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PREVENTIVE AND CONTROL MEASURES FOR DENTAL CARIES IN SCHOOL DENTAL
PROGRAMS OF SOUTH EAST ASIA

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INTRODUCTION

Dental caries is a recent disease in the history of man.

It is rare in the teeth of ancient skulls. It remains relatively rare in some parts of the world but virtually every person in the civilized world is attacked by the disease in his lifetime. Urban dwellers in developing countries are rapidly becoming victims of a high prevalence of dental caries.

The disease is costing more and more to treat and the number of people affected is increasing. The manpower and finance to meet these needs are not enough and certainly will not be as prevalence increases.

The purpose of this thesis is to help the writer to develop his knowledge of preventive school dental health programs and to set out general recommendations for types of programs which would appear to be suited for the needs of some developing countries.

The thesis is composed of three main parts. The first part deals with the types of recommended preventive and control methods that have been used in different countries and reported by various leading figures and authors in the preventive field.
The second part is the review of literature of school dental programs in each individual country. This includes the following:

a) Population
b) Dental Manpower
c) Economic
d) Dental Caries Prevalence
e) Dental Practice
f) Water Fluoridation
g) School Dental Health Service
h) Short Summary and Conclusion
i) Short Recommendation for Improvement

The final part contains over-all recommendations, summaries and conclusions of all the countries involved.

Due to the limited available information resources and the lack of direct experience that could be gained by visiting and actually participating in the school dental program of different countries, the materials presented is of a general nature. The recommendations, summaries and conclusions are based only on information derived from the available literature.
2. **PREVENTIVE AND CONTROL MEASURES:**

2.1 **Dental Health Education:**

It is important that dental health education is improved on a broad front, from efficient distribution and reinforcement of information to involvement in preventive dental procedures as well as the support of research into factors which will promote permanent alternation of behaviour. (Mason 1975)

People vary in extraversion and dominance and this will affect their popularity and the influence they are able to exert. (Argyle 1969)

Both community and opinion leaders in groups can be very useful in promoting dental health education.

Behaviour is a function of attitudes, norms, habits and expectancies about reinforcement. It often changes attitudes as people develop attitudes that justify their previous behaviour. Attitudes help people to adjust, to defend their egos, to express their values and to understand the world around them. The experiences of people determine their attitudes. (Triandis HC-)

Health educators, too often provide complicated health information that they themselves think people need without first finding out what actually the people are prepared to learn. Time and effort are wasted with hardly any achievement resulting in great disappointment. The technique should be the other way around so that the people could be involved and allow them to find out things for themselves (Feeling
of self-achievement). Reinforcement is needed to build up their knowledge.

The relationship of maternal anxiety to child behaviour in the dental experience is a subject of continued interest to the clinician and to the researcher, who seeks methods for predicting and modifying a child's behaviour. Research has demonstrated a significant relationship between high maternal anxiety and uncooperative child behaviour in the dental situation (Pinkham & Fields 1976).

The mothers should be made aware of the influence they exert on their children in the dental situation.

The best time for the child to visit the dental clinic is when he/she is dentifly fit. His/Her orientation would be pleasant and would help to reduce the fear which he/she would have to face one day.

Developing the awareness of risks would not only have been an ineffective way of protecting the children, it also seems to be a dangerous one: it would not produce healthy children, but health neurotice. Future studies should be directed towards harmonious health education of children living at a deeper awareness of the value of good health (Flasschaert & König 1974).
The child's first visit to the dentist should be no later than three years of age. Early visits maintained regularly throughout life, help immensely to achieve the productive concept in dentistry (Jacobs HD 1974).

One of the recurring features of the socially effective person is that he is highly rewarding to other people. Health educators should be trained and directed towards making people more aware of the non-verbal and verbal elements of interaction. Some kinds of training affect one area of social competence more than others; it will be useful to keep this list in mind while considering the usefulness of various approaches. Competent performer should be able to present himself clearly to others without too much concealment or exaggeration and without embarrassment. Embarrassment is really a form of social anxiety (Argyle 1969).

Health educators must show their interest and willingness to help people. They must show these in both verbal and non-verbal communication. They must try to avoid any action or move that may hinder or block communication. They must also try not to evaluate, control (restrict) or manipulate the people. To be
unsympathetic or to display superiority and allness would also
destroy interaction relationship.

There should be a change in attitudes and health behaviour on
the part of both the recipient and the donor in the dental
health relationship so that the effectiveness and completeness
of the health care operation will be maximised (Martin ND).

Some dentists are now making it a regular part of their office
routine to educate their patients in the value of disease
prevention. It is an attitude which has changed the modern
practice of dentistry. The combination of improved treatment
and restoration methods, all with a preventive objective, has
produced a better hope in behalf of the improvement of oral
health (Jacobs HD 1974).

Medical, dental, school personnels and any other interested body
could all combine efforts in promogating and educating the public
on health matters. It would be effective approach to reach the
public. Unfortunately, this has not been practiced widely.
Effective health education demands the understanding, sympathy, cooperation, and support of health specialists, in the school program. Physicians, nurses, dentists, bygienists, physical educators and nutritionists should understand, contribute to and cooperate in the program of health education. Criticism, dissension and aspersion will weaken the best of programs (Turner, Gellery and Smith).

People are not only unaware of dental health, but also different groups have different knowledge about it.

People sometimes refuse outside help because they feel that their problem is uncurable and normal.

Before people take any preventive action, they must be made aware of the followings: (Jacobs AD 1974).

A) They are susceptible to the disease in question.

B) The disease would affect them seriously should they contact it.
C) The preventive measures which are available

D) The benefits of the preventive measures outweigh the disadvantages.

Prevention is not so spectacular as treatment (restoration) and when children leave school with no fillings or only a few fillings, it is not always appreciated as successful prevention (Adorjan S 1975).

Oral hygiene kits issued directly to children of kindergarten are positively influenced their dental care behaviour. Significantly increased percentage of children changed to using the clinically proven fluoride toothpaste, an approved type of toothbrush, and disclosing tablets; the three oral hygiene aids included in the oral hygiene kits. (Fanning EA and Leppard PI 1975).

Can dentistry be appreciated by outsiders? Yes, but conveying this image to the public is a big problem. Each dentist should remind his patients of the positive benefits of his services and try to have his patients motivate their family and friend to seek these benefits. Patients do not appreciate good dentistry
and tell others about it if they do not know what has been done, why it was done, how it was done and what it means to them to have it done (Leff SD 1975.)

Community education in dental health is important to enable the community to appreciate the full benefits of the services provided. Poverty, lack of dental personnel and treatment facilities have been thought to be the only major factors for the poor dental health of the people. Singapore where there is in recent years rapid urbanization, a steady increase in affluence and number of dental graduates, the standard of dental health has not improved accordingly to expectation (Deong 1973).

Medical and dental public health records show clearly that present practices are poor. Attitude toward disease has not led to hygiene living. We have traditionally blamed Divine Providence for the illnesses which our own negligence has caused. The general lack of basic information in health matters. There is a considerable amount of such recent information that needs to become the possession of the average citizen. Habit affect health, and school can help to develop
health habits of the children (Turner, Sellery and Smith).

The evidences that the school can improve habits are as follow:

i) Youth is the time of habit formation. Health habits among others, are being formed at school.

ii) The school furnishes the kind of training that is needed for habit formation.

iii) The school works harmoniously with the homes. (Turner, Sellery and Smith).

If the children are taught the basic of good oral hygiene and are encouraged to practice it continually throughout their primary school year, they will develop favourable good oral habit which will remain with them for life. Other measures could be taught along this line.

The same approach should be encouraged at home. They should be well orientated to the dental clinic at the age of 3 and when no treatment is required. It is easy to get them on any preventive program at this stage.
The general principle underlying health education are as follows:

(Turner, Sellery and Smith)

i) One's health (including dental health) is determined by both his heredity and his mode of living. Two children with the same program of living may not maintain the same health.

ii) Health education is the joint responsibility of the home and school and less directly of the community. The school does not expect to supplant the home but rather to allow the child to find at school support for the program of healthful living which he is being taught at home.

iii) In the elementary school health education, or teaching of health is principally in the bands of the classroom teachers. Children will form habits, not by learning a fact, but by doing things repeatedly with satisfactory results.

iv) Health education must be accepted and fastened by the administrative authorities of the school as a part of the education program if it is to succeed. One can usually tell by talking with the principal, before going into classrooms whether there is a real health education program in the school or not.

v) Effective health education demands the understanding sympathy, cooperation and support of health specialist in the school system.
Physicians, nurses, dentist, hygienists, physical educators and nutritionists should understand, contribute to and cooperate in the program of health education. Criticism, dissension, and aspersion will weather the best of programs.

vi) Health instruction and the development of health attitude and habits contribute to the easier and better accomplishment of the medical, dental and nursing services.

vii) The promotion of teacher health is important to the health education program as well as to the quality and cost of education. Well teacher will do better classroom work then a sick teacher.

viii) The professional skill and initiative of the teacher constitute a most valuable element in the health education of the child. The health program must be so arranged that constructive and creative contribution of the individual teacher may be fastened.

ix) It is necessary to develop health practices on the part of the child before he is old enough to understand the scientific reasons upon which there practices rest. Health training begins in the home yet is supplemented at school.

x) Correct attitudes are important. The desirable attitudes toward health regards it as means of enriching life and not as an end in itself. Health contributes to happiness, to
comfort, to enjoyment and to the maintenance of friendly social relationships.
2:2 Fluoride:

A) Water Fluoridation:

The water supplies suitable for fluoridation are those in large towns and cities provided that water treatment and disinfection are efficiently maintained. It is in these places that the dental need is developing fastest; it is in these places that the need for water fluoridation is greatest. Its benefits could be reaped for a life time by all future urban dwellers who will constitute nearly one half of the population within thirty years. (Fuller 1969)

The costs relative to the ultimate benefits are not great. The Government of Hong Kong indicates a capital expenditure of approximately US$3600.00 for large capacity feeders (flows more than 2 million gallons per day) including accessories and air conditioning, and of approximately US$1200.00 for smaller feeders (flows less than 2 million gallons per day). Operational expenditure was given at about US$0.15 per 1000 imperial gallons, and cost per person per year receiving fluoridated water, about 2US cents. (Fuller 1969)

It is a measure specifically directed to children, which by reducing dental decay 50% to 60%, will reduce the need later for more expensive treatment facilities. New Zealand has shown already that water
fluoridation reduces the loss of dental treatment. The payment per child by the New Zealand Government to private dentist for the complete dental treatment if children has been halved at Hastings as a result of water fluoridation. (Fuller 1969)

An evaluation is made of the reduction in caries prevalence amongst Hastings children during a period of 10 years fluoridation. It is shown that in permanent teeth of children aged 6, 7, 8, 9, and 10 years caries rates have been reduced by 84, 73, 67, 53, and 55 per cent respectively.

In the permanent teeth of children aged 11 - 16 years caries rates have been reduced by from 52 - 30 per cent and caries rates in the deciduous teeth of children aged 5, 6, and 7 years have been reduced by 52, 50 and 36 per cent respectively. The reductions in caries prevalence rates in both permanent and deciduous teeth which have been described in Hastings children very closely resemble, for example, those described at Grand Rapids (Michigan) after 10 years of water fluoridation. (Tudwig 1965)

The effect of fluoridation on a dental public health program was found that there was a reduction in the staff and a reduction in the
overall loss of the program. (Deby and Hollis 1966)
A) School Water Fluoridation

One method, the fluoridation of school water supplies offers a means whereby sizable numbers of children may be benefited with principal demands in personnel, equipment and funds. (Horowitz, Stanley, Frank, Law and Driscoll 1968).

At age six, there is still a significant amount of calcification to occur in the later erupting permanent teeth. In addition, it has been demonstrated that a notable fluoride uptake occurs between the completion of permanent tooth calcification and eruption. There is also evidence that erupted teeth derive some caries-inhibiting benefits from the topical action of fluoridated water. (Horowitz, Stanley, Frank, Law and Driscoll 1968).

Since 1958, fluoride has been added to the water supplies of rural schools in Pike County, Kyig and Elk Lake, Pay at levels of 3ppm and 5ppm respectively. Fluoride levels greater than the optimum for immunity fluoridation were used in an attempt to approximate the total fluoride intake of children who drink fluoridated water on a full-time basis.
(Horowitz, Stanley, Frank, Law and Driscoll 1968).

An interim dental examination, conducted in 1966 was compared with the baseline findings, study children in Pike County experienced over-all reductions in average number of DHF teeth of 32.8 per cent and in Elk Lake, 33.9 per cent. (Horowitz, Stanley, Frank, Law and Driscoll 1968).

The most apparent disadvantage of school water fluoridation is that children are usually five or six class old before they begin attending school and consuming the school's water, whereas maximum benefits accrue when fluoridated water is consumed from birth. Another disadvantage to school water fluoridation is that children receive only intermittent exposure to fluoride because they attend school just five days a week for only part of the day. (Horowitz, Stanley, Frank, La.; and Driscoll 1968).
C) Systemic Fluoride Supplements

Fluoridated tablets taken daily right after birth up to the age where all the permanent teeth are fully calcified will have the same reduction in caries prevalence as the public water fluoridation, that is about 50-60%.

Fluoridated tablets are recommended in those areas where the community water supplies are not fluoridated. It should be emphasized also that the occasional user of tablets received very little protection against dental caries. Self-administration appears to be an unsatisfactory method of fluoride therapy because the majority of parents fail to maintain the daily fluoride supplements for the children (Fanning EA 1975).

Fluoride tablets have limited value. It may be employed in situations where water fluoridation is not feasible, and adequate control can be maintained. (Fuller 1969).
D) Topical Fluoride Application by Dentists or Auxiliary

The effectiveness of topical treatment depends not only on the amount of fluoride deposited, or in the case of Starrous fluoride, the amounts of time and fluoride deposited but on the extent of penetration of these ions, the types of compounds formed, and the reversibility of the reaction taking place (Sognnaes).

The oral surfaces of teeth acquire a resistance to dental caries if treated topically with a 1.0 or 2.0 per cent solution of Sodium fluoride. A series of four topical applications effect an approximate 40% reduction in the dental caries incidence (McClure FJ).

Calcium fluoride deposited on the tooth surface will not be permanently retained, some will be removed by saliva, food and being only slightly soluble, the remainder will furnish low concentration of fluoride ions. (Sognnaes).

Topical application of fluoride may also exert an effect directly on the plaque material. This effect may be a reduced ability of the plaque flora to form acid and polysaccharides from
Carbohydrates, or as a change in the Microbial Composition of plague (Loeschae, Murray, and Mellbery 1973).

Stannous fluoride has been found to cause discolouration of teeth and its chemical composition is not very stable. It is advisable to use it on the posterior teeth.

The use of topical application of fluorides is recommended for school dental health services especially in areas where the water supplies are not fluoridated.

The basic problem is that it requires the involvement of dental personnel and in places where there is an acute shortage of dental manpower, this may not be possible.

School health nurses could be trained to help in places where it would not be possible for the dental personnel to carry out this program.
The semi-annual supervised self application of a prophylactic paste, containing 9% Stannous fluoride, in school programs resulted in a statistically significant protective effect against the development of caries. The results observed with this program for a three year period in children aged six to fourteen years who were lifetime residents of an optical fluoride area indicated significant reduction in the incident of dental caries 30.1% and 24.7% as expressed by DHF teeth and surfaces respectively. If only the teeth had erupted during the study period were considered, the biogritude of the protective effect was 38.4% (Gish, Mercer, Stookey, and Pahl 1975).

The twice-daily use of an acidulated phosphate–fluoride mouthwash that contains a small amount of fluoride is effective in reducing the incident of dental caries in children. The figures given in this study were, decrease of 26% in the incidence of decayed and filled teeth and 25% in decayed and filled surfaces. (Finn SB, Moller P, Jamison H, Regattieri L and Hing LM 1975).

The application of acidulated phosphate of sodium fluoride in gel in a custom fitted tray of polyvinyl as well as of neutral sodium
fluoride yet have shown to reduce dental caries by 75 per cent
to 80 per cent; 23 months after cessation of treatments, the
remaining children in both groups still retained the advantage
of 55 per cent and 63 per cent fewer new DMF surfaces than the
controls (Pameijer HN, Hunt EE, and Brudevold FA, 1963).
2.3 Diet

Another important factor in the practice of dental prevention is the selection of a proper, wholesome diet. We must always avoid the heavy consumption of sweets such as candy and cake. Sugar in its refined and sticky form is the chief cause of dental caries. Between-meal snacks should be cut down as they interfere with proper nutrition. A well-balanced diet will help to prevent oral and systemic disease (Jacobs AD 1974).

Most meals contain something slightly cariogenic (acid-producing). Three count of waves of acid production can be expected with three normal meals (Truuvert M 1973).

If the teeth are cleaned (by using toothbrush) right after each meal, most of the cariogenic agents will be removed thus the attack of acid on the teeth will be eliminated or reduced.

When the child starts eating solid food, its attitude to eating becomes established. Therefore, if the child is trained to the habit of regular meals during this time, this may be of importance for avoiding caries accelerating food habits later on (Krasse BO).
Although the enamel of the fully erupted teeth is a very stable structure, it may undergo certain changes. Studies with radioactive isotopes have clearly shown that the enamel is fully permeable to substances normally occurring in the saliva and it takes up various elements mainly from the saliva (Krass B0).

Why do people eat so often between meals.

The most obvious reasons are as follows:

i) Economic:

Carbohydrates are our cheapest source of Calories.

ii) Practical:

The convenience of carbohydrates - rich meals and snacks might be of greater importance than the economic reasons. It is then more convenient to take sandwiches to the office (or schools) than to eat a cooked meal.

iii) Physiological:

A meal or a snack rich in carbohydrates but poor in protein will not still the hunger very long. This fact may be a physiological reason for repeated eating.

iv) Psychological:
The composition of a single meal is of less significance than the habit of eating between meals. This emphasizes the importance of psychological factors, which play an important role in establishing an eating pattern, which then may cause a nutritional disorder. A nervous person eating between meals often suppresses his restlessness. This might give rise to obesity, but it is possible that in some persons this same urge to eat causes caries. (Krasso 19). Teeth should be cleaned right after meal. Snacking should be discouraged if the teeth can not be cleaned (using toothbrush) right after eating.

Mothers should be taught about the nutritional value of food and should also be made aware of their great influence on their children diet which may determine their children's attitude about diet in the future.

Nutritionists and community health nurses should be taught about the effect of certain diet (sweets etc) on dental diseases and be encouraged to include it in their normal instructions to the community (mothers).
Any group that deals with the diet of the children should be included in this program. Good example are the people working in the School Canteens.

Snacking — enemy of teeth

As most meals contain something slightly cariogenic (acid-producing), we can count on three waves of acid production with three normal meals a day. The picture would look something like this:

![Graph showing acid production waves]

This pattern is unlikely to produce many cavities. However, if we add three very minor snacks, i.e. a Lifesaver candy at 10:00 a.m., a cookie and soft drink at 3:00 p.m. and a cup of hot chocolate at bedtime, the picture would be slightly different.

![Graph showing altered acid production waves]

The acidity would hardly have a chance to fall enough for the enamel to reach the remineralization zone. If this eating pattern is followed constantly, the result could easily be rampant caries (decay almost out of control) (Truuvert 1973).
2.4 Other trace elements - local and systemic

The prevalence of dental caries have been observed in two isolated villages in Colombia, South America. Although each village has less than 0.1 ppm fluoride in the drinking water, the caries prevalence between the two villages were highly significant. Water samples were analysed and it was found that concentration of calcium, magnesium molybdenum and vanadium were greater in the village with the low caries prevalence while concentration of copper, iron and manganese were higher in the samples from the village with the higher prevalence. (Glass, Rothman, Espinal, Velez and Smith 1973)

The studies with copper sulphate on a entirely post developmental study basis in the white lot resulted in reductions varying from 20 to 70%. Two studies in the use of vanadium as vanadium pentoxide in lionister have been reported in which unspecific major reductions in the incidence of teeth decay have been described. (Sognnaes)

Silver nitrate has been used on early lesion to arrest caries. It has been successful in alot of cases. The only unfortunate effect is that it leaves spots on the surface of the tooth.
Most of these experiment were done in rats. Comparable dates have not been obtained. There is still a lot of studies to be done before it is decided whether these elements could be used effectively in reducing dental caries in man.
2.5 Fissure Sealants

Nuva-Seal and Epoxylite 9075 have been repeated to reduce dental caries by as much as 99.3 and 64.6 per cent respectively after 2 years of their insertion and the retention was 80.8 and 51.5 per cent. (Rock)

Nuva-Seal has the most satisfactory bond strength to tooth enamel both immediately after application and after storage for six months at 37°C. The bond strength of Epoxylite 9075 and of Espe 717 decrease notably with time, but those of Aspa and poly F appear to increase with time, although these bond strength are considerably lower than those obtained with Nuva-Seal. (Williams, Fraunhofer, and Winter 1974)

Epoxylite 9070 a fluoride – containing sealant indicate a 100 per cent loss of sealant after 2 years, but a statistically significant caries reduction. It can be assumed that this sealant loss adhesion and sloughs off once it has delivered its dosage of fluoride to the adjacent enamel. (Lere H 1974)

The success rate of adhesive glass-ionomer cements in selected fissures was high. Fissure sealants were completely lost in only 10% of cases in the first year, only a further 4% in the second year. The incidence of occlusal caries was small and accrued only
when sealant was lost.

There is difficulty of finding the basis of fissures were when these are well-defined or when deepfossae are present. Any leakage will permit the growth of bacteria and caries will progress underneath undetected.

A fissure sealant must form a firm attachment to the enamel substrate if it is to be effective.

Since resin sealants are not truely adhesive, retention is provided mechanically by etching the enamel in the fissures with either phosphoric or citric acid. This treatment roughens the tooth surface and produces a honey-comb like structure so that tags of sealand can penetrate deeply into the enamel and so form a effective bond.

The disadvantages of the current resin sealments lies in their nature. These hydrophobic resins do not form hydrolytically stable bonds, have poor resistance to wear, have a low modulus of elasticity and a high thermal expansion, (Mclean and Wilson 1974)

Fissure sealants are hard to manipulate and their effectiveness is still debatable. Their usage
should be restricted to caries where absolute success is predictable.
2.6 Other Control Measures.

Systemic visits to the school preferably every six months by the dental teams will ensure early detection and diagnosis of dental caries and other dental conditions. Early lesions could be easily filled and great numbers of teeth saved. Time and expenses would be reduced. Other more serious conditions could be diagnosed and referred to the appropriate specialist for early treatment.

School health nurses should be encouraged to pay more attention to the total health of the children. They could be trained to provide oral examinations to the children and refer them for dental treatment. This should be stressed in areas where there is great storage of dental manpower.

The total dental health of the school children should be evaluated. Too often people tend to concentrate mainly on the teeth and miss other developing conditions existing in other parts of the oral cavity.

The use of toothbrush right after meal is an effective method of removing plaque. Toothbrushing scheme could be implemented in schools to be used right after lunch. Mothers should be trained to supervise the scheme for their children at homes.
Fluoridated dentifrice and mouth rinses have been proven to interfere the formation of plague.

Fluoride may exert an effect directly on the plague bacteria. This effect may be a reduced ability of the plague flora to form acid and polysaccharides from carbohydrates, or as a change in the microbial composition of plague (Loesehee, Murray and Mellbery 1973).

A tooth with a small lesion if treated has a better chance of survival than a tooth with a big filling. Time and experience are greatly reduced and the children are more cooperative because fear and pain are minimal.

Thumb sucking, dipping dummy into honey, harmful dietary habits such as snacking between meals and any other habits which may be harmful should be discouraged. Dental health education of both mother and children is needed in this area.

Patients should be made aware that they are susceptible to dental diseases. There is no treatment that will give them full
guarantee against the diseases. They should also be made aware that the early detection of the diseases can be cured and control and the best logical way for them to be dental functionally fit is to have regular visits preferably every 4-6 months a year.

Early demineralized sub-surface enamel has been proven that it can be re-mineralized by various elements, fluoride being one of them.

After eruption and throughout the life span of the teeth when fluoride from drinking water, food, saliva and topical application is taken up by the enamel surfaces (Sognnaes P49).
3.1 SINGAPORE

Singapore a tropical island lies about \( \frac{3}{4} \) of a mile to the south of the Peninsula of West Malaysia. Being without hills of note and without a large catchment area, it gets a large portion of its water supply from mainland Johore. (Chan 1973)

Diet.
The main staple diet is rice (high carbohydrates), but being exposed to western culture and habits (Higher in protein and refined sugar) (Chan 1973)
3.1.1 Population:
Singapore, with its population growth under control had a population of 2,100,100 according to a national survey conducted in (1970-1971). In 1974, the FDI (Basic fact sheets 1974) reports showed a slightly increased population of 2,240,000 an increase of 139,900 over three (3) years. Ninety five per cent (95%) of its population live in urban areas.


<table>
<thead>
<tr>
<th>Pre-school Children</th>
<th>School Children</th>
<th>Adolescents</th>
<th>Adults</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>age 0-5</td>
<td>Age 6-14</td>
<td>age 15-19</td>
<td>age 20+</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>11.0</td>
<td>27.0</td>
<td>11.0</td>
<td>49.0</td>
<td>2,100,100</td>
</tr>
</tbody>
</table>

Distribution by Ethnic, Racial Groups and Language
Spoken - 1972 (Vllth APDF/APIZO 1974)

Distribution by Groups

<table>
<thead>
<tr>
<th>Chinese 76%</th>
<th>Malays 15%</th>
<th>Indians 7%</th>
<th>English 50%</th>
<th>Chinese 40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Others 2%</td>
<td>Malay 10%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.1.2 Manpower:

According to the FDI - Basic Fact Sheets report 1974, there is a slight increase in dental manpower over three years. This is shown on table number four (4) below.

### Number of Dentists - 1972 (Vllth APDF/APIZO 1974)

<table>
<thead>
<tr>
<th>Government Services</th>
<th>Private Practice</th>
<th>Total Number</th>
<th>Ratio: Population (Dentists: Population)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fully Qualified</td>
<td>112</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Partially Qualified</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>195</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>395</td>
<td>1:5,300</td>
</tr>
</tbody>
</table>

### Number of Operating Auxiliaries - 1972 (Vllth APDF/APIZO 1974)

<table>
<thead>
<tr>
<th>Operating Auxiliaries</th>
<th>Operating Auxiliaries</th>
<th>Ratio D/N:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>Private</td>
<td>Pop 1:2,216</td>
</tr>
<tr>
<td>School Dental</td>
<td>Other School Dental</td>
<td>Nurse Hygienist Hygienist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>163 (-)</td>
</tr>
</tbody>
</table>

### Number of Non-Operating Auxiliaries - 1972 (Vllth APDF/APIZO 1974)

<table>
<thead>
<tr>
<th>Non-operating Auxiliaries</th>
<th>Non-Operating Auxiliaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Technicians</td>
<td>Private Technicians</td>
</tr>
<tr>
<td>Chair Clerical Assistance</td>
<td>Chair Clerical Assistant</td>
</tr>
<tr>
<td>28</td>
<td>63</td>
</tr>
<tr>
<td>(-)</td>
<td>(-)</td>
</tr>
<tr>
<td>(-)</td>
<td>(-)</td>
</tr>
</tbody>
</table>
FDI – Basic Fact Sheets 1974 (Manpower) Table No: 4

Dentists 239

Physicians specialized in dentistry
  (Stomatologists) 1

School Dental Nurses (New Zealand type) 190

Dental Hygienists 0

Dental (Chairside) Assistants 260

Dental Laboratory Technicians 67

Unqualified Dentists 180

3.1.3 Economic Status:

Population and per capital income (1970-1971)

(VIIth APDF/APICO 1974)

<table>
<thead>
<tr>
<th>Population</th>
<th>Year</th>
<th>National Per Year Capital Income $US</th>
<th>Annual Rate Economic Growth $US</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 million</td>
<td>1970</td>
<td>1000</td>
<td>1970 17.2%</td>
<td>1970</td>
</tr>
</tbody>
</table>

3.1.4 Caries Prevalence:


DFF per 6-year-old child 4.8 (6 yr)

DMFT per 12-year-old child 2.6 (12 Yr)
3.1.5 Dental Practice:

Dental health Services: (FDI - DFS 1974)

Dental division of the Ministry of Health operates a total of ninety eight (98) dental clinics, rendering dental services to the following population groups:

1. School children
2. Pregnant and nursing mothers and their infants in mother and child health centres.
3. Persons with low income.
4. Hospital patients and chronic sick.
5. Consultation cases and other cases requiring special treatment.

Maternal and child health centres and Hospital services division provide emergency treatment facilities for pre-school children (11 per cent of population). The school dental service division provides comprehensive dental care for all primary school children (17 per cent of the population).

National servicemen are treated by the army dental officer.

Most adults above twenty (20) years of age (49 per cent of the population) receive dental care from private dental surgeries.
Methods of Financing Dental Health Services:
Expenditure for all health services forms 8.4 per cent of the total national budget. Dental health services relilize 3.2 per cent of the fund allocated for the entire health services. The school dental service division expends the largest portion of funds for maintenance and expension treatment facilities for primary school children.

Dental practitioners in the private practice levy the usual and customer fee-for-service to patients, although there is no nationally agreed fee-schedule for service provided. Some commercial and industrial enterprises provide their own dental health service (usually dental emergencies only) as a fringe benefit for their employees. (FDI - 1974)

3.1.6 a Fluoridation of communal water supplies:
The fluoridation of communal water supplies started in 1958 (0.7 ppm) and this covers ninety five per cent (95%) of the total population. (95% population live in urban areas). The dental caries experience in primary teeth in the 7-9 year old group had been reduced by 35% after 10 years of fluoridation. (Fuller 1969)

3.1.7 School Dental Services:
Dental Health programmes - Preventive measures
There has been widespread dental health education programmes since 1969. It was also the year that
Dental Health Education unit was established within the dental services provided by the government with some assistance from commercial firms.

Dental health education unit

Responsibilities of the unit.
This unit is responsible for the planning directing and coordinating all dental health education activities, the training and advising of dental health educators, and the production of educational materials and audio visual aids for teaching purposes. It has on its staff, two (2) full time dental officers, one (1) dental nursing officer, a team of twelve (12) dental nurses, and two (2) clinical staff.

Main objectives of the unit are:
1. To motivate the entire community to maintain lifetime dental health
2. To carry out a sustained programme of education the public to practice preventive care and to seek dental check-ups and treatment regularly.
3. To teach the entire population especially school children, basic skill of toothbrushing and to cultivate in them the habit of maintaining good oral hygiene.
4. To collect regularly for programme planning and development, data on barriers such as habits, beliefs and attitudes that may hinder the individual from attaining positive dental health.

Activities of the unit are

1. Toothbrushing drills in school -
   Its aim is to develop toothbrushing skill and habit. This activity is performed daily by 350,000 school children in all the 600 primary schools. For this activity, representative teachers from all primary schools who were to take charge of the drill in their school were briefed on the importance of toothbrushing for dental health and given some training on toothbrushing technique and procedures to be adopted in the daily toothbrushing drill. These teachers in turn instructed other teachers in their school. The teachers were given teaching charts and models of jaws produced by the dental health education unit to assist in the teaching of toothbrushing. Suitable toothbrushes and mugs at prices within the means of every child were specially manufactured and made available to the children through the schools.

The role of classroom teachers;

To encourage other teachers to make greater efforts to improve the standard of toothbrushing skill for school
children. A competition is organized annually for teachers in presenting the best trained class of children in toothbrushing and attractive prizes are awarded.

In the education of children, teachers have been asked to carry the major share because of their educational training, their numbers in the school system, and the influence they have over children.

Responsibilities of classroom teachers:

a) The teaching of toothbrushing technique to their class of children and supervising them in their toothbrushing (daily).

b) The teaching of dental health subjects in the classroom.

Teachers are encouraged to integrate the teaching of dental health with the teaching of other aspects of healthy living and to include dental health topics in the teaching of other subjects, as well as in varied situations as possible. The choice of methods and the situation in which dental health topics are included are left to the trained teacher who know their best. The whole objective of the school programme is to help children grow up with the correct attitude and behavior towards preserving and maintaining their own dental health and to condition them to react favourably in any dental situation.
Teaching aids:
Teaching aids in form of pamphlets, charts and models are regularly produced by the unit and distributed to the teachers so that the teacher will be regularly motivated by dentists and be fed with authentic professional information and teaching aids in this area.

Teaching dental health through media of songs and games has also been introduced. It is believed that there is great potential in these methods where children can derive pleasure and satisfaction in the activity engaged in and at the same time are learning about dental health unconsciously.

Activities of the unit — (continued+)

2. Dental Health contests —
It is a means of motivating the public and in particular the younger generation to maintain dental health throughout life. Such contests are held based on the contestants oral health status. This contest is held annually for school children in different age groups and for the 17-21 year old boys and girls.

In the contests, the condition of teeth and gums and the degree of malocclusion and the state of oral hygiene are considered. Where the primary and secondary groups are contestants, the principals and teachers are invited to participate as judge in the elimination rounds within each school and the best ten and entered against
children from other schools.

The purpose of this is, firstly, to arouse the interest of principals and teachers with regards to the dental health of their children and secondly to reduce the number of entries to the competition to leave manageable proportions. For the teenagers contest for boys and girls, participants are required to look into their own health and seek the aid of dentists to obtain certain data about their own teeth which are required in the entry form. The purpose here is to get interested contestants to know more about the condition of their own teeth.

As a result of conducting these contests over several years, the dental health education unit has now on record, several hundred children found with perfect sets of teeth. To encourage these children to maintain lifetime dental health, the unit is currently organizing a dental health club and membership, which will have to be renewed annually, will be opened to all children with perfect sets of teeth. Members, on passing a dental examination, will each receive a current membership badge. As incentives to remain in the club, free supplies of toothbrushes and toothpaste and other oral hygiene aids will be made available to members throughout the year. Monthly activities which will include talks, discussions, and excursions to the water works and factories relevant to dental health will be
organised for members. It is hoped that among these members, some will volunteer to assist the unit in propagating information to others on how to maintain oral hygiene and health, and many will grow up to serve the community in which they reside as dental health education.

Poster competitions are also held annually for school children with the assistance of the Ministry of Education. This activity will provide an opportunity for those less fortunate in dental health to participate in the dental health week.

3. Dental Health Week.

It is observed annually with a mammoth exhibition held in the town ball as the main event. The various competition held throughout the year have their final judging during the week and the prizes are awarded to winners on the final night of the week.

The results achieved so far appear to be promising, with the demand for dental services steadily increasing, and the public becoming more conscious of their dental health.

Incremental care for Primary School Children.

The group given top priority for incremental dental care is the primary school children. Most treatment of primary
school children is carried out by dental nurses in school dental clinics. These school dental nurses are supervised by dental surgeons in the ratio of 1:24. This care is managed free of charge, taking care of about half of the primary school population of 350,000.

The dental division of the Ministry of Health also train a new category of dentist called dental therapists. This new group will help their dental surgeons to give follow-up incremental dental care to their secondary school children and adult population as well. This is in line with solving the problem of acute shortage of dental surgeons.

Currently, the Singapore School Dental service has a total of 77 school dental clinics (including 2 clinics, each with over ten (10) dental chairs, known as school dental centres) manned by a staff of over 220 which includes 31 dental officers, 134 school dental nurses, 18 student dental nurses, and 2 dental nursing sisters.

Objectives of the school dental service:

1. To provide systematic dental treatment for all primary school children; totalling about 350,000 and all children attending kindergartens, and finally, all the secondary school children numbering about 150,000.
2. To promote dental health consciousness amongst the school children.

With the present facilities, systematic dental treatment is available to 167,000 primary school children, and this is only half of all the primary school children.

School Dental Nurse:

Singapore dental nurses training school was established in 1962. The graduates are posted to suitable school dental clinics, where they undergo a further 12 months of field training under the direct supervision of a dental officer. Only fully trained school dental nurses are allowed to take charge of school dental clinics under the control and supervision of dental officers.

Responsibilities and Activities of School Dental Nurses

Each nurse is responsible for the dental well-being of about 600 primary school children, and she discharges the responsibility through a six-monthly dental examination prophylaxis, dental health education, and dental treatment such as fillings in primary and permanent teeth. Extractions under local anesthesia or topical anesthesia of all primary and permanent teeth with the exception of the maxillary and mandibular permanent molars and mandibular premolars. She does pulp capping for transmucous exposures of pulp.
but root carial treatment is outside her scope and duties. No tropical fluoride applications is done by the nurse. She renders emergency treatment such as relief of pain in the form of dressings. She is also taught to recognize malocclusions and to refer such a case to the dental officer.

Dental health education forms an important part of the duties of the school dental nurses. Individual as well as group instructions are given by them.

In the school dental clinics and centres, aside from providing systematic dental treatment for primary school children only, they also serve as outpatient clinics for both the primary as well as the secondary school children who seek dental treatment.

The school dental clinics all either within the school building or in the separated building but in the grounds of the school. Two mobile dental clinics with 2 chairs each are stationed in two of the schools and are used as static clinics.

These are plous for 95 dental clinics in schools in the next 6 years.

It was realized in a survey in 1970 that the dental health
status of children attending primary schools with school clinics was better than those attending primary schools not provided with dental clinics.

3.1.8 Summary and Conclusion

Commercial water fluoridation has been in existence for 18 years. It serves 95% of the total population. The project is claimed to have reduced dental caries prevalence in the 7–8 year old group by 35% after 10 years of its implementation.

With the present facilities and manpower, systematic dental treatment is available to 167,000 primary school children, half of the total primary school children population. All the primary school children and secondary school children do participate in some forms of dental health education activities.

School dental nurses are rendering systematic dental care for 600 primary school children every year.

Classroom teachers are involved in providing as well as promoting dental health education activities to the school children.
Dental caries prevalence is more prominent in the deciduous dentitive than in the permanent. Periodontal diseases increase with age; starting as early as 6 years in Chinese children.

Lack of manpower and funds is evident. Only half of the primary school children receive the benefit of the school dental service.

A new category of dental personnel called the "Dental Therapists" is being developed to assist the dental surgeons of their load. Finally, the unqualified but registered dentists are in private practice in Singapore.

Although, Singapore has one of the best school dental service among the South East Asian countries, there is still ample room for improvement. Professional and self-topical fluoridation application could be applied to the more susceptible group of schools children. Dental health education of the mothers and school children could be emphasized more so that the practice of effective dental health could be practiced at home and also the children maintain the value of good oral health.
thougout life.

3.4.9 Recommendation for Improvements:

1. The semi-annual supervised self-application of a prophylactic paste, containing 9% stannous fluoride in school programs resulted in a satisfically significant protective effect against the development of caries. The significant reduction in the incidence of dental caries of 30.1% and 24.7% as expressed by DMF teeth and surfaces respectively in children aged 6 - 14 years. (Gish, Mercer, and Dahl, 1975)

This could be added to the other preventive programs already instituted. The effect of water fluoridation plus the effect of topical fluoridation application would reduce the incidence of dental caries greatly. The number of required fillings would decrease and each school dental nurse could each after the dental health of greater number of children. School teachers and mothers could help in supervising this program.

2. The health education of mother and child should be encouraged and supported for it must be made to succeed. (Fuller 1969) Children will form habits, not by learning a fact, but by doing things repeatedly with satisfactory results. (Turner, Sellery and Smith)
This approach could be used in the kindergarten schools.

The professional skills and initiative is the teachers constitute a most valuable element in the health education of the child. The health program must be so arranged that constructive and creative contributions of the individual teacher may be fostered.

(Turner, Sellery and Smith)

3. Training of more school dental nurses to provide dental care to those who are not covered at the present situation. They should be well orientated toward providing more preventive type of treatment rather than the ideal number of 600 used for restorature type of treatment.

4. School medical and community nurses could be trained to examine and provide simple emergency type of treatment so that the school dental nurse could have time to concentrate on the restorative treatment. Great numbers of school children could be covered this way.

5. Community education in dental health is important to enable the community (especially the mothers) to appreciate the full benefits of the services provided. Poverty, lack of dental personnel and treatment facilities have been though to be the only major factors
for the poor dental health of the people. Singapore
where there is in recent years rapid urbanization, a
steady increase in affluence and number of dental
graduates the standard of dental health has not improved
accordingly to expectation. (Deong 1973)
3.2 MALAYSIA

Malaysia is made up of two distinct regions. The peninsula portion referred to as West Malaysia. The two regions States of Sabah and Sarawak officially known as East Malaysia. The two regions are separated by 400 miles of the South China Sea. There are 13 states in Malaysia. (Dental Division, Ministry of Health Malaysia 1970-71).

3.2.1 Population:

The population in general (West and East Malaysia) is 12,014,960 (FDI-BFS 1974). Twenty two point seven per cent (22.7%) of the total population are school children aged 6-14 years. (Viith APDF/ARO 1974).

Distribution by Ethnic, Racial Groups and Language Spoken (1972) (Viith APDF/ARO 1974)

Distribution by groups
Malay: 53% Chinese: 35%
Indian/Pakistani: 11% Others: 1%

Distribution by language
Malay official language
other languages by ethnic groups
In West Malaysia, large concentration of the three major ethnic groups are concentrated mainly in the coastal areas of the peninsula which is the most developed part of the country (Dental Division, Ministry of Health, Malaysia 1970-71).

3.2.2 Diet

The staple food is rice for all the three major ethnic groups.

In the urban areas, the shops and supermarkets have on stock the widest range of imported refined and canned foods and a good selection of local produce. Imported foods are well patronised in the urban areas. In the rural areas, there is little dependence on refined and canned food, and well-balanced meals can be prepared with local vegetables, fish and meat.

(Dental Division, Ministry of Health Malaysia 1970-71).

3.2.3 Dental Manpower: (F.D.I., B.F.S. 1974)

<table>
<thead>
<tr>
<th>Dentists (qualified in Division 1 of the Dental Register)</th>
<th>West Malaysia</th>
<th>Sarawak</th>
<th>Sabah</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians specialized in dentistry (stomatologists)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physicians practising as dentists without a dental qualification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School dental nurses (New Zealand type)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental hygienists</td>
<td>West Malaysia</td>
<td>Sarawak</td>
<td>Sabah</td>
</tr>
<tr>
<td>Non-operative auxiliaries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental laboratory technicians (government trained)</td>
<td>West Malaysia</td>
<td>Sarawak</td>
<td>Sabah</td>
</tr>
<tr>
<td>Unqualified dentists (2)</td>
<td>West Malaysia</td>
<td>Sarawak</td>
<td>Sabah</td>
</tr>
</tbody>
</table>
The number of dentists (including dentists) to population ratio is 1:14,185.

3.2.4 Economic:


<table>
<thead>
<tr>
<th>Population</th>
<th>Year</th>
<th>National Per Capita Income</th>
<th>Year</th>
<th>Annual Rate Economic Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.8 million</td>
<td>1970</td>
<td>360 $US</td>
<td>1970</td>
<td>6.8% $US</td>
</tr>
</tbody>
</table>

Although the people receive low wages, the prices of goods are not expensive. An average wage earner can live comfortably with a small family.

3.2.5 Dental Caries Prevalence:

National Survey Results for Dental Caries (1963-1972) (Viith APDF/APRO 1974)

<table>
<thead>
<tr>
<th>dft per 6 year old child</th>
<th>DMFT per 12 year old child</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.3 (6gr)</td>
<td>3.7 (11gr)</td>
</tr>
</tbody>
</table>

Low < 3dft                Low < 3DMFT
Moderate 3-6dft            Moderate 3-6DMFT
High > 6dft               High > 6DMFT

(WHO Standard)
Fig. 1. The average DMF teeth of children in W. Malaysia.

Fig. 2. The average DMF teeth of children in W. Malaysia.

(Yasson and Low 1975)
3.2.6 Dental Practice:

Dental Health Services.

The dental public health is a responsibility of the Ministry of Health. The chief professional administration is a dentist (Sundram 1973).

Dental public health services are aimed at the rural areas while private practices are concentrated in urban environs (Fuller 1969, Rahman 1972, and Sundram 1973).

The dental health service covers approximately 80% of the total adult population. More than half of the total number of dental surgeons in Malaysia are employed in Government Services (FDI-BFS 1974).

There are 120 qualified dental surgeons in private practice in West Malaysia, 6 in Sarawah and 1 in Sabah. There are about 440 Division II dentists throughout Malaysia, covering 30% of the population (FDI-BFS 1974).

There are a total of 465 government dental clinics, 140 are devoted to school dental care, 190 are in health centres, and sub-centres and 48 are main dental clinics with full prosthetics and other facilities (Fuller 1969, Rahman 1972, and Sundram 1973).

Dental nurses are permitted to work only within government service (Fuller 1969, Rahman 1972, and Sundram 1973).
The greatest problem is that of manpower shortage. To overcome professional manpower deficiencies, the government has initiated the following measures:

1) Establishment of a dental faculty at the University of Malaya with an intake of 30 in 1972.
2) Compulsory service of two years for new dental graduates is within the Dental Act of 1971 for staffing dental clinics in rural areas.
3) The recognition of selected foreign degrees, recognised by the British Dental Council.
4) Recruitment of foreign dentists on two-years contracts (presently dentists from Indonesia, Pakistan, Korea and Egypt are in government employ) (Sundram 1973).

3.2.7 Water Fluoridation:
There is artificial water fluoridation in the pilot stage in the State of Johane (11 centres) and Sarawah (3 centres). The number of communities served are 14. The population served by fluoridated water is 3,000,000. There are small traces of natural fluoride in the water, far short of the required optimal level. Topical application of 2% sodium fluoride and 8% stannous fluoride by school dental nurses in the public dental health service. Both the Government and the National Dental Association are in favour of fluoridation (FDI-BFS 1974).
3.2.8 School Dental Health Service;

The dental services in Malay, Sabah and Sarawah are mainly concerned with the school-going population. The dental health service covers approximately 30% of the school-going population. The pre-school children, expectant and nursing mothers also receive dental care (FDI-BFS 1974).

There are 140 government dental clinics devoted to school dental care. In each of the 13 states in Malaysia has district dental officers with their team of school dental nurses, dental technicians and chairside assistants. The dental care of school children is few (Sundram 1973).

The school children are examined and treated regularly. Treatment is provided either at schools, health centres or hospitals. Some schools have toothbrushing and topical application of fluoride program. (Vith APDF/AFRO 1974).

An interesting channel for strengthening the oral hygiene and preventive programs in school is the formation of a joint school health committee composed of representatives from the Ministries of Health and Education for the total health of the school child.
Dental health education is aimed at the classroom teachers, educators of health personnel, and the mothers so that the child is exposed to dental health in the home (Sundram 1973).

The high prevalence of dental caries and low level of restorative care despite free dental care for all school children (West Malay) are certainly disturbing. The lack of dental manpower is perhaps only part of the problem. A more difficult obstacle to good dental health is the reluctance of those in the lower socio-economic group to accept restorative care (Vassin and Low 1975).

54.5% of the Chinese children, 50.1% of the Malay children and 59.3% of the Indian/Pakistani children show evidence of plaque on the teeth. It thus appears that diet and dietary habits play an important part in causing the observed variation (Vassin and Low 1975).
Fluoridation has been implemented in 14 countries. Dental caries is the main problem because of the great number of un-met filling requirement. School dental service covers only 30% of the school population due to the shortage of manpower and facilities. About half of the number of school populations show evidence of plaque on their teeth, not surprisingly when only few of the schools have toothbrushing schemes. School dental nurses are being trained and employed in the school dental service, the number at the present is still insufficient. Health education is aimed at the mothers and the educators of health services.

3.2.9 Summary and Conclusion:

The training and recruiting of dental personnel to meet the required number of dentists in the school dental service (about 6 million children) are very expensive. Even if the government is able to do this, most of the money would go to salary and very little would be left over for the program. The cost-benefit-effectiveness of preventive programs (e.g. fluoridation, fluoride mouthwash, toothbrushing, health education etc) have been proven to cut valued treatment measures (restoration).
3.2.10 Recommendation for Improvements:

A. Water Fluoridation.

The water supplies suitable for fluoridation are those in large towns and cities. It is in these places that the dental need is developing fastest; it is in these places that the need for water fluoridation is greatest. The cost relative to the ultimate benefits are not great. In Hong Kong the cost per person per year is about 2 US cents. It is a measure specifically directed to children which by reducing dental decay 50-60% will reduce the need later for more expensive treatment facilities (Fuller 1969).

Other more populated non-fluoridated centres in Malaysia could benefit from fluoridation if it is introduced.

B. Fluoride mouthrinses and toothbrushing schemes.

About 54.5% of the Chinese children, 50.11% of the Malay children, and 59.5% of the Indian/Pakistani children show evidence of plaque on their teeth (Yassin and Low 1975). Introduction of above schemes in the schools daily routine will not only improve the oral hygiene but also reduce the incidence of dental caries.
The presentation of plague on the tooth surface accumulate bacteria and provide nutrient for them. Demineralization of enamel, the initial stage of dental caries starts underneath the plague.

C. Topical application of Fluoride

The use of topical application of fluoride is recommended for school dental health service especially in areas where the water supplies are not fluoridated. The main problem is that it requires the involvement of dental personnel and in places where there is great shortage of dental manpower, This may not be possible (Loeschae, Murray and Mellbery 1973).

The semiannual supervised self-application of a prophylactic paste, containing 9% stannous fluoride, in school programs resulted in a statistically significant protective effect against the development of caries. The significant reductions in the incidence of dental caries are 30.1% and 24.7% as expressed by DMF teeth and surfaces respectively (Gish, Mercer, Stookey and Dahl 1975).

D. Training and employing more school dental nurses
The training of school dental nurses should be geared toward prevention so that they will be able to provide effective preventions for the school children. If they were trained to provide more preventive than restorative, each nurse could look after the dental health of 1200 school children rather than the ideal number of 600 for restorative treatment. Dental health education should be emphasised in their curriculum.
3.3 INDONESIA

Indonesia is the largest archipelago in the world with a total of 15,000 islands. It is among the countries richest in natural resources in the world. Transportation and communication services are not well developed, making the implementation of general programs difficult. Another important problem is the distribution of the population, majority of the population live in the island of Java, which is a small part of the total area of the country. The country is divided into 25 provences, each headed by a governor. The provences are divided into regencies. These are further divided into smaller districts. The districts are divided into sub-districts. The smallest administrative unit is the Village (Botero 1968).

3.3.1 Population:


<table>
<thead>
<tr>
<th>Pre-school children (Age 0-5)</th>
<th>School children (Age 6-14)</th>
<th>Adolescents (Age 15-19)</th>
<th>Adults (Age 20+)</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>118,459,845</td>
</tr>
<tr>
<td>19.4</td>
<td>24.7</td>
<td>9.6</td>
<td>46.2</td>
<td></td>
</tr>
</tbody>
</table>
3.3.2 Dental Manpower:

<table>
<thead>
<tr>
<th></th>
<th>Government Service</th>
<th>Private Practice</th>
<th>Total number</th>
<th>Ratio to Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualified</td>
<td>Fully Qualified</td>
<td>Partially Qualified</td>
<td>628</td>
<td>890</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2000</td>
<td>1518</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1:78,037</td>
</tr>
</tbody>
</table>

About 700 qualified dentists are in public dental health services. 500 are in the Armed Forces, about 100 in dental schools and the remaining number (200 dentists) are solely in private practice. It would not be correct to identify dentists and dental nurses in strict compartments of employment as government-employed professionals and auxiliaries we also permitted, owing to the low government salaries to have their own practices. About 50 dental nurses are in private practice and the remaining 250 are in the employ of government (Sundram 1973).
3.3.3 Economic:


<table>
<thead>
<tr>
<th>Population</th>
<th>Year</th>
<th>National Per Capita Income</th>
<th>Year</th>
<th>Annual Rate Economic Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>$US</td>
<td></td>
<td>$US</td>
<td></td>
<td></td>
</tr>
<tr>
<td>118,459,845</td>
<td>1971</td>
<td>85</td>
<td>1967</td>
<td>6.5%</td>
</tr>
</tbody>
</table>

Although the country is rich in natural resources, its population is extremely big. Many people (including dentists) have to have double jobs to earn extra money for the extras in life.

General socio-economic problems affect the educational institution in two main areas:

a) Shortage of equipment, facilities, libraries and budgetary constraints.

b) Lack of patients for students in a number of departments (March 1972).
3.3.4 Dental Caries Prevalence


<table>
<thead>
<tr>
<th></th>
<th>dft per 6-year-old child</th>
<th>DMFT per 12-year-old child</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4.5 (12 gr)</td>
</tr>
</tbody>
</table>

Table 1. Surveys of Dental Caries in Indonesia

<table>
<thead>
<tr>
<th>NUMBER SURVEYED</th>
<th>SURVEY DESCRIPTION</th>
<th>dft</th>
<th>DMFT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20285</td>
<td>Urban schoolchildren from 15 cities</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.6</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.8</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11002</td>
<td>Bandung children</td>
<td>4.5</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.4</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.4</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3246</td>
<td>Urban schoolchildren from 7 cities</td>
<td>-</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.7</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.4</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>854</td>
<td>Rural population</td>
<td>-</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.0</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.1</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Data from these studies also indicated that the D component was by far the largest and sometimes the only contributor to the DMF counts and that occlusal caries accounted for between 83 and 94 per cent of the carious lesions in the seven city study (Barnes, Martin and Barnard 1974)
3.3.5 Dental Practice:
Dental health care and dental education in Indonesia have a low priority. This low priority has led to a non-planned and non-coordinated development of the dental health services and the institutions for dental education and training, which have little or no relevance to the country's needs. Only dew dental students pass their examination because of the bottlenecks system of examinations. The students who instead of being inquisitive and curious, tend to rely upon note learning in order to fulfil the minimum requirements to pass examinations rather than learning how to become a useful member of a health team (Morch 1972). The twenty-five provences have dental services under the Dental Section of the Division of Curative Medicine within the administrative framework of the Ministry of Health (Sundram 1973).

The dental health services are at present ideally structured on three levels (Sundram 1973).

1. The highest is the Director of Dental Health, which has a dental chief and is responsible for the general philosophies, policies, organisation and planning of the dental health services of the country (Sundram 1973).
2. The second is the implementation and evaluation level which is responsible for supervision, reporting and data collection. In big towns which have dentists and dental auxiliaries, supervision, evaluation and reporting are functioning satisfactorily but this is not so in the rural class (Sundram 1973).

3. The third or operational level is where the dental care programs are in actual operation such as the treatment of school children with the use of operating dental auxiliaries (Botero 1968; Sundram 1973).

There are over 2,000 unqualified dentists reportedly practising in the country (Sundram 1973).

3.3.6 Water Fluoridation:
Artificial community water fluoridation has not been implemented. The amount of natural fluoride in water is negligible (Vilith APDF/ APRO 1974).
3.3.7 School Dental Health Service:

The school aged group is estimated at 27 million of which 15 million are school going and about 10 million are primary school children. The school dental services are however rudimentary as the main problem would appear to be associated with lack of funds (Sundram 1973).

School children are examined about twice a year. Curative and treatment are provided either at schools or at the health centres as needed. The service is free for most of the school children. Only emergency treatment is free for all. School children are also treated at the private surgeries where parents have to pay. Only few of the schools have toothbrushing and topical application of fluoride schemes. Dental health education in school is limited (Vith APDF/APRO 1974).

One would expect that the type of treatment rendered to the school children would be mainly emergency type. The reason is constraints of manpower and funds. If all the dentists (600) and the dental nurses (250) concentrate only on the primary school children (10 million), the ratio would be 1:11,764. Twice this number of personnel would cut the ratio down to about 1:5,000
which is still too high for 1 operator to provide effective restorative treatment. Therefore, the number of untreated cavities is still the main problem although the prevalence of dental caries is only 4.5df (6 year old) (Sheihm 1974). One would expect the P.I. index to increase with age as no preventive (toothbrushing) measure is instituted to combat it.

3.3.8 Summary and Conclusion

Dental caries among school children is the main problem. The present number of dental personnel is inadequate to meet the restorative needs, of the 10 million primary school children. The constraint of funds is also a big problem. The low priority in dental health care has led to a non-planned and non-coordinated development of the dental health service in general (including school dental health service).

Unless dental health care becomes important in the eyes of the government officials, more funds made available and well planned and coordinated programs implemented, the present situation will persist for a number of years to come. Fluoridation of the public water supplies and other preventive measures instituted into the school dental program could help to minimize the problem.
3.3.9 Recommendation for Improvements:

1. Dental health must be recognised as being an integrated part of the general health in a population, since dental disorders not only interfere with speech, chewing, digestion, physical and psychological well-being, but can also lead to more severe complications which will affect general health. Furthermore, experience from many countries shows that with increasing socio-economic development, the severity and extent of dental diseases tends to increase rapidly. Such an increase in the need for treatment of dental diseases will, of course, become an economic burden for society, if it is not controlled at an early stage (Moller 1971).

2. Introduction of preventive measures, for instance drinking water fluoridation, topical application of fluorides, fluoride mouthrinses and etc. (Moller 1971).

3. School dental services - subdivision into preventive and curative subprograms, the former being a combination of oral hygiene and a self-applied supervised fluoride application in
moderate caries groups. The curative subprogram is a systematic
cure operation comprising conservative care of the permanent
dentition only for the first and last primary school class, plus
contingency care in the interim. The target population is the
same as that for the fluoride application activity (Barmes 1974).

4. Training of more school dental nurses to provide more
preventive type of services to the primary school children.
Example topical fluoride application, early diagnosis of caries
and treatment, dental health education for children, mother and
school teacher, supervision of toothbrushing and mouthrinses
schemes etc.

5. Dental health education for mothers and school teachers may
not be possible at the present because of manpower constraint,
but should be picked up when possible, because these two groups
have greater influence on the children than the dental personnel.
Classroom teachers could be easily trained to supervise some of
the preventive programs (toothbrushing, mouthrinsing, self-
applied fluoride solution etc) at schools. The mothers on the
other hand could do the same at home. In the mean time, dental
health education by the dental personnel for the school children should be continued along with the treatment. Research to improve the methodology is very important. The type of dental health education provided should include improved dietary habits and oral hygiene.

6. It is necessary to develop health practices on the part of the child before he is old enough to understand the scientific reasons upon which these practices rest. Children will form habits, not by learning a fact, but by doing things repeatedly with satisfactory results (Turner, Sellery and Smith).
3.4 THE PHILIPPINES

3.4.1 Population:

There are about 41,680,469 people living in the Philippines (FDI-BFS 1974).


<table>
<thead>
<tr>
<th>Pre-school children</th>
<th>School children</th>
<th>Adolescents</th>
<th>Adults</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 0-5</td>
<td>Age 6-14</td>
<td>Age 15-19</td>
<td>Age 20+</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>19.9</td>
<td>23.2</td>
<td>10.0</td>
<td>46.9</td>
<td>36,590,065</td>
</tr>
</tbody>
</table>

The estimated population increased between the years 1970 and 1974 is about 5 million, about over 1 million of new birth per year.

This will further increase the problem of dental manpower.

Distribution by Ethnic, Racial Groups and Language Spoken (Viith APDF/APRO 1974).

<table>
<thead>
<tr>
<th>Distribution by Groups</th>
<th>Distribution by Language</th>
</tr>
</thead>
</table>
3.4.2 Dental Manpower:

(FDI-BFS 1974)

Dentists (registered) 12,664

School dental nurses (New Zealand type) 0

Dental Hygienists 5 (x)

Dental (Chairside) Assistants 830 (x)

Dental laboratory technicians 200 (x)

The dentist to population ratio is roughly 1:3,291 according to the FDI figures for number of registered dentists to the population.

There are no formal courses or government facilities for the training of dental hygienists, school dental nurses or dental technicians. Indeed some dentists in private practice and a few hospitals employ dental hygienists who are in fact qualified dentists. There are believed to be about 500 unemployed dentists willing to practice dentistry (Allwright 1972, Sundram 1973). Owing to the problems associated with employment they have at present found occupations as clerks, salesmen etc (Sundram 1973).
3.4.3 Economic


<table>
<thead>
<tr>
<th>Population</th>
<th>Year</th>
<th>National Per Capita Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>36,590,065</td>
<td>1970</td>
<td>301</td>
</tr>
</tbody>
</table>

Annual Rate Economic Growth

3.4.4 Dental Caries Prevalence:


dft per 6-year-old child: 4.7 (6gr)
DMFT per 12-year-old child: 1.4 (13-14 gr)

66.32% of children examined, 3 to 6 years old, had one or more decayed temporary teeth, with an average of 3.83 teeth per child needing fillings. 80.59% of persons examined, 12 to 65 years and over had one or more DMF teeth at an average of 7.11 decayed, missing and filled permanent teeth per person. 57.27% of children examined ages 3 to 14 were found with bacteria also. 22.00% of children examined belonging to the 7-14 age group showed varying signs of inflamed gingiva, an oral condition known to be the precursor of periodontal diseases in later years if left untreated (FDI-BFS 1974).

Dental caries in the main problem among pre-school children, the figures given above show this. One would expect caries prevalence to be also high among primary and secondary school children. Restoration has no guarantee to prevent recurrent caries. Fluoridation if taken during the calcification of teeth (early age) reduces caries by
50-60% has not been implemented. Other preventive measures are limited. Poor oral hygiene is also evident among children. Reasons could be socio-economic and lack of knowledge of good dental health.
3.4.5 Dental Practice:

Dental Health Services: (FDI-BFS 1974).

The Bureau of Dental Health Services, Department of Health, created by Republic Act 3814 in 1966 is the government agency responsible for the establishment and maintenance of adequate standards for all dental services, except those of the public schools and the Armed Forces. Those of the dental clinics operated by dental schools and colleges, and those of the private dental clinics.

These are the following types of dental services in the country.

(FDI-BFS 1974).

1. Rural dental units - organised and administrated by the Department of Health.

2. Hospital dental service - 169 government hospitals under the Department of Health.

3. Public schools dental service - administrated by the Bureau of Public Schools, Department of Education and Cultures.

4. Private schools dental service - Republic Act 951 requires private schools, colleges and universities to provide dental care for the students.

The rest are the industrial dental service, the City of Manila Health Department which employs a number of dentists. Other city and provincial
governments which provide their own dental services, and finally, the Armed Forces Dental Service which provides all types of free dental service to servicemen and also free service for dependents except prostheses (FDI-BFS 1974).

Private practitioners provide treatment needs to the public, the majority of whom are adults and children with parents who can afford to pay for their dental care. The majority of private dentists establish their clinics in urban areas (FDI-BFS 1974).

3.4.6 Water Fluoridation:

Water fluoridation is awaiting the final negotiations between the Bureau of Dental Health Services and the Metropolitan Waterworks and Sewerage System. About 3 million people in the city of Manila would benefit from the project. (FDI-BFS 1974).

There are several communities found to have varying degrees of fluorosis among school children. The government and the National Dental Association are in favour of fluoridation. (FDI-BFS 1974).
3.4.7 School Dental Health Service:

The Philippines with a population of over 36 million has 43 per cent of its total population under the age of 15—a total of about 16 million for whom health and social services are already stretched to the limits (Viith APDF/PRO 1974).

The National average DMF is 2.5, an annual incidence rate of roughly 4 of a DMF tooth. On the other hand, the consistently higher DMF averages of 4.7 for children in Manila aged 5 and 6 years reflects an upward trend and that this should be countered by more vigorous application of modern preventive procedures, such as water fluoridation (Kwan, Fajardo and Guftsag 1976).

Public School Dental Service:

It is administered by the Bureau of Public Schools, Department of Education and Culture. There are 505 school dentists travelling from one school to another to attend to the dental needs of 10,308,257 school children enrolled in the public schools (elementary grade). For the school year 1973-74, 83.56% of school children with defects were given dental treatment (FDI-BFS 1974).
Private Schools Dental Service

Republic Act 951 requires certain private schools, colleges and universities to provide dental service to the pupils and students. There are now 675 dentists employed on a full-time or part-time basis by the private schools throughout the country. Students are charged medical and dental fees upon entering the school, whether or not they receive treatment (FDI-BFS 1974).

The City of Manila Health Department

Has its own dental staff numbering 167 dentists stationed in health centres and in public schools to provide dental care to 273,603 school children enrolled in the public schools. For the school year 1973-74 priority attention among other treatment was given to filling of coipus permanent teeth. Out of 107,628 decayed teeth 73,138 teeth or 40.8% were filled with permanent fillings (FDI-BFS 1974).

Other City and Provincial Governments

These other agencies provide their own dental care services for the public including school children. Statistics for this are not available at present (FDI-BFS 1974).
Armed Forces

The children of the servicemen receive free dental treatment except prostheses (FDI-BFS 1974).

Toothbrushing programs for school children up to Grade 3 has been going on for several years. In 1967 the mouthrinse program was introduced in Jan Jose, Nueva Ecija. This program has since developed into a regular program with a yearly financial appropriation from the Municipal Board. The town has also acquired a building called the Fluoridation Centre which houses a dental clinic where mouthrinses for school children are available and their self-application supervised. Likewise, clinical dental care has been made available to them. Nine other municipalities have since adapted a bi-weekly mouthrinse program. (Kwan, Fajardo and Gufsag 1976, 1st WHO Regional Course in PHD, 1975, FDI-BFS 1974).

3.4.8 Summary and Conclusion:

Dental caries is the main problem affecting children as early as 3 years of age. Its on the upward trend. The school age population is increasing and the dental manpower, funds and facilities are already stretched to the limits. Water fluoridation has not been introduced and the type of dental care provided for the school children are
mainly restorative and curative types. Few schools have other
type of preventive treatment such as toothbrushing fluoride
mouthrinsing.

The provision of restorative type of treatment for school children
is becoming more and more expensive to render. Even richer
countries are finding it hard to provide effective restorative
treatment to all the school children population. Water
fluoridation and other preventive measures have been proven to be
effective and inexpensive to combat dental caries.

3.4.9 Recommendation for Improvements:

1. Water fluoridation - has been proven to reduce dental caries
by 50-60% if taken earlier in life when the teeth are still
forming (calcification).

2. Semiannual supervised self-application of a prophylactic
paste, containing 9% stannous fluoride, in school programs
result in a statistically significant protective effect against
the development of caries. A significant reduction in dental caries
of 30.1% and 24.7% has been expressed by DiFT and DMFS respectively
(Gish, Mercer, Stookey and Dahl, 1975).
3. Other preventive measure like toothbrushing, mouthrinsing, regularly dental examination and etc are also important and should be continued. School teachers are other medical personnel (nurses, health aids etc) should be encouraged to participate in the total health of the school children.

4. Dental health educators, too often provide implicated health information that they themselves think that, what the people need and should know without first finding out what actually what the people are prepared to learn. Great disappointment results in this type of approach because people would not learn. The method should be simple so that anyone can follow. Information should be also given so that if anyone is in trouble he/she knows where he/she can get help. Alternative types of treatment should be also given so that no one feels hopeless when in trouble. Reinforcement is needed to increase the knowledge.

Mothers and school children should be approached in this way whether in the community health centres or in schools. Emphasis should be stressed on diet. They should be encouraged to reduce the cariogenic types of diets and how to reduce the effect if they are taken.
3.5 THAILAND

Thailand is a South East Asian country, situated on the Indonesian Peninsula at lat: 5-20 north and long: 97-105 East. It is bounded by China, Laos, Cambodia, Vietnam, Malaysia and Burma. (Kummanont T 1973)

3.5.1. Population:


Distribution of population by age groups

<table>
<thead>
<tr>
<th>Pre-school</th>
<th>School</th>
<th>Adolescents</th>
<th>Adults</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 0-5</td>
<td>Age 6-14</td>
<td>Age 15-19</td>
<td>Age 20+</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>15.2</td>
<td>27.1</td>
<td>11.1</td>
<td>45.1</td>
<td>34,152,000</td>
</tr>
</tbody>
</table>

The population has increased from 1971-1974 by roughly about 5,848,000 (FDI - Basic Fact Sheets 1974) which shows that the 1974 total population of 40 million.

Nationalities

98% Tais, the rest being Chinese, Indians and others.

(Kummanont T 1973 )
3.5.2 Dental Manpower:

There are 1,476 class I dentists, 909 second class and 20 school dental nurses (New Zealand type). (FDI-BFS 1974).

3839 of the 2nd class dentists are known to have undergone formal training in the school of Dental Hygiene from 1944-54 the rest were trained by apprenticeship (Sundram, J. 1973).

Government:

(i) Hospital - there are dental clinics in almost every hospital, both government and private (about 25% of the 1st class dentists are employed in hospitals). (Kummanont, 1973)

(ii) Armed Forces - 10% of the dentists are employed in the armed forces clinics and hospitals (Navy, airforce, army and police.) (Kummanont, 1973)

(iii) Organization - 10% of dentists work in municipality health centres and hospitals. (Kummanont, 1973)

(iv) University - 40% are lecturers and staff in hospital and universities. (Kummanont, 1973)

Honorary:

Volunteers from the salaries groups for providing mobile dental clinic services to the dentist shortage areas. These are mostly under the Royal Patronage and few from other institutions. (Kummanont, 1973)

Non-Government:

10% work in some organisation dental clinics, 50% of dentists work in full time private practice. (Kummanont, 1973)
All dentists (qualified) are allowed to work in private clinics after official working hours. (Kummanont, 1973)

Second class dentists are not allowed to work under general anaesthesia to extract in case of acute inflammation, to extract roots and bad positioned teeth, to treat the root canal to restore the non-vital tooth to make a prosthesis over the rest of the tooth. All are in private practices. (FDI-BFS 1974)

Distribution of dentists in the country:
About 70% work in the big cities. The rest are in other smaller cities leaving the rural areas without any dentists. (Kummanont, 1973)
The dentists to population ratio is 1:16,771 including the second class dentists.

Administrative Structure:
It is undergoing change at the moment but the intention is to establish a Dental Division in the Ministry of Public Health with its own chief responsible to the Under Secretary of State. (Sundram, C.J. 1973)
3.5.3 Economics:

Thailand is an agricultural land with very few industries. 18% of the land area is agricultural. Three quarters of the cultivated land area favours rice growing. (Kummanont, T. 1973). 82.3% of the work force are agricultural workers, 2.5% professional and the rest craftsmen, salesmen and labourers etc. (Kummanont, T. 1973)


<table>
<thead>
<tr>
<th>Population</th>
<th>Year</th>
<th>National Per Capita Income</th>
<th>Year</th>
<th>Annual Rate Economic Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>34,152,000</td>
<td>1970</td>
<td>$US145</td>
<td>1969</td>
<td>$US6.8%</td>
</tr>
</tbody>
</table>

3.5.4 Dental Caries Prevalence:

National Survey Results for Dental Caries (1963-1972)

dft per 6 year old child    DMFT per 12 year old child

-                                0.6 (12 yrs)

3.5.5 Dental Practice:

Dental Health Services

The dental health service in 71 provinces are administered by both government and municipality under a flexible central administration. (Sandram, C.J. 1973)

Ministry of Public Health:

Responsibility for dental health services is distributed under various sections, mainly medical authorities in the Department of Health and Medical services.
3.5.6 Water Fluoridation:

Fluoridation has not yet been planned, because of insufficient funds. (Kummanont, 1973). However, there are 30 communities with naturally fluoridation water serving a population of 5 million people. (FDI-DFS 1974)

Topical fluoride application are available at the government facilities and individual dentists on demand. (Kummanont, 1973)

There are no oral hygiene and preventive programs in the country (Leslie, 1968). Toothbrushing programs too have not been initiated. (Saudram, C.J. 1973)

In spite of the genuine interest and efforts of many dentists in the various services throughout Thailand, the dental care program for school children is largely an extraction service in both cities and provinces. (Sundram, C.J. 1973)

3.5.7 School Dental Health Service:

The department of health deals mostly with dental services for school children; services all organised by the Dental Section of the division of school Health. Owing to shortage
of personnel, equipment and finance the service is inadequate for the number of school children, estimated to be 1/7th of the total school population. The services are at present limited mostly to the capital area; there are 6 dental health centres for school children in provincial area. (FDI-BFS 1974)

School children in government elementary and secondary schools received five treatment. (Kummanont 1973)

School children are examined on a yearly basis and treatment is sought elsewhere where except for schools with fixed dental clinics or can be reached by the mobile dental units. (Vllth AFDC/APIZO 1973)

There are 22 health centres, 4 mobile dental units, few fixed dental clinics in some schools and 2 municipal hospitals where the children could receive dental care.

Leslie (1968) showed that an incremented school program of the New Zealand type with one operator (operating dental auxiliaries) for 1000 children instead of the ideal 600 per operator would mean that Thailand requires a field-staff of 4,260 school dental nurses. At a graduation rate of 200 in one year, it would take 25 years to accomplish this number. The present rate of 10 per year, it would take 375 years (Sundram C.J. 1973)
3.5.8 Summary and Conclusion:

1. Lack of manpower and facilities limited the dental care of the school children to mainly emergency type treatment.

2. Preventive programs are non existent. Fluoridation has not been implemented and topical fluoride application, mouth-rinsing, and tooth-brushing schemes are also not in practice in the schools.

3. New Zealand type of operating dental auxiliaries are being trained at the rate of 10 per year to look after the dental health of the school children.

4. Population is increasing quite rapidly. There was an increase of 5,848,000 from 1971-1974.
5. Although the average of DMFT of the school children is quite low (0.6 12 yrs), there are quite a number of children who do not receive any type of treatment at all and those who do receive, get mainly the emergency treatment.

6. There are a good number of second-class dentists, second-class dentists, some had formal training in the school of Dental Hygiene and the rest by apprenticeship. Although the caries prevalence is low (0.6DMFT 12 yrs) is the number of existing dental personnel (dentist/nurses), the equipment and availability of funds make it impossible to provide at least conservative dental care to all the school children.
To train the operating dental auxiliaries to look after the dental health of school children is less expensive to train dentists, but to train the operating auxiliaries and to introduce preventive programs such as fluoridation of water supplies, topical fluoride application, fluoride mouthrinsing and toothbrushing schemes in the schools, will be the most economical method of attacking the problems. Dental health education should then follow the above mentioned.

3.5.9 Recommendation for Improvement:

1. A Division of Dental Health should be set up within the Ministry of Public Health to plan and implement programs of dental health within the existing structure of the public health services (Olson JV 1972).

The people (dentist/school dental nurse) who actually is involved in the school dental program should participate in the planning of the program. They are the ones who have faced the problems, therefore, their contributing experiences should help in improving future programs.

2. New Zealand dental nurse type program should be expanded as rapidly as possible throughout the country to provide dental treatment to the school children.
(Olson JV 1972).

To train dentists to look after the health of the school children would be too expensive, beside properly trained dental auxiliaries has been proven to perform as good as any dentist in treating children, New Zealand type of auxiliaries is a very good illustration.

3. Fluoridation of public water supplies in large towns and cities. It is in these places that the dental need is developing fastest. Its benefits could be reaped for a life time by all future urban dwellers who will constitute nearly one half of the population within thirty years. It is a measure specifically directed to children which by reducing dental decay 50% to 60% will reduce the need later for more expensive treatment facilities. The capital expenditure is approximately US$3600 for large capacity feeders. (Fuller JF 1969).

The manpower and money required if fluoridation is implemented will be greatly reduced because there would be less teeth to fill.
4. Before fluoridation could be implemented, topical fluoride application, fluoride mouthrinsing and tooth-brushing schemes could be instituted. School teachers and mothers could help with a minimal training to supervise these schemes. School dental nurses would have time to do fillings and prophylaxis for the school children.

5. Other methods, such as fluoride tablets and fluoridated salts etc have limited value. These may be employed in situations where water fluoridation is not feasible, and adequate dental can be maintained (Fuller JF 1969).

Parents tend to forget to give the tablets to their children. The consumption of salts vary from person to person.

6. Dental Health Education should be aimed at the parents (mothers) and school teachers first because of their great influence on the children. Dental health education for the children should start later either in schools, health centres etc. The combination of efforts by dental health educators, parents and teachers should improve the dental health of the school children.
3.6 SOUTH VIETNAM

3.6.1 Population:


<table>
<thead>
<tr>
<th>Age</th>
<th>Pre-school children</th>
<th>School children</th>
<th>Adolescents</th>
<th>Adults</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>18.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-14</td>
<td></td>
<td>35.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-19</td>
<td></td>
<td></td>
<td>12.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20+</td>
<td></td>
<td></td>
<td></td>
<td>34.0</td>
<td>17,910,300</td>
</tr>
</tbody>
</table>

3.6.2 Dental Manpower:

Number of Dentists-National Survey (1972) (Viith APDC/APRO 1974).

<table>
<thead>
<tr>
<th>Government Service</th>
<th>Private Practice</th>
<th>Total Number</th>
<th>Ratio to Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fully Qualified</td>
<td>231</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Partially Qualified</td>
<td>-</td>
<td>300</td>
</tr>
</tbody>
</table>

There are 7 school dental nurses, 80 dental hygienists, 300 chairside assistants and unknown numbers of untrained dental technicians (Sundram 1973).

3.6.3 Economic:


<table>
<thead>
<tr>
<th>Population</th>
<th>Year</th>
<th>National Per Capita Income</th>
<th>Year</th>
<th>Annual Rate Economic Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>17,910,300</td>
<td>1971</td>
<td>185</td>
<td>1970</td>
<td>5.0%</td>
</tr>
</tbody>
</table>
3.6.4 Dental Caries Prevalence:

National Survey Results for Dental Caries (1963-72) (Viith APDC/APRO 1974).

<table>
<thead>
<tr>
<th>dft per 6-year-old child</th>
<th>DMFT per 12-year-old child</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.1</td>
<td>7.4</td>
</tr>
</tbody>
</table>

In 1964 a dental survey for caries prevalence was carried out by the ICNND which showed the DMFT in children was low although the caries attack rates in deciduous teeth of the same children were high (Moreira 1973).

About a decade later, in 1971, Barmes reported DMF averages for six and twelve year old children in Saigon to be as high as 2.1 and 6.3 teeth respectively (Moreira 1973).

The table above shows that dental caries in children have increased tremendously especially in the deciduous teeth from 2.1 to 10.1 dft. The reasons could be attributed to rapid urbanization, war and insufficient and limited dental health facilities.

The caries experience in both dentitions was somewhat higher in people living in the Coastal and Delta regions, than in people in the more remote Highland areas. No ethnic differences in caries susceptibility could be demonstrated (Russell 1965, Moreira 1973).
3.6.5 Dental Practice:

The chief of the Dental Services is a dentist under the Director-General of Health in parity with the nursing service (Sundram 1973).

There are 106 dentists in government employment (that are permitted private practice also), over 60 are in full-time private practice and 134 are in the Armed Forces. In addition, there are an estimated 3,000 dentists practising without any formal training and an unknown number of untrained dental technicians (Sundram 1973).

There are over 70 government dental clinics which are virtually extraction clinics where about 1,500 extractions and 20 fillings in one month are done (Sundram 1973).

3.6.6 School Dental Health Service:

School children are examined once a year. Treatment is provided as soon as possible either in the health centres, hospitals or private surgeries. Few children receive free treatment from the government facilities. Most parents have to pay for their children's dental care (VIITH APDC/APRO 1974).
The majority of children who needed dental care, receive mainly the emergency type of treatment, namely the relief of the aching tooth or teeth (Sundram 1973).

Oral hygiene and preventive programs in school were initiated in 1970 but not sustained because of war conditions. Fluoridation plants for the Saigon population were supposed to be installed and maintained by Australia in 1973 (Sundram 1973).

3.6.7 Summary and Conclusion:

1. Dental caries is prevalent among school children especially the 6 year old groups. One can assume that the periodontal condition is also high especially if the progress of dental caries is not checked.

2. School children are examined once a year, but the majority receive only emergency type of treatment. Most parents can not afford to pay for their children's dental care.
3. Fluoridation of public water supplies and preventive programs for the school children are not in practice.

4. There are more non-qualified dentists than the qualified ones.

5. There is definitely a shortage of manpower. 1 dentist to about 30,000 children only excluding the adult population.

The school children are at the mercy of dental diseases especially dental caries. There is no existing effective conservative and preventive measure to combat the conditions and unless some immediate effective actions are taken to help solve the problems, there will be a massive number of edentulous people in the future. The number of qualified dentists will not be able to meet the denture demands and the patients will have to seek help from less qualified people.

3.6.8 Recommendations for Improvement:

1. Public Water Fluoridation. It is a measure specifically directed to children, which by reducing dental decay 50% to 60%, will reduce the need later for more expensive treatment facilities and manpower (Fuller 1969).
The capital expenditure is about US$3600 for large capacity feeders (for more than 2 million gallons per day), smaller feeders is about US$1200 (for flows less than 2MGD) (Fuller JF 1969).

This should be implemented in the cities where many people dwell, so that great numbers of children would benefit from it.

Fluoride tablets may be employed in situation where water fluoridation is not feasible, and adequate control can be maintained (Fuller JF 1969).

2. Self-fluoride topical application, mouthrinsing and tooth-brushing schemes should be implemented in the schools and the teachers trained to supervise them.

3. Community dental health education. Should be aimed at the parents (mothers) and teachers to make them aware of the dental health and the total health of the children. The adult population should also be made aware of their health, their susceptibility to the disease, how to prevent them and where to get treatment when required. The scheme should be aimed at changing attitudes
of the community to appreciate dental health; simple home care instruction (toothbrushing, mouthrinsing, the use of dental floss etc) and dietary modification.

4. School Health Education. Teachers should be trained to carry this because of their great influence on the children. School dental nurses may be used to enforce the program.

Evidences that the School can Improve Habits (health).

a) Youth is the time of habit formation. Health habits, among others are being formed at school.

b) The school furnishes the kind of training that is needed for habit formation.

c) The school works harmoniously with the home. (Turner, Sellery and Smith)

5. Training of operating dental auxiliaries to look after the dental health of the school children. If preventive dentistry is implemented in the school dental program, each auxiliary could look after the dental health of 1200 school children each year. The back log of required treatment would be greatly reduced. Cost of manpower, equipment, materials and supplies would also decreased.
3.7. HONG KONG

3.7.1 Population.


<table>
<thead>
<tr>
<th>Age Group</th>
<th>Pre-school children</th>
<th>School children</th>
<th>Adolescents</th>
<th>Adults</th>
<th>Total Pop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 0-5</td>
<td>% 11.7</td>
<td>% 27.0</td>
<td>% 14.4</td>
<td>% 46.9</td>
<td>4,159,90</td>
</tr>
</tbody>
</table>

About fifty four (54) per cent of the population is under the age of twenty (20).

3.7.2 Dental Manpower:

Number of Dentists-National Survey (1972) (Vith APDF/APRO 1974).

<table>
<thead>
<tr>
<th>Government Service</th>
<th>Fully Qualified</th>
<th>Partially Qualified</th>
<th>Total Number</th>
<th>Ratio to Pop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>68</td>
<td>209</td>
<td>218</td>
<td>495</td>
<td>1:8,400</td>
</tr>
</tbody>
</table>

There are 22 dental nurses and 225 dental technicians. All the dental nurses, and 43 of the dental technicians are employed by the government (Sundram 1973).
3.7.3 Economic:


<table>
<thead>
<tr>
<th>Year</th>
<th>National Per Capita Income</th>
<th>Year</th>
<th>Annual Rate Economic Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>700 US$</td>
<td>1970</td>
<td>15% US$</td>
</tr>
</tbody>
</table>

4,159,900

3.7.4 Dental Caries Prevalence:

National Survey Results for Dental Caries (1963-73) (Viith APDF/ APRO 1974).

<table>
<thead>
<tr>
<th>dft per 6 year-old child</th>
<th>DMFT per 12 year-old child</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3 (5-8 yr)</td>
<td>2.0 (12 yr)</td>
</tr>
</tbody>
</table>

The average number of decayed or filled deciduous teeth per child in the age-group 5-8 was 5.1. When compared with the results of Allright survey in 1961. This represented a reduction by about one third. This substantial reduction in caries experience can be attributed to the six gears of fluoridation Hong Kong had by then enjoyed (Moreira 1973).

About 60 per cent of the children and 90 per cent of adults had inflamed gingivae (Moreira 1973).

3.7.5 Dental Practice

The government service is primarily concerned at the moment with the dental care of its employees and their
children, and in public health program in preventive dentistry. The auxiliary Dental Workers (Dental Hygienists) Regulation which came into force in 1969 enables dental hygienists to be employed both in private offices of qualified dentists or by the government; school dental nurses are however, limited to government employment (Sundram 1973).

Some of voluntary organisation give both emergency treatment for the relief of pain and to a limited extent, routine dental care. Some industrial corporations provide dental treatment up to a ceiling of US$30 per annum to their employees under the medical benefits scheme (Sundram 1973).

3.7.6 Water Fluoridation
Fluoridation of water supply was commenced in 1961 and the entire population benefits from this preventive measure (Sundram 1973).

The efficiency of fluoridation was more pronounced in the permanent than in the deciduous teeth. Children aged 6-8 year averaged 0.5 DMF teeth per child. This amounted to a reduction in caries experience by three-quarters when compared with Allright's findings for the same age group in 1962 (Moreira 1973).
3.7.7 School Dental Health Service:

Fluoridation is the main preventive measure available for the school children population. Only children of government employees are treated. At the government facilities. Other voluntary organisations give both emergency and to a limited extent some routine dental care to the children (Sundram 1973).

There are about 1 million school children of which ¾ million are in elementary schools with an increase of 100,000 new pupils every year. (Sundram 1973). One would expect that very small number of this, are the children of the government employees who can receive treatment from government facilities. The rest, the parents have to pay for their dental requirement if they can afford it.

The main dental diseases effecting the School Children.

A. The number of children with the back-log of un-met restorative needs becomes the primary problem.
B. Gingivitis effecting about 60% of the children is almost an equal problem with dental caries (Moreira 1973).
C. About one-fifth of persons aged 7-19 years required treatment for one form or other of handicapping dentofacial anomely, crowding was the commonest (Moreira 1973).
Forty (40) per cent of children aged 6-11 required treatment for malocclusion (Chan 1968).

3.7.8 Summary and Conclusions:
A. School dental service is not one of the government priority projects. The program was abandoned in 1964.
B. Great number of children (including school children) suffer both dental caries and periodontal diseases. Malocclusion is also common.
C. Government provide dental services to only its employees and their dependents. Dental health education which is the only type of service being provided to the public is still at the infant stages. Fluoridation has been implemented since 1961. Its the only effective preventive measure the public benefit from.
D. The present manpower (dentists) is insufficient to serve the ever growing population (population explosion).
E. Numbers of voluntary organisations provide emergency treatment to the under-privileged people.

Unless the government changes its attitude about dental health especially of the school children and make it one of the priority projects and provide funds for the program (e.g., training of school dental nurses etc), the existing situation would persist for good number of years to come. Also unless the dental profession help push the government for the need of school dental service nothing would be done.
3.7.9 Recommendation for Improvement:

I. There is faint hope in the developing countries of the increasing dental needs being matched by dental professional resources and facilities. It is necessary therefore, to ameliorate the dental manpower problem by involving all existing educators in the dental health program.

The school teachers, school health education nurses, midwives, nurses at maternal and child health centres etc; the function of the dentist being to educate the educator (Fuller 1969).

Hong Kong could start with training the school teachers to supervise toothbrushing and fluoride mouthrinsing schemes in their respective schools. The service could expand it to include other areas as the program progress. They could also be trained to carry out simple dental health education for the school children and mothers.

Evidences that the school can improve habits (health).

a) Youth is the time of habit formation, health habits among others are being formed at school.

b) The school furnishes the kind of training that is needed for habit formation.

c) The school works harmoniously with the homes (Turner, Sellery and Smith).
Mothers could be influenced by the teachers to look after the dental health of their children while at home.

**Mouthrinse with Fluoride.**

Fluoride mouthwashing once a fortnight commenced in Portsmouth in 1968. Campaigning the FMR and non FMR of the children aged 5,6,11,12,15 through the whole 6 year period of the scheme is believed to be valid in public health terms a where a reduction of the caries increment of at least 30 per cent is the minimum to be of practial volume. (Bristow 1975)

**Importance of Toothbrushing.**

Effective and oral hygien procedures at intervals of 48 hours are compatible with gingival health. However, if the intervals between complete removal of peoque exceeded 48 hours gingivivities developed. (Lang, Cumming and Loe 1973)

These two schemes (toothbrushing and mouthrinse) are implemented in schools under the supervision of the teachers, the under-privileged children could benefit greatly from them. The great back-log of un-met dental caries would be reduced and their oral hygien improved. It could be that the great back-log of dental caries in the deciduous teeth is due to their poor oral condition.
The government should at least provide toothbrushes and other supplies (eg. fluoride for mouthrinsing etc.) that the teachers need to carry out this preventive program.

Dental Health Education especially in Dietary Modification.

Another important factor in the practice of dental prevention is the selection of a proper, wholesome diet. We must always avoid the heavy consumption of sweet, such as candy and cake. Sugar is the chief cause of dental caries and decay. Between-meal snacks should be cut down on they interfere with proper nutrition. A well balanced diet will help to prevent oral and systemic disease. (Jacobs 1974)

Snacking is the enemy of teeth. Most meals contain something slightly cariogenic (acid-producing). Three counts of acid production can be expected with three normal meals. The diagram below shows the pattern of acid production.
However, if three very minor snacks are added between the normal meals, the picture would be slightly different. The acidity would hardly have a chance to fall enough for the enamel to reach the remineralization zone. If this eating pattern is followed constantly, the result could easily be rampant caries. (Jacobs 1974) See diagram below.

The community health nurses and the school teachers could easily be trained to educate the mothers especially on dietary modification (eating habits) of the children. The mothers should be taught how to control their children to eating sweets between meals. To eliminate the eating of sweets is an impossible task, but the mothers should know that it's better for their children to eat sweets right after the normal meal at home and the teeth be cleaned right away rather than provide the children with sweets to take to schools where they may not have any toothbrush to clean their teeth after eating.

To train the required number of dentists to provide treatment to the total school population would be a very
expensive program and it requires a great number of years. The use of operating dental auxiliaries has been very successful in many countries (e.g. Singapore, New Zealand etc;.) Their training usually lasts only two years and a number of them could be trained at the same amount of money required to train on dentist. With the school children already getting the benefit of fluoridation, the involvement of the education (teachers etc), the school dental nurses could look after the dental health of an increased number of school children rather than the ideal 600.

There is no universal answer which can be applied to each and every country, but each has to be assessed according to its new way of life, individual problems and available resources. The difference and consultants tell us also that the need is for simple measures of dental disease control and prevention which can be understood easily, which can be applied at the community level and which will persuade people to achieve dental health by their own personal attitudes and actions. (Fuller 1973)
3.8 SOUTH KOREA

3.8.1 Population:


<table>
<thead>
<tr>
<th></th>
<th>Pre-school Children</th>
<th>School Children</th>
<th>Adolescents</th>
<th>Adults</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 0-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 6-14</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 15-19</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 20+</td>
<td>67</td>
<td></td>
<td></td>
<td></td>
<td>31,469,132</td>
</tr>
<tr>
<td>%</td>
<td>67</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There are about 4 million people living in Seoul alone and 1 million of them are primary school children (Sundram 1973).

3.8.2 Dental Manpower:

Number of dentists - 1972 (Viith APDF/APIZO 1974)

<table>
<thead>
<tr>
<th>Government Service</th>
<th>Private Practice</th>
<th>Total Number</th>
<th>Ratio to Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully Qualified</td>
<td>Partially Qualified</td>
<td>315</td>
<td>1,548</td>
</tr>
</tbody>
</table>

The number of dental personnel have increased according to FDI reports in 1974. There are now 2,236 dentists, 52 dental hygienists, 1,442 dental assistants and 605 dental laboratory technicians (FDI - Basic Fact Sheets 1974).
Facilities:

A. 16 mobile dental clinics for the rural areas.

B. 200 health centres in the urban areas throughout the country.
   Each health centre has a dental clinic room manned by either
   full time dentists or part time dentists in private practice.

C. There are dental clinics in the government hospitals where
   dental services are also available.

D. Each of the nine districts in Seoul has a health centre for the
   school children staffed by two physicians, one dentist and one
   dental nurse. (Sundram, 1973)

There are about 30 dentists in government employ staffing dental
clinics rooms in 200 health centres, 90 are in universities and
the remaining 2000 are in private practice. About 800 dentists are
in private practice in Seoul alone. (C.J. 1973)

Korea Dental Association provides nursing and emergency services
through its two large mobile dental clinics. (Sundram, C.J. 1973)

Very few people receive free government dental service except for
emergency treatment which is free for all.

The majority of the parents have to pay for the dental care of
their children. (V11th APDF/APIZO 1974)
There are 3 dental schools and dental hygiene training schools graduating 140 dentists and 8 dental hygienists per annum.

(Sundram, C.J. 1973)

3.8.3. Economics:


<table>
<thead>
<tr>
<th>Population</th>
<th>Year</th>
<th>National Per Capita Income</th>
<th>Year</th>
<th>Annual Rate Economic Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>31,469,132</td>
<td>1971</td>
<td>252</td>
<td>1972</td>
<td>US$</td>
</tr>
</tbody>
</table>

3.8.4. Dental Caries Prevalence:

National Survey Results for Dental Caries (1963-73) (V11th APDF/APRO 1974)

- dft per 6 year-old child: 2.9 (7yr)
- DMFT per 12 year-old child: 0.6 (11yr)

The practice of mouthswishing after meals with green Chinese tea which has a high fluoride content seems to be responsible for the low prevalence of caries and periodontal disease.
3.8.5. Dental Practice:

The dental section of the Ministry of Health and Social Welfare was formed in 1965. (Fullar, 1969, Sundram, 1973)

Responsibilities:

A. Administration of dental health services to the public.
B. Registration and licensing of dentists and other para-dental personnels.
C. Research and study of dental techniques.
D. Control of illegal dentistry.
E. Dental care for rural areas without dentists through the use of mobile dental clinics. (Fuller, 1969, and Sundram, 1973)

3.8.6. Water Fluoridation

Fluoridation of the drinking water has not been initiated in Korea yet, though the 4 million population in Seoul could well benefit by this move. (Sundram, 1973)

The number of communities with naturally fluoridated water is not known. (FDI-BFS 1974)

Fuller (1969) described the old Korean custom of mouth-swishing after meals with green chinese tea which appeared to be related to a low caries incidence due to its high fluoride content. A national epidemiological survey was initiated by WHO through Fuller (1969) and subsequently consolidated by Kuatson in 1971. (Sundram, 1973)

The government and the Korean Dental Association are in favour of fluoridation (FDI-BFS 1974)
3.8.7 School Dental Health Service

The total number of primary school children in Korea is about 6 million. Seoul city has a nucleus of a school dental service with 9 dentists responsible for about 1 million primary school children. Each of the nine districts in Seoul has a school health centre staffed by 2 physicians, 1 dentist and 1 dental nurse (Sundram 1973).

School children are examined in schools once a year by the government dental personnels. Those who need treatment are referred to school health centres, health centres, hospitals or to private surgeries. Government hospitals and health centres provide only restorative, curative and emergency treatment. Only emergency treatment is free for all (Viiith APDF/APRO 1974).

Very few school children are entitled to free government dental services and few also receive preventive type of treatment mainly topical fluoride application. (Viiith APDF/APRO 1974).

Oral hygiene or preventive programs are the main interest of the Korean Oral Health Association. During the Korean Dental Health Week which is held every year, dental health education of the public is the main activity. Though authorised by the government this association is mainly financed by a toothpaste manufacturing company with
a small subsidy from the government (Sundram 1973).

Although the dental caries prevalence among school children is low, it is still the main problem because the number of back-log of un-met caries among children is very high. The services offered by the government are not free except for emergency treatment and the manpower to meet the need is insufficient.

3.8.8 Summary and Conclusion

The number of the primary school children population is so great that the present number of manpower available is insufficient to meet the restorative treatment needs of the children.

Although the caries prevalence of the school children is low the number affected by the disease and the back-log of the un-met need is high.

Fluoridation of the public water supplies and other preventive measures in school dental program which could help this problem have not been implemented yet.

It is almost impossible to train or employ the required number of dentists to effectively provide restorative treatment to all the school children. It would be a very expensive scheme which the country would not be able to afford. Otherwise expensive usage of dental
personnel (school dental nurses) should be considered. Preventive programs like fluoridation of the public water supplies, topical fluoride application, tooth-brushing and fluoride mouthrinses should be implemented in the school dental health program.

3.8.9 Recommendation for Improvement:

I. Fluoridation of the public water supplies

The water supplies suitable for fluoridation are those in large towns and cities. The cost relative to the ultimate benefits are not great. The capital expenditure is approximately US$3600 for large capacity feeders. The cost per person per year receiving fluoridated water is about 2 US cents (Fuller 1969).

It is a measure specifically directed to children which by reducing dental decay 50 to 60% will reduce the need later for more expensive treatment facilities. The payment per child by the New Zealand Government to private dentists for the complete dental treatment of children has been halved at Hastings as a result of water fluoridation (Fuller 1969).
The effect of fluoridation on a dental public health program has reduced staffs and overall cost of the school dental program (Deuby and Hollis 1966).

The 1 million primary school children population in Seoul could benefit from the introduction of fluoridation in the water supply.

II. Toothbrushing and mouthrinsing schemes
The semiannual supervised self-application of a prophylactic paste, containing 9% stannous fluoride in school programs have reduced dental caries in children aged 6-14 years by 30.1 to 24.7%. (Gish, Mercer, Stookey and Dahl 1975).

Daily toothbrushing in schools supervised by trained teachers will improve the oral hygiene of the children.

The twice-daily use of an acidulated phosphate fluoride mouthwash that contains a small amount of fluoride is effective in reducing the incidence of dental caries in children by 26% (Finn, Moller, Jamison, Regattier and Hing 1975).

III. Training of operating dental auxiliaries.
The training of these type of dental personnel is less expensive and it takes normally 1-2 years. They have proved themselves to be as capable as dentists in
looking after the dental care of the school children. Good example are the New Zealand School Dental Nurses. Many other countries are training auxiliaries for this purpose. An operating dental auxiliary in Korea could look after the dental care of 1200 or more children instead of the ideal 600 because of the low caries prevalence among school children, of fluoridation and other preventive programs like the ones mentioned above are implemented, this number could be increased.

IV. Dental Health Education

Both mothers and teacher have great influence on children. Dental health education should be aimed at this direction so that these groups of people can influence the attitude of the children to accept and practice good oral health.

Dentists, dental auxiliaries and other health personnel (doctors, nurses, nutritionists etc) should be involved in this program if its to be successful.
Dental health services in Japan have been carried out mostly by the group of dentists since 1900. With the enactment of the Dentist Law in 1900, the system of dentist was legally established.

At the present, the National Agencies which are organising and administrating dental health services in Japan are the Ministry of Health and Welfare, the Ministry of Education and the Ministry of Labour. The Ministry of Health and Welfare is mainly dealing with the whole population in general, the Ministry of Education is for the school children and students, and the Ministry of Labour is for the working people at the factory (Medical Affairs Bureau, Ministry of Health and Welfare 1961).

3.9.1 Population:


<table>
<thead>
<tr>
<th>Pre-school children</th>
<th>School Children</th>
<th>Adolescents</th>
<th>Adults</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 0-5</td>
<td>Age 6-14</td>
<td>Age 15-19</td>
<td>Age 20+</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>8.5</td>
<td>15.4</td>
<td>8.7</td>
<td>67.4</td>
<td>103,720,060</td>
</tr>
</tbody>
</table>
Distribution by Ethnicity, Racial Groups and Language

Spoken (1972).

<table>
<thead>
<tr>
<th>Distribution by Groups</th>
<th>Distribution by Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese 100%</td>
<td>Japanese</td>
</tr>
</tbody>
</table>

3.9.2 Dental Manpower

Number of Dentists in Dental Health Services (1972)

(VIith APDC/PRO 1974).

<table>
<thead>
<tr>
<th>Government Services</th>
<th>Private Practice</th>
<th>Tot. Nbr.</th>
<th>Ratio to Pop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully Qualified</td>
<td>Partially Qualified</td>
<td>127</td>
<td>37,732</td>
</tr>
</tbody>
</table>

Number of Operating Auxiliaries (1972) (VIith APDF/PRO 1974).

<table>
<thead>
<tr>
<th>Operating Auxiliaries</th>
<th>Operating Auxiliaries</th>
<th>Ratio to Pop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Government School</td>
<td>- Private School Dental</td>
<td>95</td>
</tr>
<tr>
<td>- Dental Dental Hygienist</td>
<td>Others Nurse Hygienist</td>
<td></td>
</tr>
</tbody>
</table>

Number of Non-Operating Auxiliaries (1972) (VIith APDF/PRO 1974).

<table>
<thead>
<tr>
<th>Non-Operating Auxiliaries-Govern.</th>
<th>Non-Operating Auxiliaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technicians Chair- technicians</td>
<td>Chair- clerical assistants</td>
</tr>
<tr>
<td>Clerical assistants</td>
<td></td>
</tr>
<tr>
<td>Assistants</td>
<td>Assistants</td>
</tr>
<tr>
<td></td>
<td>8,722</td>
</tr>
<tr>
<td></td>
<td>31,585</td>
</tr>
</tbody>
</table>
The dental manpower has increased according to FDI Annual Reports 1974. There are now 38,055 dentists, 7,352 dental hygienists, 31,858 dental assistants and 8,215 dental technicians. (FDI-BFS 1974)

3.9.3 Economics:


<table>
<thead>
<tr>
<th>Population</th>
<th>Year</th>
<th>National per Capita Income</th>
<th>Year</th>
<th>Annual Rate Economic Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>103,720,060</td>
<td>1970</td>
<td>1,537 US$</td>
<td>1970</td>
<td>10.5%</td>
</tr>
</tbody>
</table>

3.9.4 Dental Caries Prevalence:

National Survey Results for Dental Caries (1963-72) (V11th APDF/APRO 1974)

<table>
<thead>
<tr>
<th>dft per 6 year-old child</th>
<th>DMFT per 12 year-old child</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.4 (6yr)</td>
<td>4.9 (12yr)</td>
</tr>
</tbody>
</table>

Japanese children consume a lot of refined carbohydrates. The consumption of sugar is believed to be one of the highest in the world. The between-meal eating habit and caries prevalence in children has been evaluated from the material obtained on 476 children. Dividing the group into one with a number more than 10 and another with less than 10, comparison was made about the regularity of between-meal eating habits. Regular eating habit remained at only 23.5%, with the group with less caries; whereas the group with more than ten showed 45.7%.

(Susumucehara, 1972-1973).
3.9.5 Dental Practice:

Dental Health Services

The Dental Health Section of the Ministry of Health and Welfare plays a leading role in implementing dental and health programs through other government agencies, e.g., School Health and Child and Maternal Sanitation sections, and local health agencies, operating at Health Centres of which there are 800 in Japan in the basis of 1:100,000. The Dental Health Measures provide by-laws as follows:

Dental examination for pregnant women and infants, three year old children, school children and students at both primary and secondary schools. (FDI-BFS 1974)

Nearly the whole population is covered by six social or health insurance schemes. All treatment are covered except orthodontic and application of topical fluoride. Scale of fees is regulated by the government. (FDI-BFS 1974)

Over 97 per cent of qualified dentists are engaged in practice and approximately 80 per cent are in private practice. Only about 0.4 per cent are in public health services. (FDI-BFS 1974)

Geographical distribution of dentists tend to be concentrated in urban areas, and where living standards are low, the ratio of dentists to population is low. (FDI-BFS 1974)
3.9.6 Water Fluoridation:

There is only one community with artificial water fluoridation (Yamashina) serving approximately 12,000 people. There is also one with natural fluoridated water serving a smaller population of 3,000 people. (FDI-BFS 1974)

3.9.7 School Dental Health Service:

The schools except colleges and universities are required to have at least one school dentist by the School Health Law. Oral examination is practices on children at 3 months before their entrance to the primary school. All students, school children, infants and school teachers are annually receiving at least one health examination including and examination. The school authorities are required to inform the results of the examination to the parents and advise them to seek necessary treatment at the hospital, health centres, private surgeries etc (Medical Affairs Bureau, Ministry of Health and Welfare, 1976).

All dental clinics, health centres, hospitals etc provide all kinds of dental treatment and restorations and are covered by Health Insurances with the exception of orthodontic and preventive services (e.g., topical fluoride application) (Medical Affairs Bureau, Ministry of Health and Welfare 1961).

Some schools have their own dental clinics (Sundram 1973). There is one health centre to every 100,000 population located at every prefecture. Private surgeries are also available to the school children (Medical Affairs Bureau, Ministry of Health and Welfare 1961).
In 1958, Dental Hygienists were introduced to manage the dental health of the school children and many school dentists use them throughout the country. The 25 per cent of them employed in the government health centre, dental clinics and school dental clinics; undertake the same type of work as the school dental nurse (New Zealand type). Those employed in private practice do oral phrophylaxes, insertion of fillings and mouth impressions for models (Sundram CJ 1973).

As the school health program is in the hands of the school's own free will, the results is greatly different by the schools. In good schools, 50 to 80 per cent of the children completed their dental treatment, while, some schools, only 5 per cent of those with dental caries completed treatments (medical Affairs Bureau, Ministry of Health and Welfare 1961).

The number of pregnant mothers and pre-school children attending and receiving treatment at the health centres are so many.

In 1971, there were 171,914 pregnant mothers, 1,648,147 infants and 1,137,545 3 year old children who received treatments at the health centres (Ministry of Health and Welfare 1974).
One can assume that the same situation exist in hospitals and private dental clinics, and also the waiting list would be very long that the school children just give up hope of completing their required treatment.

There are no New Zealand type of school dental nurses to help the dentists of some of the loads, but there are 7,352 dental hygienists most of them employed by private practitioners (FDI-BFS 1974, APDC/APRO 1974).

Although majority of the school children are covered by health insurances, only limited number of them do complete their treatment. The main reasons are shortage of manpower and insufficient facilities available.

School dentists apply sodium fluoride (2 per cent) 3-4 times a year to the school children. But the manipulation is somewhat troublesome and topical application of fluoride is not accepted so widely (Medical Affairs Bureau, Ministry of Health and Welfare 1961).

In Japanese primary schools, the school lunch program is widely carried out. Two or three schools put NaF in the milk and soup (0.5mg per day) (Medical Affairs Bureau, Ministry of Health and Welfare 1961).
Vitamins H and D tablets containing various quantities of NaF are now available on the market (Medical Affairs Bureau, Ministry of Health and Welfare 1961).

Every primary school is carrying out the training for toothbrushing. During the Oral Hygiene Week (the 1st week of June) the drill for toothbrushing is opended on a grand scale at various cities and towns (Medical Affairs Bureau, Ministry of Health and Welfare 1961).

Dental Health Education
A. The method is to let the child discover his own problems and unsolve them. The competition of "Good Teeth School" or Good Teeth Class are held between schools. Excellent schools of Health program is officially commenced in the National scale.
B. The curriculum of middle schools include the subject of health and physical education. The school boys and girls are required to take 70 bonus (2 units) for this subject. High schools and colleges have similar subject.

C. The dental clinics and hospitals are also practicing the instruction of health education.
D. Radio, television, newspapers and magazines are playing an important role for the dental health education to the public.
E. During the first week of June, which is called Oral Hygiene Week, dental health education is especially emphasized under the auspices of the government and the Japan Dental Association.

F. During the teacher training programs, health education is among those subjects that are required. Health education in-service training for the teachers is widely practiced by the Ministry of Education. A seminar and conference of health education is held annually in many cities and towns.

G. Dental health education for pre-school children and mothers are practiced by dentists in both the private dental clinics and in the health centres. (Medical Affairs Bureau, Ministry of Health and Welfare 1961)

There is no report on what kind of dental health information is given to the school children, pre-school children, teachers and the mothers. There is also no report whether the approach taken is effective or not.

3.9.8 Summary and Conclusion:

Dental caries prevalence is high in children especially in the 6 year old groups. The present number of dentists looking after the dental health of the school children can not cope with the load. Treatment facilities (e.g., health centres, and other dental clinics) are insufficient.
The type of dental treatment provided for the school children are mainly curative and restorative treatment. The type of preventive programs available is ineffective. The effectiveness of the type of dental health education at the present is debateable. Dental hygienists are employed in the school dental program. Their main duty is mainly restorative.

Unless the number of dentists is increased to meet the dental demand of the school children which would be an expensive approach, the condition of dental caries would remain the same or get worse.

The most topical and inexpensive ways to tackle the problem would be to implement preventive dentistry into the school dental programs. This would mean different uses of fluoride (public water fluoridation, school water fluoridation, topical applications regularly, fluoride mouthrinsing (daily), use of toothpaste with fluoride etc). Dietary modification, changing of between meal eating habits, consumption refined carbohydrates and finally a more regular dental examination preferably every 4-6 months interval to ensure that early resines are treated at early stage. Dental hygienist should be trained to do more preventive than conservative dentistry.
3.9.9 Recommendation for Improvement:

1. Fluoridation

The benefits of public water fluoridation (artificial) have been demonstrated repeatedly in terms of the reduction in dental caries experience. A recent study in Newburgh and Kingston, U.S.A., evaluated the effect of fluoridation in terms of reduced fillings needs and costs of a dental public health program. (Denby and Hollis, 1966). Hastings was the first city in New Zealand to fluoridate its water supplies in 1954. The reduction in dental caries prevalence has been observed at regular intervals. (Denby and Hollis, 1966).

An evaluation is made of the reduction in caries prevalence amongst Hastings children during a period of 10 years fluoridation. It is shown that in permanent teeth of children aged 6, 7, 8, 9, 10 years, caries rates have been reduced by 84, 67, 53 and 55 per cent respectively. Children aged 11-16 years caries rates have been reduced by 52-30 per cent. Caries rate in deciduous teeth of children aged 5, 6 and 7 years have been reduced by 52, 50 and 36 per cent respectively. (Ludwig, T.G., 1965)

The costs of fluoridation in relation to the ultimate benefits are not great. The capital expenditure is approximately US$3600 per large capacity feeders (for flows more than 2 million gallons per day).

The capital
cost for smaller feeders is approximately US$1200 (for flows less than 2MGD). The cost per person per year receiving fluoridated water, about 2 US cents. (Fuller JF 1969).

The cost of fluoridation has gone up, but the cost is still minimal in comparison to the cost of conservative and restorative treatments.

Fluoridation in Hastings (N.Z.) has increased the number of children that lack school dental nurse can look after. There has been a saving in the cost of the school dental program, and the number of manpower used to be required is greatly reduced. Dental practitioners have more time to devote to the population over 16. The children are spaced unnecessary pain and discomfort require fewer fillings and extractions, lose less school time taken up by treatment, and who finally pass to adulthood with more tooth tissue and less restorative dentistry (Denby and Hollis 1966).

2. School Water Fluoridation
   i) School water fluoridation offers a means whereby sizable numbers of children may be benefited with minimal demands on personnel, equipment and funds.
   ii) The most apparent disadvantage of this method is that children are usually five or six years old before they begin attending school and consuming the school's
water, whereas maximum benefits accrue when fluoridated water is consumed from birth.

iii) Another disadvantage to school water fluoridation is that children receive only intermittent exposure to fluorides because they attend school just five days a week for only part of the day.

iv) A dental survey after six years of school fluoridation showed that children in the test school averaged 21.9 per cent less dental decay than the children in the central group. (Horowitz, Heifetz, Law and Driscoll 1968).

3. Other Uses of Fluoride

Topical Application

The oral surfaces of teeth acquire a resistance to dental caries if treated topically with a 1.0 or 2.0 per cent solution of sodium fluoride. A series of four topical application effects on approximate 40 per cent reduction in the dental caries incidence. (McClure FJ). Fluoride has been found to add protective layer to the surface of the enamel, seals off defected marginal edges of amalgan fillings and helps in the re-mineralization of early decalcifying enamel subsurfaces.

Fluoride (topical acidulated fluoride) may also exert an effect directly on the plaque bacteria. This effect may be a reduced ability of the plague flora to form acid and polysaccharides from carbohydrates, or as a change in the microbial composition of plaque (Loesche, Murray and Mellbery 1973).
4. Mouthrinsing (Fluoride)

It is fully recognised that the method chosen of comparing the FMR and Non-FMR members of age cohorts as opposed to following individual children through the whole 6 year period of the scheme is not ideal but this is believed to be valid in public health terms where a reduction of the caries increment of at least 30 per cent is the minimum to be of practical value (Bristow 1975).

5. Fluoride Tablets

Fluoride tablets maybe employed in situation where water fluoridation is not feasible and adequate control can be maintained (Fuller JF 1969).

When fluoride tablets were taken daily from within the first year (after birth) 77-88 per cent had zero dmf. (Fanning 1975).

If this scheme could be maintained in both primary and secondary schools, the same result could be attained.

It should be emphasized that the occasional user of fluoride tablets received very little protection against dental caries (Fanning 1975).
6. Toothbrushing (Frequency)
Effective oral hygiene procedures at intervals of 48 hours are compatible with gingival health. However, if the intervals between complete removal of plaque exceeded 48 hours gingivitis developed (Lang, Cumming and Loe 1973).

7. Fluoridated Toothpaste
When used in conjunction with the toothbrush helps remove the plaque, lower PH in the mouth and helps in the re-mineralization of early decalcification of the subsurface enamel.

8. Use of Dental Hygienists
The use of operating dental auxiliaries has been proven successful in many countries, New Zealand being the best example. Some dentists in Japan use them in their dental public health program (school dental health service). In order to cover the school population at the least cost, the dental hygienists should be employed, and to run the school dental program with supervising dentists checking them now and them. They should be taught to provide more preventive treatment (e.g., topical fluoride application, mouthrinses, toothbrushing schemes and dental health education to improve the oral health and any harmful dietary habits) rather than restorative. In this way, each dental hygienist could look after the dental health of up to 1200 children two times the ideal number for restorative treatment.
9. Dietary Modification

One important factor in the practice of dental prevention is the selection of a proper, wholesome diet. We must always avoid the heavy consumption of sweets, such as candy and cake. Sugar is the chief cause of dental caries. Between meal snacks should be cut down as they interfere with proper nutrition. A well balanced diet will help to prevent oral and systemic disease (Jacobs AD 1974).

10. Role of School Teacher

The school teachers being required to take health courses (including dental health) during their training should be trained to supervise the fluoride mouthrinsing and tooth-brushing schemes. Teachers have great effect on school children. Simple dental health instruction (education) could be better taught by the teachers than the dental hygienists or dentists.

Evidences that the school can improve habits (health)

a) Youth is the time of habit formation, health habits, among others are being formed at school.

b) The school furnishes the kind of training that is needed for habit formation.

c) The school works harmoniously with the homes (Turner Sellery and Smith).
The dental hygienists and the school teacher could combine their effort to educate the mothers to look after their children's dental health at homes.

Dentists in both private and government practices to continue educating the mothers on home dental care for their children.

There is no universal answer which can be applied to lack and every country, but, lack has to be assessed according to its own way of life, individual problems and available resources. The differences and constraints tell us also that the need is for simple measures of dental disease contact and prevention which can be understood easily, which can be applied at the community level with the minimum use of professional personnel, and which will persuade people to achieve dental health by their own personnel attitudes and actions (Fuller JF 1973).
SUMMARY AND CONCLUSIONS

Dental caries is an increasing major problem in all the countries. It is on the upward trend partly due to the influence of civilised diet and rapid increase in urbanization and population explosion.

The types of treatment available are mainly curative and restorative. The dental manpower, funds and facilities are stretched to their limitations while there still exist a great back-log of un-met needs.

The use of operating dental auxiliaries is inconsistent and limited. The preventive program in the school dental service are sparodic and vary from countries to countries. Only three countries (Hong Kong, Singapore and Malaysia) have introduced public water fluoridation and only a few have instituted the practice of other use of fluoride in their school dental program.

There seems to be a unstable type of management of the school dental service which has constituted to this inconsistent approach to the dental needs of the school children. It seems that anyone who could help is already has his handful of problems and worries. This has led to the discouraged and frustrated few, who me trying their best to cope up with the increasing needs. Good coperation and coordination between and within departments are needed.
The socioeconomic status and the unawareness of the benefits of the dental health service of the people restricted their usage of the service. The parents are economically restricted to provide full dental care benefits for their children.

The most economical approach to this major problem where many people especially children could benefit most at a relatively low cost would be the introduction of preventive and control measures against dental caries.

Public water fluoridation has been proven to be the most effective and inexpensive preventive method against dental caries. It has reduced dental caries prevalence in children 50-60% when used at an early age. School water fluoridation is almost as effective except that it is more expensive. The use of fluorides in other forms is also recommended and the methods should depend on the economic ability of each individual country.

Other preventive and control measures such as regular dental examination and treatment, dental health education, diet modification should be encouraged and practices. The use of other non-dental personals such as the member of the medical professions, teachers, mothers etc should be fostered to enforce and maintain an effective school dental program especially in the countries where there is an acute shortage of dental manpower.
The use of operating dental auxiliaries in the school dental service would definitely alleviate the shortage of dentists and also reduce the cost.

Each individual country should carefully plan the best and the most practical and economical method on how to establish it school dental program and try to improve on that in the future. For example, one country might not be able to provide dental service for all its primary school children at the existing resources. What would be then, the best effective method that could cover a large portion of the school population with minimal cost and use of dental manpower. What type of service should be provided and what age group should be treated. What type of dental personnel should be used to provide this service? Should the training of the operating dental auxiliaries be expanded to include the normal routine type of services that a dentist usually practice so that they could render great variety of routine type of treatment to the children. Should their supervision be flexible so that they could cover a great number of school children. All these things should be considered so that the most practical and economical approach could be developed to the best well and ability of each individual country.
The developing countries can not afford the types of school dental service that exist in the developed countries. Training and recruiting dentists to man the school dental service are very expensive which the majority of the countries can hardly afford. Preventive and control measures and the use of operating dental auxiliaries should be the front-line solution to the dental caries problem.
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