of choice in providing systemic fluoride but where communal water fluoridation is not feasible or where apathy and

political opposition prevent its implementation, fluoride supplements offer an alternative source of systemic fluoride; Fluoride tablet, drop and lozenges (Newbrun, 1989)

The cariostatic effects of fluoride supplements have ranged from less than 10% to more than 80% depending on how soon after birth supplementation starts, and on the degree of compliance and dosage (Driscoll, 1974)

Fluoride supplement dosage schedual approved by the American Dental Association, the American Academic of Pediatrics, and the American Academy of Pediatric Dentistry in 1994 is shown in Table I.

Table 2.1: Fluoride supplement dosage

Age	Fluoride ion level in drinking water (ppm)*		
	<0.3ppm	0.3-0.6ppm	>0.6ppm
Birth-6months	none	none	none
6months-3years	0.25mg/day**	none	none
3 - 6 years	0.5 mg/day	0.25mg/day	none
6 - 16 years	1.0 mg/day	0.5mg/day	none

* 1 ppm = 1 mg/lite

** 2.2 mg Sodium fluoride contain 1 mg fluoride ion

(http://www.ada.org/public/topics/fluoride/artcl-01.html. 12/3/2002)

B. Topical fluoride

1. Professional application

The topical application of concentrated fluoride preparations (2% Sodium fluoride, 8% Stannous fluoride, or Acidulated phosphate fluoride containing 1.23% fluoride) by a dentist or dental hygienist is an established caries preventive procedure. 2% Sodium fluoride solutions were tested in the early 1940s and were shown to reduce caries with about 30%, The use of acidulated phosphate fluoride containing 1.23% fluoride provide 9.25%-40% reduction in caries (Wellock and Brudivold ,1963)

2. Fluoride mouthrinse

A school fluoride mouthrinse program may be defined as the use of a fluoride mouthrinse by children in the school setting for the prevention of dental caries on a daily or weakly basis, depending on the resources of the school or community.

The recommendation of neutral Sodium Fluoride in diluted solution is 0.2% for weekly rinse and 0.05% solution for daily rinse (Dominick and Gordon, 1981).

Biweekly rinse for 1 minute with a solution of 0.2% Sodium Fluoride (900 ppm fluoride) was as effective in reducing decay as were professionally applied topical fluoride treatments and daily rinsing for 1 minute with a dilute solution containing 0.05% Sodium fluoride (230 ppm fluoride) gave greater caries protection. The benefits from fluoride mouth rinsing range from 20% to 50% less decay (Torell and Ericsson, 1965).

3. Fluoride dentifrices

The use of fluoride toothpaste should have an additive benefit for children who are consuming fluoridated water, or these children on a fluoride supplement for a mouth rinse program in school. Fluoride toothpaste also should be used routinely in communities which do not have a fluoride prevention program (Dominick and Gordon, 1981)

The first fluoride containing dentifrice reported to decrease the incidence of caries, as compared with the similar use of a non-fluoride dentifrice, contained Stanous fluoride (0.4%) together with calcium pyrophosphate that had been treated to increase its compatibility with fluoride (Muhler, Radike, Nebergall and Day, 1954)

Sodium Monofluorophosphate (MFP) was first tested as therapeutic agent in dentifrices in the early 1960s. Numerous clinical trials of dentifrices containing 0.76% or 0.8% MFP have been conducted by different groups in various countries in almost all these trials some degree of effectiveness, about 25% less caries, has been demonstrated (DePaola, 1983).

4.2.2 Pit and fissure sealant

The use of pit and fissure sealants increased during the year 1980, both in community programs and in private practices (Disney ,1983 ,

Narendran and Burt, 1987; ADA, 1984; and Gonzalez, Frazier and Messer, 1991). The reason for this increase, according to most studies, is that sealants are

effective in preventing dental caries (Rock and Anderson, 1982 ; Ripa, 1988; and Wleinbaum, 1989)

Although fluoride treatment is the most effective in preventing smooth surface caries, they are less effective in preventing pit and fissure caries. And although occlusal surface account for only 12.5% of all tooth surface, they account for much of the caries in school children (Roberson, Heymann, Edward and Swift, 2002). From 1988 to 1991, the NHANES III survey (NCHS, 1994) revealed that occlusal surface in children's teeth were five times more likely to be the site of caries than proximal surface and twice as likely as facial or lingual surface. Pit and fissure sealant were designed to prevent fissure caries and demonstrated to be effective (Simonsen, 1989). The sealant technique is an efficient and safe method of preventing pit and fissure caries in newly erupted molar teeth. Simonsen (1991) proposed that the placement of sealant will avoid an initial occlusal restoration, and complex restoration and extraction. The effectiveness of dental sealant for caries reduction is more than 80% after 1 year and 70% after 2 years (Ripa, 1980).

4.2.3 Diet

Dietary sucrose has two important effects on plaque. First, frequent ingestion of foods containing sucrose provides a stronger protential for colonization by Mutans Streptococcus, enhancing the caries potential of the plaque. Second, mature plaque exposed frequently to sucrose rapidly metabolizes it into organic acid, resulting in a profound and prolonged drop in plaque pH (Roberson , Heymann, Edward and Swift, 2002).

Caries activity is most strongly stimulated by the frequency rather than the quantity of sucrose ingested. Controlling dental caries through diet modification is complex and has met with only limited success. The precision cariogenicity of any food is not easily predicted, people eat a mixed diet, and the sequence of eating various foods and the form of foods may affect the cariogenic protential (Lone and Anthony, 1993).

4.2.4 Plaque control

There are essentially three approaches to preventing the dental plaque

1. Mechanical plaque removal by the individual.
2. Mechanical plaque removal by the dental professional.
3. Chemotherapeutic methods of plaque control.

A. Mechanical plaque removal by the individual

At least 2 times a day for tooth brushing and best fit most people's daily schedules and it does not matter about the type of tooth brush and scrub method is the simplest method available and on that is no less effective than any other (Brian, Stephen and Donald, 1993)

B. Mechanical plaque removal by dental professional

Professional care has been shown to successfully control plaque deposit. This procedure consist of rubber cup cleaning of accessibility surface and engine-mounted pointed bristle was used for cleaning fissure in occlusal surfaces and use dental floss for interdental cleaning (Brian, Stephen and Donald, 1993).

C. Chemotherapeutic method of plaque control.

The inability of many people to remove their own dental plaque consistently results from insufficient knowledge, poor mechanical ability or lack of motivation these kinds of people must use chemical plaque control added in mechanical plaque control.

Chlorhexidine gluconate 0.2 % once or twice daily is recommended to be a chemical agent and the other antibacterial compound which can be used for caries inhibition is alexidine dihydrochloride 0.053- 0.05% and cetylpyridinium chloride (Brian, Stephen and Donald, 1993)

2.5 CONCLUSION

2.5.1 Why do we use pit and fissure sealant for preventing dental caries in school children?

Many strategies used for caries prevention in school children; water fluoridation, oral fluoride tablet intake, fluoride mouth rinse are very effective for caries preventing in smooth surface but in comparison with pit and fissure sealant some authors said although sealants were more expensive, on an annual cost per person, it has greater effect in reducing caries on occlusal surfaces (Louise, 1997). For water fluoridation is not available in Thailand nowadays, only Nakhorn-nayok province can provide fluoride water to people as a pilot project in the province.The others provinces cannot do so because of high cost for investment and Thai people usually do not drink

tap water because they are not sure about the cleaning process (Dental Health Division, Health Department, Ministry of Public Health, 1998)

For fluoride mouth rise, the Ministry of Public Health conducted the an academic forum in 1998 and announce that it's not necessary for school children who brush their teeth with fluoride dentifrice everyday to use fluoride mouth rinse, because using fluoride mouth rinse every two weeks and brushing with fluoride toothpaste everyday provide the same outcome as brushing alone, so nowadays, the school provide brushing after lunch with fluoride dentifrice activity and pit and fissure sealant to prevent occlusal caries in first molar teeth and oral fluoride tablet intake for kindergarten children and other oral health promotion to promote good dental health in the school.

2.5.2 What are alternative materials for pit and fissure sealant?

Resin material is used as pit and fissure sealant since 1970s (Simonsen, 1984). A high compressive strength is the advantage of resin and the disadvantage of this material is that it is sensitive to moisture, so it's quite difficult to manipulate resin in a field setting where moisture cannot be controlled and resin also needs heavy equipment for the sealing procedure, therefore, it is always used in a clinical setting where a perfect condition can be controlled.

Glass-ionomer material was introduced for using as pit and fissure sealant in 1974s (McLean and Wilson, 1974), that it needs no heavy equipments is the advantage of this material, the less retention rate is the disadvantage of glass-ionomer when

compared with resin (Raadal, 1996 ; Roger, 1996 ; Arrow, 1995 ; Gunlog, 1995 ; Songpaisarn, 1995 and Forss, 1994). Although glass-ionomer has a lesser retention rate than resin, some authors report that there are the remaining material in the bottom of the pit an fissure of the tooth and glass-ionomer can release fluoride for preventing dental caries (Matha and Franklin, 1995). Another advantage of glass-ionomer is that it is less sensitive to moisture than resin so it can be used in a field setting where moisture cannot be controlled properly. So it would be interesting to compare the cost-effectiveness ratio between resin and glass-ionomer used as pit and fissure sealant in mobile dental services for school children.

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