



THE UNIVERSITY OF
SYDNEY

COPYRIGHT AND USE OF THIS THESIS

This thesis must be used in accordance with the provisions of the Copyright Act 1968.

Reproduction of material protected by copyright may be an infringement of copyright and copyright owners may be entitled to take legal action against persons who infringe their copyright.

Section 51 (2) of the Copyright Act permits an authorized officer of a university library or archives to provide a copy (by communication or otherwise) of an unpublished thesis kept in the library or archives, to a person who satisfies the authorized officer that he or she requires the reproduction for the purposes of research or study.

The Copyright Act grants the creator of a work a number of moral rights, specifically the right of attribution, the right against false attribution and the right of integrity.

You may infringe the author's moral rights if you:

- fail to acknowledge the author of this thesis if you quote sections from the work
- attribute this thesis to another author
- subject this thesis to derogatory treatment which may prejudice the author's reputation

For further information contact the University's Copyright Service.

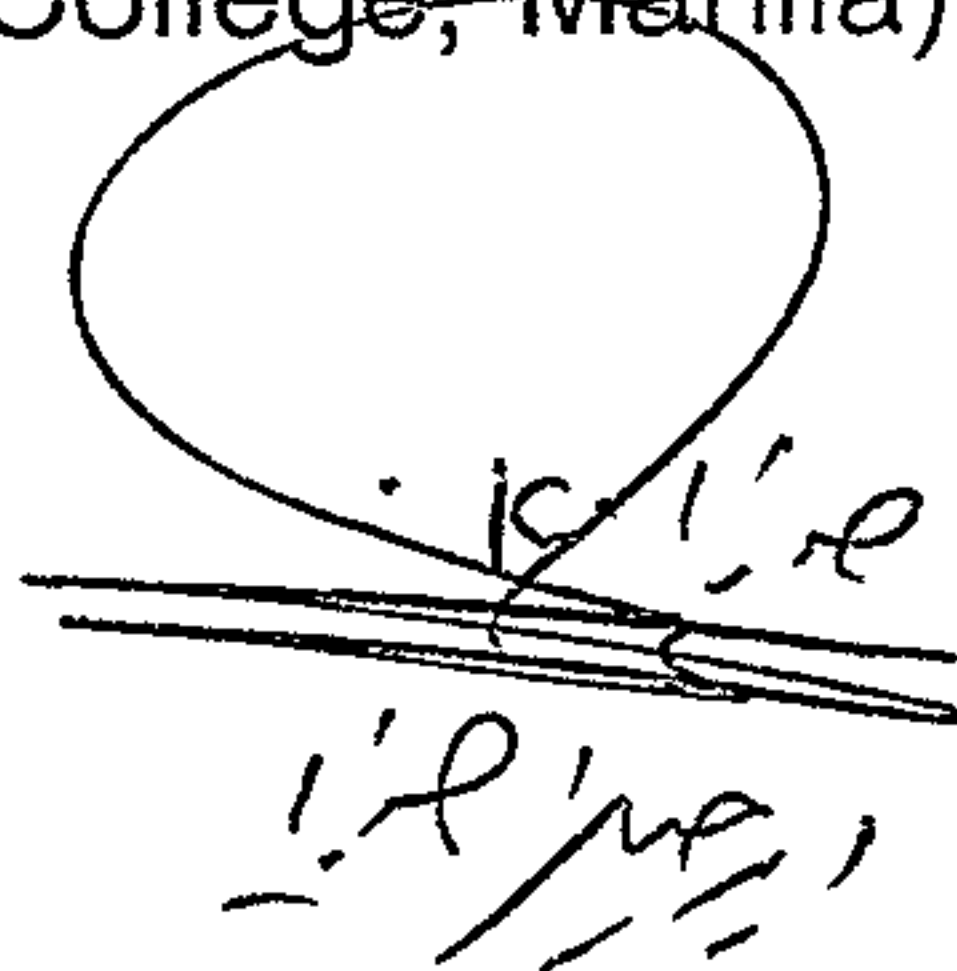
sydney.edu.au/copyright

ORAL HEALTH EDUCATION
A NECESSITY FOR (IR) OF IRAN

ISLAMIC REPUBLIC

AMIR H KAMBOOZIA

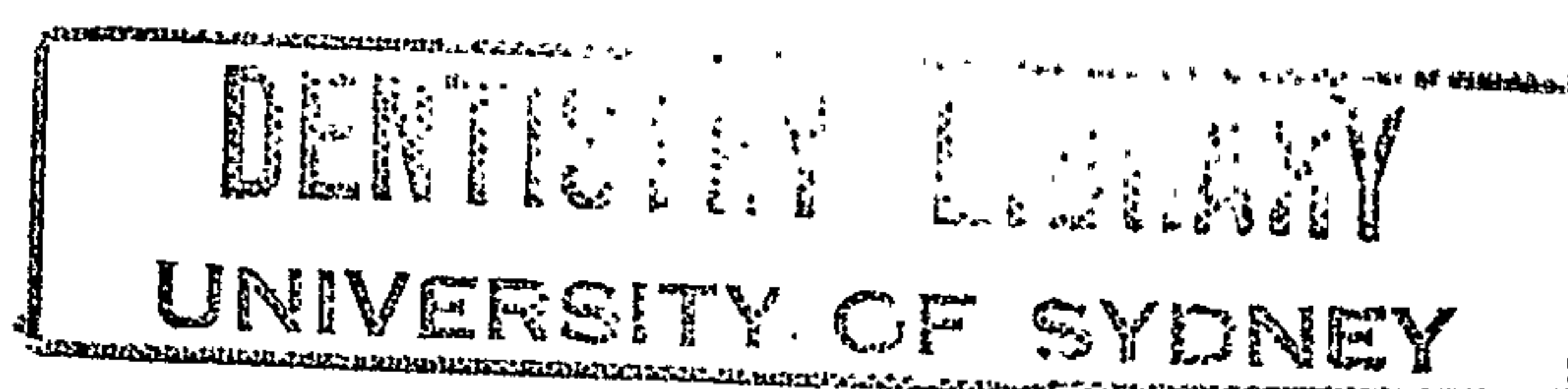
DMD (De'Ocampo Memorial College, Manila)



A thesis submitted in partial requirement for the
DIPLOMA IN PUBLIC HEALTH DENTISTRY

Department of Preventive Dentistry
Faculty of Dentistry
University of Sydney

1990



SUMMARY

Oral health education is a major component of dentistry in practically every country. Its standard activities range from public programmes of mass education and instructional sessions with groups such as schoolchildren to the advising of the individual patient in the dental office.

The objectives of all these activities are broadly similar: to provide the information that individuals need to maintain oral health, and generally to prevent oral disease through the development of dentally beneficial of personal behaviour.

A World Health Organization expert committee concluded that the main principle in the control of the world-wide problem of oral disease was educating the public as to the benefits of prevention by intensive oral health education.

Oral health education is required for Iran. Hence the aim of this thesis was to:

1. Discuss methods of bringing awareness of oral disease to the Iranian community;
2. Discuss methods of motivating the Iranian people to adopt oral health practices to minimise their oral diseases; and
3. Review the literature on methods and techniques of oral health education.

Attitudes and oral health behaviour in relation to prevention and treatment of oral disease are directly concerned with oral hygiene practices and the frequency of dental visits.

Determinants for these activities are numerous and include:

- Previous oral care experiences;
- Knowledge of oral disease;
- Perception of own oral health;
- Dietary habits;
- Belief in oral treatment; and
- Barriers to treatment.

In the determinants of an individual's oral behaviour, psychological factors, face-to-face interactions, social influences including the media, and information available should be considered. The most frequently reported intervention in the literature is providing children with knowledge and skills in order to change their behaviour. Psychological factors, for example fear, have been discussed.

Primary oral health care has emerged as an important concept in IRAN where dentistry, as currently practised, has not proved capable of controlling oral disease. Training for provision of primary oral health care must be shaped to meet the specific needs of the country and community.

The goal of all health education is to guide people towards the acquisition of lasting healthy living practices and habits. Because oral hygiene behaviour is mainly influenced by socialisation, methods directed at improving oral cleanliness should stress the importance of general hygiene, and emphasise that oral hygiene is one of its integral parts.

Oral health should be integrated with programmes dealing with general hygiene and grooming; a diversity of approaches and maximal participation by the community, individuals and professionals should be encouraged. The dentist/hygienist-centred strategy is not likely to be effective in reducing periodontal disease at a community level.

Social and educational strategies directed at groups are more likely to be useful. Programmes should concentrate on educating significant individuals in the community, educating educators, and educating the dental team. The programmes should be continuous and low key and refrain from victim blaming exhortations to clean teeth with devices of questionable usefulness.

One of the purposes of this thesis was to show how current knowledge can be implemented in order to prevent oral disease in both individuals and the community. The thesis also identifies problems in Iran that may inhibit preventive and treatment programmes. Furthermore, community-based programmes are usually structured to provide complementary therapeutic treatment of disease as well as prevention. In this thesis emphasis has been placed on the high priority that should be given to preventive or control programmes in order to minimise the need for curative, restorative, and therapeutic treatment of oral disease.

The Thesis discussion centred on:

- Established methods for the prevention and control of dental caries;
- Methods available for the prevention but more especially the control of gingivitis and periodontal disease; and
- The role of health education and health promotion in the prevention and control of oral disease.

There are special problems with prevention in IRAN, principally high periodontal disease prevalence, high dental caries rates and lack of resources to deal with these problems. With appropriate assistance, much can still be accomplished in the country. Depending on economic resources and disease patterns, the national and local laws may also determine what procedures can or cannot be employed.

1. Fluoridation of community water supplies is the most effective action to prevent dental caries in those communities where piped water supplies are in place. It is relatively cheap and does not depend on individual action.
2. Where water fluoridation is not feasible, community-based alternatives are salt fluoridation, school-water fluoridation or supervised ingestion of fluoride supplements.
3. Supervised mouthrinsing with fluoride solutions, usually in schools, is effective in both fluoridated and non-fluoridated communities. Dentists or auxiliaries can also apply effective fluoride gels or solutions to the teeth of individual patients.
4. The use of fluoride toothpastes is recommended as a routine part of self care.
5. All preventive activities have an educational component. Community leaders and others should be educated regarding the institution and maintenance of community preventive measures. Individual patients should be educated regarding their oral hygiene, use of fluoride, restriction of sugary snacks between meals and the necessity for regular dental visits when services are available. Oral health education of the public can be concentrated towards special target groups, such as expectant mothers and handicapped.
6. Because dental caries is a public health problem in many countries, public policy to control the availability of cariogenic foods should be considered.
7. Fissure sealants, when applied properly, are highly effective in preventing caries in occlusal surfaces of teeth. Their use is recommended on newly erupted teeth in susceptible persons, and they may be specially useful in the handicapped. Trained operators are required and the procedure is reasonably expensive; these factors may restrict the use of sealants where resources are limited.
8. The ability of the individual patient to control plaque by toothbrushing, flossing or chewsticks should be developed to the utmost as the first step in controlling periodontal disease. In many adults, regular plaque removal by dental professionals, two to four times per year, may be necessary to control periodontal disease fully.

ACKNOWLEDGEMENTS

I wish to express my sincere gratitude to my supervisor, Professor PD Barnard, for his valuable advice and guidance. His constant support, patience and understanding made the task of completing this thesis enjoyable and satisfying; and made the difficult times seem easier.

I also wish to thank the World Health Organization and the Ministry of Health and Medical Education of Iran for their financial support and assistance during this period of study in Australia for this postgraduate course.

I would like to thank my wife and my family for their moral support and encouragement.

TABLE OF CONTENTS

Number	Title	Page
	Summary	i
	Acknowledgements	iv
	Table of Contents	v-vi
	List of Tables	vii
	List of Figures	vii
1	INTRODUCTION	1-6
1.1	Health	2
1.2	Health Education	3
1.3	Oral Health Education	4
1.4	Target Groups	6
2	PRIORITY OF ORAL HEALTH PROBLEMS	7-18
2.1	Dental Caries	7
2.2	Periodontal Disease	10
2.3	Malocclusion	11
2.4	Trauma	12
2.5	Speech Problems	15
2.6	Nutrition and Diet in Oral Health	15
2.7	Acute Lesions of Oral Mucosal	16
2.8	Other Oral Pathology	17
3	ORAL HEALTH EDUCATION	19-33
3.1	Concepts of Oral Health Education	19
3.2	Adoption of Preventive Measures by Individuals	
3.2.1	Psychological determinants	21
3.2.2	Face-to-Face interactions	23
3.3	Social Determinants	
3.3.1	Influences of media campaigns	28
3.3.2	Product advertising	30
3.3.3	Economic and political influences	31
3.3.4	Informing the public	32
4	ORAL HEALTH EDUCATION AND PREVENTIVE MEASURES	34-69
4.1	Oral Health Education Team	35
4.1.1	Dentist	36
4.1.2	School dental nurse (New Zealand type)	37
4.1.3	Dental hygienist	38
4.1.4	Oral health workers (in Iran)	39
4.1.5	Classroom teacher	41
4.1.6	Other health personnel	43

TABLE OF CONTENTS (continued)

Number	Title	Page
4	ORAL HEALTH EDUCATION AND PREVENTIVE MEASURES (continued)	
4.2	Level of Prevention	
4.2.1	Primary prevention	44
4.2.2	Secondary prevention	45
4.2.3	Tertiary prevention	46
4.3	Community Prevention of Dental Caries	47
4.3.1	Water fluoridation	48
4.3.2	Salt fluoridation	50
4.3.3	Milk fluoridation	52
4.3.4	Dental fluorosis	53
4.3.5	Promotion of diet	54
4.4	Individual Self Care	
4.4.1	Fluoride dentifrices	58
4.4.2	Dietary control	59
4.4.3	Home use of fluoride rinses and tablets	61
4.5	Prevention of Periodontal Disease	
4.5.1	Community measures	63
4.5.2	Individual based measures	64
5	TARGET GROUPS AND ORAL HEALTH	70-84
5.1	School Children	70
5.1.1	School water fluoridation	71
5.1.2	Self-Applied fluoride	72
5.1.3	Professional methods	76
5.1.4	Self-applied and professional methods	78
5.2	Pre-School Children	79
5.3	Pre-Natal and Nursing Mothers	80
5.4	Adults	81
5.5	Handicapped Persons	82
6	DISCUSSION AND CONCLUSIONS	85-91
7	REFERENCES	92-108

LIST OF TABLES

Table No.	Title	Page
1	Caries prevalence trends in highly industrialized countries. - WHO Global Oral Data Bank 1983. Source: WHO (1987)	8
2	Caries prevalence trends in developing countries or territories. - WHO Global Oral Data Bank 1983. Source: WHO (1987)	8
3	The epidemiology of traumatic dental injuries. Source: Andreasen and Ravn (1972)	13
4	Dosage level of supplemental fluoride recommended in the USA. Source: American Academy of Pediatrics (1979)	74

LIST OF FIGURES

Figure No.	Title	Page
1	Prevalence and incidence of traumatic dental injury to primary teeth among children in Copenhagen. Source: Andreasen and Ravn (1972)	14
2	Prevalence and incidence of traumatic dental injury to permanent teeth in Copenhagen. Source: Andreasen and Ravn (1972)	14

1 INTRODUCTION

Twelve years ago the I.R. of IRAN Health Ministry started to establish a health network as *a nationalised project to provide primary health services to the community*. The *dental health system was considered an integral part of this network*, as dental disease affected such a large proportion of the population.

However, preventive behaviour has not penetrated through to the IRAN population to the desired level, and there is a necessity to consider the total population for our program planning. *If we believe that dental and oral health is more than a problem for the dentist, and is a public problem, we must involve all segments of society.*

Despite the *improvement of oral health services within this decade (1980-1990)* by the establishment of several dental schools, hundreds of dental clinics, and by increasing the number of dentists in cities and oral health workers in the rural areas, the lack of knowledge has shown up the great *gap that exists between prevention and the treatment of oral diseases*. Considerable numbers of the population only approach the dentist for treatment when they have pain. In general, dentistry provides for only those persons who present themselves to the dental office for treatment.

As well as the above mentioned attitudes and behaviours of the patient, the major problem to implementing any oral health program is the *lack of oral health analysis to identify and establish measurable goal and strategies*.

The most important step for the Ministry of Health regarding oral health is to *study the present oral health situation and collect clinical record data to facilitate any oral health care planning in the future*.

1.1 HEALTH

Health is defined in the constitution of the World Health Organization (WHO 1961) as:

" a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"

This definition applies to the whole individual, and therefore encompasses such specific parts of the organism as the oral cavity.

This emphasis on *" complete physical, mental, and social well-being"* puts both medicine and society in the untenable position of being required to attain unattainable goals.

There is no reason whatever to think that medicine can, for instance, make more than a modest contribution to *"complete ... social well-being"*, which involves (among other) political, cultural, and economic factors. Health may be, most of the time, a necessary condition for well-being, but it is not a sufficient condition.

Instead of referring to a single concept, the word *"Health"* refers to a family of concepts, namely - *function, stress, adaptability, and normalcy*. (Stoll 1977)

1. *Function* enables the individual to work, play and live comfortably within his environment.
2. *Stress* is any force within the environment that tends to affect the individual's ability to function in a meaningful and satisfactory manner.
3. *Adaptability* provides the incentive and the direction so that the individual can accept change without undue strain due to external forces.
4. *Normalcy* permits the individual to accept limitations within a certain range that is normal for him.

1.2 HEALTH EDUCATION

There are many academic definitions of health education, but Young and Striffler (1969) define health education as *"the provision of health information to people in such a way that they apply it in everyday living"*.

A health education program should aim to rouse the public consciousness to the fact that *oral disease affects general health*. Turner (1964) said that health education is the use of health knowledge, educational skills and behavioral sciences to promote sound health attitudes, appreciations, understandings and behaviours.

The WHO (1970) *definition of health education* is aimed at persuading people:

1. To adopt and sustain healthful life practices;
2. To use judiciously and wisely the health services available to them; and
3. To take their own decision, both individually and collectively, to improve their health and environment.

Health promotion is the responsibility of all those who are concerned with bringing about the improvement of health.

French (1985) has said that *health education is an aspect of health promotion* and one of its roles is to provide individuals with information, skill, and experiences through which they can exercise a greater degree of *control over their own health*.

Health tends to be appreciated only when it is impaired. *Early symptoms of disease frequently go unnoticed* or are regarded as of little significance.

The development of a concept of positive oral health is made difficult by the chronic, recurrent, often irreversible, cumulative, and prevalent nature of dental disease.

These characteristics certainly contribute to the belief that dental problems are inevitable and non preventable.

Moreover, the *teeth have different degrees of importance to different individuals*. Some protect their teeth because of their functional and aesthetic value; others look after them because of the contribution they make to social and mental well-being.

To many individuals, the teeth are seemingly of such low value that few attempts are made to preserve or protect them.

These difficulties are further increased by the relative efficiency, comfort, and social acceptability of artificial replacements for the natural dentition. Those who regard the loss of teeth through disease as inevitable may consider dentures to be the best possible solution to their dental problem.

Other major obstacles to the development of a concept of positive dental health are:

- the undramatic nature of most dental disease;
- the association of dental treatment with pain, discomfort, and anxiety; and
- the reluctance of many individuals to accept and carry out, on a regular continuing basis, the oral and general health practices related to prevention and control of dental diseases. (WHO 1970)

1.3 ORAL HEALTH EDUCATION

The *aim of health education*, of which oral health education is an integral part, and as stated by WHO (1970) is to persuade people to:

- Adopt and sustain healthful life practices;
- Use judiciously and wisely the health services available to them; and
- Take their own decision both individually and collectively to improve their health status and environment.

The *general aim of oral health education* is to *promote the life-long maintenance of a dentition* which is comfortable, functional, socially acceptable, and promotes good general health (Ashly 1989).

The *ultimate objective of dental health education* is improved dental health through a voluntary change in patient's "dental" behaviour (WHO 1987).

Therefore, oral health education is used for the compensation of the results of dental neglect by linking the available scientific knowledge about the prevention of the disease

to the daily life style of the patient. Hence, *oral health education is an inter-disciplinary, multifactorial and most time - consuming procedure* in dental practice (WHO 1978) which apparently, can be fulfilled only by a *team work approach*.

The personnel involved in the oral health education team comprise the dentist, the dental auxiliaries who come in contact with patients, and other related health and education personnel such as physicians, nurses, home visitors, social workers, and school teachers. Community leaders can assist greatly in oral health education. (FDI 1967)

The methods of dental health education involve a variety of activities, in order to penetrate all the above mentioned barriers to the prevention of the disease, such as:

- One-to-one communication which is the most effective or "ideal" situation; (Harris et al 1987, FDI 1967)
- Group presentations eg oral hygiene instruction in class settings or for a "high-risk" group; (Sheiham 1984)
- Mass communication, using newspaper, posters, booklets, slides, video-tape, films, radio and television to propagate oral health messages. (WHO 1987)

The WHO Expert Committee on Dental Health Education (1970) decided that the main principle in the control of the world wide problem of oral disease was educating the public as to the benefits of prevention by intensive oral health education. This principle should be applied for Iran where there is a need for this education concerning prevention of oral diseases within the community.

Hence, the ***AIMS OF THIS THESIS*** are to:

1. ***Discuss methods of bringing awareness of oral disease to the Iranian community.***
2. ***Discuss methods of motivating the Iranian people to adopt oral health practices that will minimise their oral disease.***
3. ***Review the literature on methods and techniques of oral health education.***

1.4 TARGET GROUPS

Target groups are identified for the enhancement of the effectiveness of oral health education. Children, expectant and nursing mothers, the disabled, patients with periodontal conditions or prostheses, industrial workers, parents and school-teachers, associations, administrations, health insurance enterprises, mass-media personnel, are the personnel involved or potentially involved in oral health education.

(Dunning 1979, Sheiham 1984, Craft 1984).

For behavioural, epidemiological, practical and political reasons some groups are considered as having priority over others and the most appropriate aids should be selected and used in the appropriate circumstances. Community dentistry is concerned with oral disease prevention and oral health care services to all the people of the community; the rich, the poor, the educated, the disadvantaged, urban and rural of every social, religious and ethnic group. However, it is beyond the means of even the most developed countries to provide the service to everyone due to economic reasons, and to this can be added the lack of professional manpower in the case of developing and underdeveloping countries.

The target groups in IRAN should include:

Children;

- schoolchildren
- pre-schoolchildren
- prenatal and nursing mothers

Adults

The handicapped

2 PRIORITY OF ORAL HEALTH PROBLEMS

The purpose of this chapter is to illustrate that the current concept of oral health in IR Iran should be much broader in scope. It should include the prevention, control and treatment of disorders of the oral mucosa, the dentition and the maxillofacial skeleton. Only by achieving all these goals can the dental profession ensure more complete oral health care for the population to be served.

The oral health services for the Iranian population have improved as previously mentioned (in Introduction), but what does the public know of them, and how will this knowledge affect public policy and the demand for dental services? There are no clear answers to either of these questions. This is largely because of the paucity of survey data on public knowledge and attitudes about oral health and the dental delivery system. As such, much of the information in this thesis is based on the personal knowledge of the writer concerning dental practice and education in Iran.

2.1 DENTAL CARIES

Dental caries can be defined as a localised, post-eruptive pathological process of external origin involving the destruction of hard tooth tissue, which if continued, results in the formation of a cavity (Harris et al 1987).

Epidemiological data available to WHO show large differences in the prevalence of dental caries in various areas of the world. The information from the WHO global oral data bank (March 1983) confirms two major trends in oral health status:

1. Deterioration for most of the developing countries; and
2. Improvement for most of the highly industrialised countries.

While the *dental caries prevalence continues to increase in Iran*, especially in the urban population, *dental caries prevalence has reduced in many industrialised countries*.

Table 1 documents decreases in dental caries prevalence that have occurred in several industrialised countries. **Table 2** presents data on increases that have been noted in developing countries. The prevalence rates are based on the number of decayed, missing, and filled permanent teeth (DMF) at 12 years of age.

Table 1**Caries prevalence trends in highly industrialized countries.****Source: WHO Global Oral Data Bank 1983 (WHO 1987)**

Country	DMF teeth at 12 years			
	Highest		Lowest	
	Index	Year	Index	Year
Australia	9.3	1956	2.1	1982
Canada	7.4	1958-60	2.9	1979
			(13-14 years)	
Finland	7.5	1975	4.0	1981
Japan	5.9	1975	2.0	1979
New Zealand	10.7	1973	3.3	1982
Norway	12.0	1940	4.5	1979
Sweden	7.8	1937	3.4	1979
Switzerland	9.6	1961-63	1.7	1980
USA	7.6	1946	2.0	1980

Table 2**Caries prevalence trends in developing countries or territories.****Source: WHO Global Oral Data Bank 1983 (WHO 1987)**

Country/territory	DMF teeth at 12 years			
	Lowest		Highest	
	Index	Year	Index	Year
Chile	2.8	1960	6.3	1978
Ethiopia	0.2	1958	1.5	1975
French Polynesia	6.5	1966	10.7	1977
Iran (Islamic Republic of)	2.4	1974	4.9	1976
Israel	2.4	1966	3.7	1976
Jordan	0.2	1962	2.7	1981
Lebanon	1.2	1961	3.6	1974
Mexico	2.7	1972	5.3	1976
Morocco	2.6	1970	4.5	1980
Philippines	1.4	1967-68	2.9	1981
Thailand	0.4	1960	2.7	1977
Uganda	0.4	1966	1.5	1982
Zaire	0.1	1971	2.3	1982

Problems in Iran

Dental caries may vary from one community to another, and all age groups may be affected, but the younger population are more affected. Increase in dental caries in Iran directly correlates with dietary habits of people, and the prevalence rate may vary in limited areas, because of geographic, location, genetic and social and economic factors.

In Iran today we do not have estimates of how many carious teeth are in need of being filled. However there appear to be huge numbers of carious teeth because of a high prevalence of dental caries and lack of complete preventive and corrective measures. Many teeth still need to be filled in all parts of the country. The level of fluoride in water supplies of the cities are not at optimal levels, with the exception of Tehran. Tehran city, with a population of about 10 millions, has a natural fluoride level in drinking water of about 1ppm. There are high water fluoride concentrations exceeding the limit by more than four times the optimum in one fifth of the country areas and this is another major problem for the dental health of the society. In view of this situation dental caries has assumed the level of a major national disaster.

2.2 PERIODONTAL DISEASE

Periodontal disease may be inflammatory, dystrophic or traumatic. Moreover a combination of these conditions may exist in the same mouth. Much research evidence is emerging to suggest that the term "periodontal disease" encompass several disease, each with its own aetiology and pathogenesis (Van Palenstein Helderman 1981).

Gingivitis is commonly seen in children and most adults have experienced gingivitis, periodontitis or both. Data gathered by the American Dental Association indicated that in men over 35 years and in women over 40 years, periodontal disease was responsible for between two and three times as many extractions as dental decay. (WHO 1961)

Periodontal disease is one of the most widespread diseases of mankind. Gingivitis affects over 80 per cent of young children and almost the entire adult population have experienced gingivitis, periodontitis, or both. Research and clinical evidence indicates that the damage caused to the supporting structures of the teeth by periodontal disease in early adult life is irreparable, while in middle age it destroys a large part of the natural dentition and deprives many people of all their teeth long before old age. (WHO 1978)

Periodontal disease is one of the most widespread disease of mankind, no nation and no area of the world is free from it, and in most it has a high prevalence, affecting in some degree approximately half the child population and almost the entire adult population. (WHO 1961)

Problems in Iran

There is no available data on the prevalence of periodontal diseases in Iran, but the levels are generally considered to be very high. The problems appear to be:

1. Lack of scientific knowledge of traditional practitioners and the public.
2. No motivation of general dental practitioners to provide periodontal services.
3. No appropriate and effective health education instruction and materials.
4. No appropriate support system in the community environment.
5. Not enough public knowledge of, and interest in, periodontal health.
6. No survey information on what the people know about the periodontal disease.

In the country, individual beliefs may, in fact, worsen the periodontal condition, eg some individuals believe that bleeding gums are due to brushing too hard and then decide to reduce or stop their brushing. The same attitude of individuals has been observed in other countries (Lange 1984, Schaub 1984) where many people do not recognise the symptoms of periodontal disease, nor do they associate existing symptoms with the disease.

2.3 MALOCCLUSION

Malocclusion which is the result of irregularities in the spacing and position of teeth, are common. Many are congenital, but some may be acquired by faulty habits during childhood or by the premature loss teeth. Because these irregularities encourage the retention of food debris and increase the difficulty of removing dental plaque, they may be conducive to an increase in both dental caries and periodontal disease.

Some dental and facial anomalies may be obvious at birth, e.g. cleft lip and cleft palate. These conditions present a serious problem to dentist, the surgeon, the speech therapist, the patient's family and the patient himself. Other types of anomaly may not be visible until later during childhood or adolescence, when defects in the number and formation of the teeth or in the growth of the facial skeleton may become apparent. (WHO 1970)

Problems in Iran

1. Premature loss of primary tooth or subsequent loss of permanent teeth due to unawareness of the parents.
2. Malocclusion such as crowding, over eruption and other orthodontic complications have no priority of treatment and correction, because it is considered as a luxury dental service.
3. Malocclusion treatment by orthodontic appliances is considered by the public for aesthetic purpose only, not as obtaining corrective treatment to prevent personality and appearance problems but also to prevent dental caries and periodontal disease.

2.4 TRAUMA

Dislocation and fracture of the teeth and jaws are common consequences of injuries arising from transportation accidents, industrial operations and athletic activities. *With the increase all over the world in air and road traffic, industrialisation, and participation in sport, such injuries will undoubtedly become more prevalent.* (WHO 1970)

Traumatic dental injuries are very frequent, as revealed by a survey of recent epidemiological studies from various countries listed in **Table 3**. Most of the frequencies listed are probably under-estimates because of the cross-sectional nature of the investigations. This implies that early injuries not followed by later objective findings (e.g. luxations) are probably under-diagnosed. Trauma experience of a cohort of 487 children followed in the preschool dental service from 3 years of age until school-leaving age (16 years) was reported by Andreassen and Ravn (1972). In this study, the following trauma pattern was found. Every third child had traumatised the primary dentition before leaving the pre-school dental service and every fifth child had sustained injury to the permanent dentition before leaving school (**Figure 1, Figure 2**). The extremely high frequency of injury in the primary dentition has been confirmed in studies from Dominican Republic (Garcia-Godoy et al 1981). These high frequencies are of considerable concern, especially when it is considered that recent large epidemiological studies have shown an overall increase in traumatic experiences in the past decade. (Andreassen et al 1986)

Traffic accidents, which are becoming more and more frequent, have brought about an increase in maxillary and facial injuries, as the head, the exposed part of the body, is involved in the highest percentage of injuries of all body regions. Numerous statistical data confirm that head trauma, at more than 70 per cent, definitely predominates among injuries caused by traffic accidents. (Kruger et al 1982)

Table 3
The epidemiology of traumatic dental injuries.
Source: Andreassen and Ravn (1972)

<i>Author</i>	<i>Country</i>	<i>Sample size</i>	<i>Age group (yrs)</i>	<i>Frequency of dental injuries (%)</i>
Gutz (1971)	USA	1166	6-13	20.2
O'Mullane (1972)	Ireland	2792	6-19	12.8
Andreassen and Ravn (1971)	Denmark	487	3-7	30.2
Andreassen and Ravn (1971)	Denmark	487	7-16	22.3*
Ravn (1974)	Denmark	75000	7-16	28.0
Bergink (1972)	Holland	943	11-16	15.1
Holm and Arvidson (1974)	Sweden	208	3	24.0
Wieslander and Lind (1974)	Sweden	2065	6-16	8.7
Zadik (1976)	Israel	965	6-14	11.1
York et al. (1978)	New Zealand	430	11-13	16.7
Järvinen (1979)	Finland	1614	6-16	19.8
García-Godoy et al. (1981)	Dominican Repub.	596	7-14	18.1
García-Godoy et al. (1983)	Dominican Repub.	800	3-5	35.0
Todd et al. (1983)	United Kingdom	20700	8-15	26.0*

* At the age of 15.

Problems in Iran

1. Fractures of the teeth are among the most common features of traumatic injuries of the face. There has been an increasing frequency of occurrence.

(It is difficult to give a statistically justifiable percentage of the incidences of anterior teeth or facial skeleton fractures, but the writer has treated hundreds of patient with anterior teeth or facial fractures and severe damage to the soft and hard tissues over the last five years in the Zahedan Central Clinic of Dentistry in south east of IRAN).
2. No obligatory law to use safety belts in automobiles, or a helmet while riding motorcycles and bicycles.
3. No strong penalty, or fine, for those charged with violating the traffic laws.
4. Not enough strictness from the traffic police in controlling the speed of vehicles along the roads and highways.

Figure 1

Prevalence and incidence of traumatic dental injuries to primary teeth among children in Copenhagen.

Source: Andreassen and Ravn (1972)

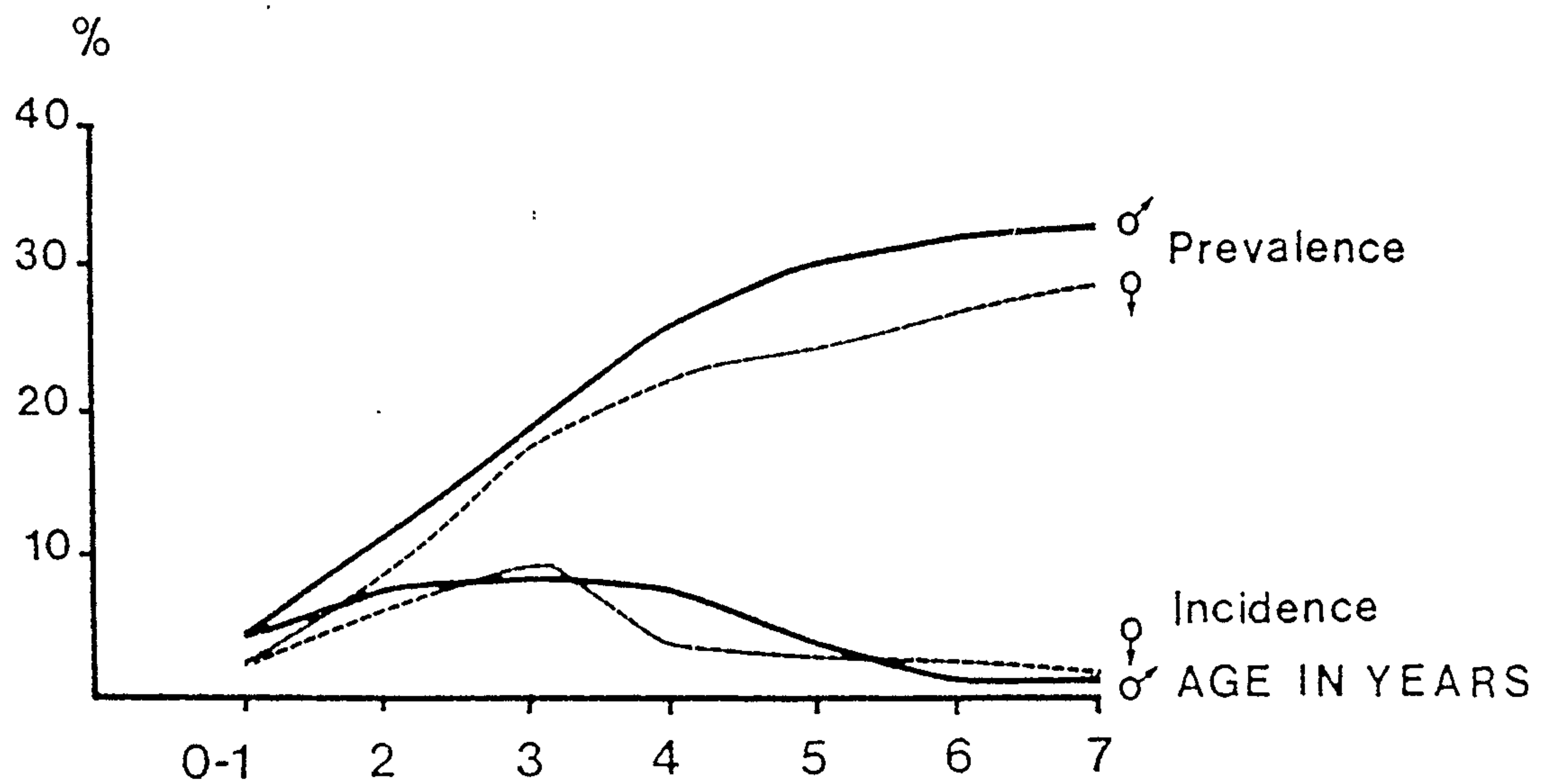
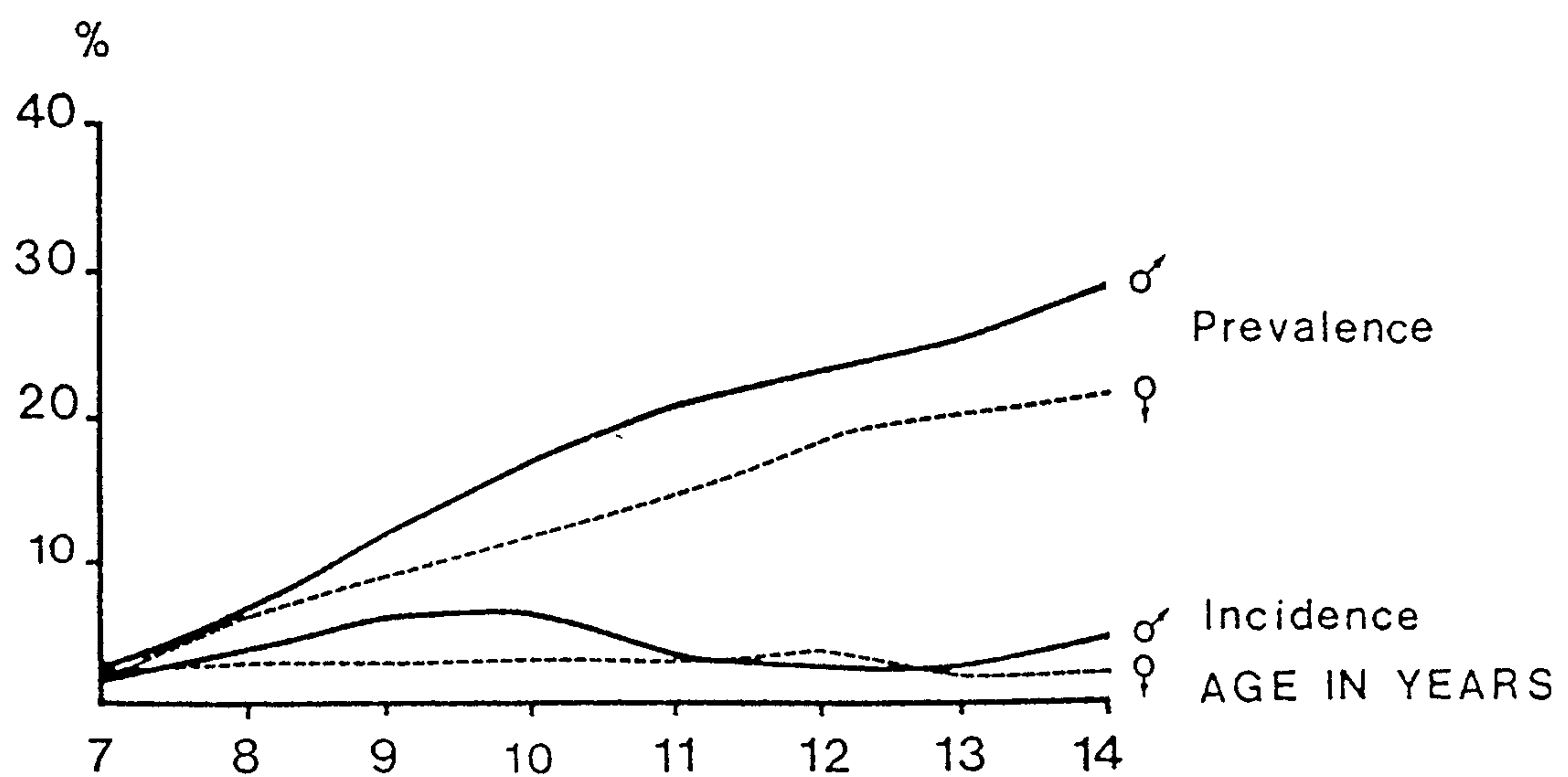


Figure 2

Prevalence and incidence of traumatic dental injuries to permanent teeth among children in Copenhagen.

Source: Andreassen and Ravn (1972)



2.5 SPEECH PROBLEMS

The maturation of speech and language represent one of the most important features of child development. Since speech is a form of learning behaviour, it is influenced by numerous factors. Abnormality of speech often reflects symptoms of physical or psychosocial disturbances that may affect the child's general growth and development. Since speech is such an important measure of human adaptation, social and education status even when other developmental factors appear normal. (McDonald 1974)

Some of the faulty speech problems are directly connected with dysfunction, malformation or pernicious habits involving the tongue, teeth, throat, and lips.

Problems in Iran

1. There are numbers of children around the country with speech problems such as voice disorder and stuttering.
2. Although many speech therapists have recently graduated from universities and been assigned to the major city hospitals, there are no speech therapists in public schools and small cities.

2.6 NUTRITION AND DIET IN ORAL HEALTH

One might assume that what is good for the body is also good for the oral cavity. This is often true: for example, Shaw (1984) has calculated that dentally desirable snacking contributes somewhat larger amounts of nutrients than less desirable snacks. Preventive nutrition in cariology is perceived as a case in which fluoride is good and sugar is bad, especially if the sugar is consumed frequently. (Scherp 1970)

Diet is an example of an important social phenomenon that plays a role in dental disease. Free sugar and fermentable carbohydrates lodged on the teeth for even a short period of time, ten or fifteen minutes, will result in formation of acids which cause tooth decay. A reduction in the frequency of intake is more important than the amount consumed as far

as dental decay is concerned. Dietary deficiency affects the health of the gingival tissues and the periodontal tissues surrounding the teeth. The lack of vitamin C produces a gingivitis which, in its most acute form, extends to the periodontal membranes. Research indicates that there is a direct relationship between the physical character of diet and the health of the soft tissue and bone supporting the teeth. (Stoll 1977)

Problems in Iran

1. Consumption of highly sugared foods is a part of some cultures in different parts of the country.
2. There is a high intake of sugar, accompanied by poor oral hygiene.
3. No dietary control of children in public schools.
4. The public does not know the difference between cariogenic and non-cariogenic foods.
5. Frequent consumption of sugary snacks between meals.

2.7 ACUTE LESIONS OF ORAL MUCOSA

The diseases in this group are transitory and many recur from time to time.

Most of the simple inflammatory diseases in children, known as gingivitis, are due to accumulation of plaque and acid-producing bacteria. The best control is supervised brushing, including flossing, and regular prophylaxis.

Herpes Simplex

Known as "fever sores", herpes simplex is seen in both children and adults. It is caused by a virus which remains in the soft tissues of the mouth long after the acute stage is over and it may recur from time to time if the individual's resistance is lowered. The onset of herpes may be very severe, with high temperature and general disability. The entire mouth and throat may be highly inflamed. The disease tends to "cure itself", and no particular treatment is prescribed. Herpes is infectious and may become epidemic in schools. The secondary lesion appears on lips and is known as "cold sores", and if the lesion is in the mouth "canker sores".

Vincent's infection

This is a serious acute infection of the gingivae which tends to become chronic. It is a disease brought on by a pathogenic bacteria but it is not considered communicable. It responds to a thorough cleaning of the teeth which removes all calculus and debris. A strict regimen of mouth hygiene must be observed consistently. Individuals who have Vincent's infection should have a thorough physical examination to determine the cause of low vitality.

The simplest gingival irritation should be regarded as a condition which may lead to more serious periodontal disturbance. The individual should remain under dental observation at regular intervals. (Stoll 1977)

2.8 OTHER ORAL PATHOLOGY

A host of other conditions affect the health of the mouth and oral structures. In fact they are so numerous that only a few are mentioned, just to indicate the magnitude of the problem of dental health.

These conditions include:

1. Lesions of the lips.
2. Lesions of the dental mucosa.
3. Lesions of the palate and various glands.
4. Lesions of the gingivae and the edentulous ridge.
5. Lesions of the tongue and floor of the mouth.
6. Lesions of the maxilla and mandible.

Some of these lesions are malignant but many are benign. The dental health problem is a complex one. It has been demonstrated that dental health or the lack of it affects all phases of child development and all areas of his environment, school, home and community. Neglect of any area of dental health results in far-reaching effects on the growth and development of the individual. (Stoll 1977)

Oral lichen planus has been considered to be a precancerous condition. In a prospective study of 570 cases, Silverman et al (1985) reported that 1.2 per cent of patients with lichen planus develop oral cancer. In a follow-up study in India (mean observation period: 5.1 years) of 722 patients with oral lichen planus, 0.4 per cent developed oral carcinoma. Oral submucous fibrosis, a related condition, is also precancerous. (Murti et al 1985)

Prevention based on knowledge seems the only workable solution to the problem. Prevention can be effective only if it is based on motivation through education. This approach should be carried out in the home, the dental office, the school and the community.

Treatment demands in Iran

Apart from the professional manpower needed to diagnose oral mucosal lesion, most require treatment and/or regular surveillance. Frequent ulcerating lesions, which are usually painful, include traumatic ulcers, recurrent aphthae, herpes labialis, atrophic/ulcerative soft tissue, and lichen planus. Recently, marked improvements in the management of these lesions in Iran have been achieved. Considering the high frequency of both herpes labialis and recurrent aphthae, these disorders ought to have priority with respect to treatment.

3 ORAL HEALTH EDUCATION

3.1 CONCEPTS OF ORAL HEALTH EDUCATION

Health education has been defined as *"the process of providing or utilising experiences for favourably influencing understanding, attitudes, and practices relating to individual, family, and community health"* (Read & Green 1971). This definition recognises that young children learn from their experiences and that learning may include the children's cognitive development and acquisition of new attitudes and behaviour. The fact that health education is a process suggests that it needs to be planned in a systematic way.

Children do not learn new behaviours through passive absorption but through activity (Piaget & Inhelder 1969). Therefore in health education, participation and activities are important in producing behavioral change.

Instruction by teachers will not alone be effective in the teaching of dental health. Teachers are considered to be significant adults by school children and they should set examples of good oral hygiene behaviours by being seen to clean their teeth.

Health education can be divided into two kinds: *the informal; and the formal*.

Informal education represents the transmission of empirical knowledge relevant to survival and is carried out mostly within the family setting and through interaction with the immediate and wider social environment. Formal health education is mediated through formally institutionalised specific organisations belonging to the educational and health systems (Baric et al 1974). Insufficient attention has been given to informal health education by family members and peer groups. In particular, peer groups, ie people sharing common characteristics and interest, may be effective in influencing patterns of dental health behaviour (Plamping et al 1980).

An appraisal of oral health education programmes indicates that they are directed at motivating individuals. Often the oral health instruction is carried out in clinical settings that are not the most conducive ones for learning. One motivation approach is based upon the cognitive learning of the KAB model: information leads to Knowledge (K), which leads to attitude (A) changes, which in turn lead to the desired behavioural changes (B). The second approach is based upon a behavioural learning model which aims to create appropriate skills and behaviours in the hope of formation good habits. (Sheiham 1983)

(Frazier 1978) concluded that *"education programmes alone have not been effective in instilling permanent desirable habits of oral hygiene or diet that whatever behavioral practices are fostered tend to regress over time"*. Gochman (1973) considered that a common shortcoming of most oral health education programmes is that they are not coordinated with general health education programmes. Instead, the frequently practised compartmentalisation of health education into oral health education, sex education and hygiene education, which has been relatively unsuccessful, should be replaced by comprehensive health education programmes (WHO 1970, Stuart 1975). Programmes directed at improving oral cleanliness should be combined with health education directed at improving general hygiene and good grooming.

Rayner and Cohen (1974) have made the following constructive suggestions for improving oral health education:

1. Approaches should maximise the significance of having a given occupation status and peer identification, and belonging to an education, income, age, sex, race or ethnic group.
2. Formal oral health education should optimise salience, pertinence, credibility, habit formation, long term change and concomitant reinforcement.
3. Progress should match behaviour with objectives, and stress imitation of significant other persons such as mothers and teachers.
4. Mothers should include community involvement, changing values by showing inconsistencies in currently held values, attitudes or behaviours, and gaining the attention and support of the mass media.

The methods must be *integrated*, and *"planning or behaviour-changing necessitates directing several tasks simultaneously and differentially to various target groups"*.

3.2 ADOPTION OF PREVENTIVE MEASURES BY INDIVIDUALS

To accelerate improvement in oral health requires an increase in acceptance of preventive methods. This, however, poses a considerable challenge. Often the public does not follow the advice of dental professionals. Regardless of the information provided, they make decisions on their experience and values.

Research at the individual level can be organised into five categories of variable that influence an individual's dental behaviour:

Psychological factors, face to face interactions among people, broad societal influences, information and the immediate surroundings, and reinforcement schemes.

3.2.1 Psychological Determinants

Studies with a psychological focus have attempted to account for dental behaviours of individuals in terms of health beliefs, locus of control fear. The health belief model (Rosenstock 1974) holds that individual will adopt a preventive behaviour if three condition are met; namely, if they feel:

1. Susceptible to the disease.
2. That the disease would be severe enough to interfere with some aspects of their lives.
3. That the benefits of taking preventive actions would outweigh the psychological and economic costs involved.

The locus of control construct postulates that people who feel that they can determine their fate are more likely to adopt preventive behaviours than those who feel that their life is determined by external factors such as luck or more powerful forces (Rotter 1966). The role of fear in motivating behaviour change has also been explored. Researchers have experimentally manipulated the fear arousal level of persuasive messages to assess their impact on dental behaviours.

None of these approaches has been found to explain why individuals do or do not follow recommended actions (Evans et al 1970, Ramirez et al 1971, Bell et al 1973, Kegeles 1980, Wallston & Wallston 1984).

Between those who want to keep their teeth at any price, even if their hope is unreasonable, and those who neglect them deliberately, there are of course, less extreme attitudes. But when it comes to care of the mouth and teeth, constant and prudent attention is far too rare. What is more surprising is that many people know that their attitude is not only illogical but compulsive (Bensaid 1981). This behaviour pattern, a response to powerful anxiety, is one which should be regarded as being symptomatic. For, as with all symptoms, such behaviour is a compromise which allows patients to maintain their balance. At the same time patients behaving this way are expressing a call for help which it is up to the dentist to heed.

Avoidance or rejection of dental care is a consequence of fear; fear of pain, as well as a primordial fear linked to infant oral anxieties and neurotic fear linked to the castration complex (Ruel-Kellermann 1980). In fact, any dental situation is bound to reawaken childhood experiences marked by numerous anxieties and phobias. In fact, the first loss of baby teeth happens at the decline of the oedipal phase in which the infant is dealing with that complex (perception of difference between the sexes; the presence or absence of the masculine organ, and incest taboo). These anxieties, which sum up every form of attack on the integrity of the body, give rise, during dental care, to a whole procession of fantasies: mutilation, perforation, tearing and ripping. It is conceivable that many actions of dentists are felt in fantasy and even in reality as attack, and by some as retaliation. (Ruel-Kellermann 1982)

On a real level, it is easy to see how determinant is the way in which dentists actually dispense their care. A lack of prior expedient attitude or even a mistaken promise like "*this won't hurt a bit*" may leave indelible negative marks. (Lautch 1971)

It can be easily seen that the rational reasons for self-neglect are diluted by the previously cited fantasy experiences which are perfectly illustrated by the drawings of children and adolescents about the dentist/patient situation.

3.2.2 Face-To-Face Interactions

Many social and educational variables influence oral hygiene behaviour.

One of the most important is socialisation, which is the process whereby informal knowledge, values, attitudes and routines are transmitted to individuals through social interaction. (WHO 1979)

Face-to-face social interaction strongly influences an individual's actions. While little systematic research has explored the role of the face-to-face relationship in shaping dental behaviours, what is known about influences upon children, adolescent and adults can be considered.

Influences on children

Empirical evidence shows that parents are the strongest influence on a young child's life and there is a direct association between a parent's personal practices and the child's behaviour (Rayner 1970, King 1978). Young children copy the toothbrushing habits of their parents and teachers. Unfortunately, during the past decade little research has been conducted on the development of the parental role as an oral health educator. It appears that social norms of mothers regarding their role in promoting their children's oral hygiene behaviours many not be well established. (Blinkhorn 1978)

Schools have been the traditional site for educating children about dental health. Thus, some investigators have sought to strengthen school programmes involving parents. (Lee 1978) However, changes in family structure which have occurred in most of the industrialised western world make it less likely that school can effectively involve parents in health programmes (Lightfoot 1978).

Mothers with very young children have been thought to represent a particularly suitable target group for oral health education and number of schemes have been directed towards them. In schemes which were successful in preventing dental caries, advice was first given

when the child was 6 months old or less, and was given on more than one occasion. In addition, fluoride supplements were prescribed or recommended.

An experimental study into oral health education for this target group commenced in Britain in 1976. From the result obtained (Holt et al 1985), it appeared that oral health education through home visits to mothers of very young children had brought about changes in attitude and practice which might be of subsequent benefit to their children. Uptake of free fluoride drops by mothers in this group was high, and 67-70 per cent continued to give them to their children up to age of two and half years. (Winter et al 1981)

Many research workers associate family parental involvement particularly that of the mother, and maintain that the mother's own childhood attitudes toward brushing were the same as the children's current patterns. However, WHO (1971) while strongly supporting the importance of parental education contends that there is no general agreement in the appropriate content of such programmes or on the best method to use.

Influences on adolescents

While parents have the strongest influence on the socialisation of young children, conformity to peer group norms tends to increase in importance as children become older. (Hamm & Hoving 1971)

The adolescent years represent the transition from child to adult and during these years increased risk-taking behaviour and challenges to parental authority commonly occur. Adolescents are perceived by many dental practitioners as their most difficult patients.

Elkind (1978) has stated that *"if we don't understand someone else's behaviour, we are likely to attribute the worst possible motives to it"*. This observation is especially pertinent to adolescent behaviour, if only because adolescent behaviour is so often difficult to understand. Regardless of their theoretical inclinations, most developmental psychologists view adolescence as a time in which the individual is striving to establish and stabilise his or her identity. (Conger 1976)

While the adolescent behaviours described are atypical or even deviant by adult standards, all are completely normal for adolescents. Clearly it is the dental practitioner's responsibility to minimise the negative effect of adolescent behaviour patterns on dental health. The best approach is to build a strong foundation of trust between the dentist and the adolescent patient. Some empathic listening with a few probing questions - perhaps about how others see the malocclusion and/or the braces of other adolescents the patient knows - may be all that is needed. The dentist should not hesitate to provide realistic feedback about the actual status of the child's occlusion and to recommend an orthodontic consultation, if appropriate. This is the only way to combat the influence of the *imaginary audience*. However, it is important that information or advice given to the adolescent be couched in relative terms.

Research has shown that disturbance of self-image is particularly common in early adolescence (Simmons et al 1973) and that adolescents who deviate physically or in acceptability of appearance from age peers often have special problems.

(Barocas & Karoly 1972, Richman & Harper 1978)

With adolescent patients the dentist is advised to assume the role of an authority figure, but not an authoritarian one. When this role is combined with an interest in and willingness to listen to the adolescent, the dentist will more likely be perceived as a stable influence against which the adolescent can judge experience. (Judith et al 1982)

Influences on adults

An adult's psychological or nominal membership in informal groups, as well as relationships with significant other persons, has been shown to play a potent role in shaping some health behaviours. (McDill 1975, Jenkins 1979)

Employing *positive consequence* with adult patients poses a different set of problem from those encountered in developing reward programs for child patients. It also requires more

ingenuity on the part of the dentist. Although children may have little real concern about, or desire to improve, their oral hygiene they are brought to the dentist by their parents, who indicate at least some degree of interest in their child's oral health by the very fact that they have made and kept an appointment for the child. Thus, it is usually not too difficult to enlist the parents' aid in helping the child learn good health behaviour.

Obviously the situation with the adult patient is quite different. Unlike the child patient, the adult patient himself must make a decision to alter his behaviour and, once having made his decision, he must also serve as his own principal source of positive consequences.

Anxiety and fear of dentistry has long been recognised as an obstacle to providing regular dental care, as well as a substantial clinical problem. It has been shown that the fear of dentists is listed fifth among commonly held fears and is among the 10 most frequent intense fears. (Agras et al 1969)

Dental fear, absence of oral symptoms, and lack of concern are found to be the most common of behavioural factors. It has been estimated in Sweden, as well as in other countries, that every second adult finds dental visits unpleasant (Hugosson et al 1986).

Many individuals associate dental treatment with pain and anxiety. There are various causes of fear, eg claustrophobia, a bad dental experience in the past, or even frightened by their parents who used the dentist as a method of persuasion. Various studies reported fear of pain is up to 54 per cent of cases. Dunning says fear and anxiety can block attentiveness and comprehension, and can even cause rejection of the communicator's statement resulting in avoidance of the recommended health habits.

Various factors influence peoples' attitudes towards dental health. Rayner (1974) found socio-economic status, social norms, and education to be of substantial importance. Chambers (1977) however, contends that although socio-economic status is a useful sign, it should not be understood as synonymous with, or as a cause of, susceptibility to preventive oral health education.

Finally WHO (1970) emphasised that in countries where the demand for dental treatment services can be met, adult oral health education is planned around the dentist-patient relationship. It is clear that opportunities for education of patients by dentist are not being fully exploited, and the extent to which dentists engage in educational activities outside their offices is extremely limited. Perhaps one of the main reasons for this is that many dentists have been educated to think chiefly in term of therapy, repair, and restoration with little emphasis on prevention and education.

3.3 SOCIAL DETERMINANTS

Beyond face-to-face interaction among people, some investigators have explored the impact of media-based campaigns, product advertising and political forces on individual oral health behaviour.

3.3.1 Influences of Media Campaigns

Many studies indicate that when the mass media are used alone to motivate preventive behaviour, most individuals are not significantly influenced to act (Green 1978). Although media-based campaigns by themselves can provide the public with information and increase their awareness, it is rare for these campaigns to motivate behaviour change. When media campaigns have been shown to achieve changes, they have been augmented by additional sources of reinforcement.

Since the seminal work of Cartwright (1949), it has been known that the mass media are not powerful *bullets* that penetrate all minds and determine all behaviours. Katz and Lazarsfeld (1955) said personal networks and opinion leaders intervene between the media and subsequent attitude and behaviours.

Research has also documented that the audience plays an active role in selecting stimuli, and in filtering media messages through their personal attitudes and values (Rao 1972). This increased understanding of how the media affects behaviour suggests that the effect of media campaigns could be expanded if they were augmented by one-to-one instruction, self-help group or self-instruction work books. The American dental profession has attempted to influence oral behaviours through media-based campaigns, sometimes reinforced with the personal involvement of dental professionals. For the most part, the impact of these efforts has not been assessed in terms of effect on individuals' preventive oral health behaviours. (Swinehart 1974, Thornton 1974)

Despite decades of media campaigns for dentistry and other health issues, knowledge of the most effective ways to stimulate behaviour changes through the use of the media is meagre. Many of the available studies are fraught with problems of contamination, and with the situation and specific nature of the studies. Both make it difficult to generalise and create a coherent synthesis. (Flay et al 1980, Lau et al 1980)

Despite these limitations, some generalisation concerning the role of the media in promoting behaviour change can be made. *Media-based campaigns to promote oral health are more likely to be effective if they continue over long periods of time, appeal to multiple motives, are coupled with social support provide training in requisite skills.*

Pamphlets and leaflets are widely used in the attempt to disseminate knowledge to people. According to the WHO Expert Committee on Health Education (1954), leaflets and pamphlets have two main functions:

1. To familiarise rapidly a large number of people with some new or recurrent theme.
2. To follow and reinforce advice given by word of mouth.

Such publications should be short, illustrated if possible, attractively presented, and cheaply produced. It should be recognised that few will be kept, and that the impact must be achieved on first reading. Before preparation, it should be decided exactly for whom the pamphlet is designed and exactly what idea it is intended to convey. The draft should then be tested on some of the people for whom it is intended and their comments noted. Any ambiguities in the text or illustrations can thus be removed. (WHO 1954)

Radio and television can carry a special message at a special time, such as Dental Health Week, but are also very valuable on a periodic basis throughout the year. Radio is another health education tool; not a teaching process complete in itself, but a tool to be used along with press releases, pamphlets, films, demonstrations and school. It draws attention, quickens interest, makes action announcements, presents needed information. Radio informs but doesn't educate in the full sense. (Dept of Public Health NSW 1969)

Health exhibitions, according to a WHO Expert Committee (1954) have two definite functions in a program of health education. If properly organised and publicised, they attract a large number of people who might otherwise never come into contact with a variety of new ideas on health matters. On the other hand, their organisation can draw into activity numerous people, such as the editor of the local newspaper, photographers, school-teachers, and other prominent citizens, who might not normally come into contact with the health department's activities.

There is a tendency for all concerned to retreat into inactivity when the exhibition is over. Planning beforehand should envisage the exhibition as the beginning or climax of continuing activity, and one or two themes should be selected in advance for continuity.

3.3.2 Product Advertising

In addition to media campaigns designed to positively influence behaviour, product advertising also influences the public. Two lessons can be learnt from studying methods and results of product advertising.

The first lesson is that budgets for preventive dental health intervention cannot compete with budgets to promote products through the media. Often this money is spent in order to gain a small increase in market share. (Quelch 1980)

During the 1970s the most heavily advertised food item in Great Britain was chocolate, receiving three times more advertising money than its nearest competitors, biscuits and crackers (Sheiham 1980). In the United States, during 1979, over 76 million dollars was spent on advertising coca-cola and pepsi-cola. (Moyer 1981)

The second lesson is that product advertising succeeds by linking personal satisfaction or enhanced self-esteem with the use of a product.

As one researcher asserted, product advertisers make risk-taking behaviours appealing by attaching these to *"legitimised values, beliefs, and norms which are widely recognised and adhered to in the dominant culture"* (McKinlay 1975). To date, promoters of dental health have not succeeded in linking preventive dental behaviour with motives other than health.

3.3.3. Economic and Political Influences

Economic and political influence may together be one of the strongest but least evaluated influences on individual dental behaviours. The sugar industry has great power in influencing economic and agricultural policy in many countries. In addition, sugar has become an important ingredient in many convenience foods, a major industry in itself (Burt 1978). During this century consumption of sugar has increased five-fold even though the world population has only doubled. (Davis 1980)

Many researchers (Arthur 1979, Brody 1980, Sheiham 1980) suggested, those enterprises that aggressively market sugar through a wide variety of products often block any change in the status quo through public relations and legislative influence. In addition, Harty (1979) mentioned that in the United States, many food manufacturers provide classrooms with educational materials under the guise of fostering good nutrition, when, in fact, they are advertising products.

Attempts to alter people's behaviours must take account of the strong influence of the sugar industry and other political forces. Stimulating consumers to demand less sugar in food might lead to increased availability of alternative choices.

Evidence by Shannon (1978) and Arthur (1979) suggests that when a consumer need exists for foods that claim to reduce the risks of dental and other diseases, products are developed and marketed to meet the need.

3.3.4 Informing The Public

To explain the preventive oral health behaviour of individuals, the role of information must also be considered. While evidence (Linn 1974, Markkula et al 1977, Blinkhorn & Verity 1979) suggests that many individuals are misinformed or lack information about prevention of dental disease, research consistently demonstrates that neither information alone nor information plus the teaching of oral hygiene skills improve long term compliance with dental self-care for most people. (Bird & Hazel 1976, Rose et al 1979)

Since a major objective of oral health education is to effect improvements, the term authenticity should reflect current scientific opinions. Dentists and other health personnel are constantly confronted with the questions, "*what is authentic?*" and "*What information should be given to the public?*" Examples of authoritative information are information received from reputable outside sources such as the American or British Dental Association, or information supported by competent investigators under the auspices of the United States Public Health Services and the World Health Organization. Local departments of health, administrators of community clinics, and resourceful practitioners who desire to apply newly reported preventive measures would do well to investigate carefully before adopting. (Pelton & Wisan 1955)

Messages are most effective when they require the least effort by the recipient.
 When delivering oral health messages, it should be done slowly a step at a time.
 When the recipient starts to talk, it is important to listen to find out whether the message has been understood. Audience capability varies from nil upwards.
 The message must be meaningful, understandable and have relevance to the receiver,
 In general, people select those items of information which promise them greatest rewards.
 Meaningfulness is the key variable in learning. Meaningful material is less easily forgotten.
 Message should be expressed in short statements, long garbled messages may cause the intent of the message to be overlooked.
 Message should have the power to arrest attention of the casual reader.
 Message must be in simple terms. Professional terminology may confuse people.
 Simplified explanations help to induce desired results.
 Written materials should be pretested before printing.
 Persons for whom material is intended should pre-test proposed wording.
 Repetition with variations contribute to both factual and attitude learning.
 Frequently it is the one message that emphasises and repeats one thought or idea, that will in time become permanently fixed.

Specificity is indispensable. Attempts to change dental habits by presenting dental information among a number of other health items are usually ineffective. It would seem that most persons, when given diversified and multiple instructions are perplexed. On the other hand, a message spear pointed with emphatic and detailed guidance will have a better chance to hit the target of improved dental concepts and practices.

Communication starts with the climate of belief. The receiver must have confidence in the sender. He must have a high regard for the source's competence on the subject. The dentist will be regarded as a source of authentic information. (Wong 1972)

4 ORAL HEALTH EDUCATION PREVENTIVE MEASURES

The rationale for dentistry's efforts to prevent oral disease is that oral health is an integral part of general health. No individual can be considered fully healthy while there is active disease present in the mouth. Oral diseases are a cause of much distress for many persons. The quality of human life is enhanced considerably when dental caries and periodontal disease can be prevented.

The majority of preventive procedures require some degree of individual action, whether it be in terms of dietary restriction, oral hygiene practices at home, or visiting a dentist. For this reason, continuing efforts of oral health education, both at the public level and directed to individual patients, are necessary. Oral health education of a different kind is required to induce governments and other community agencies to promote dental health by appropriate measures such as instituting water fluoridation and school-based preventive programmes. (Burt et al 1984)

4.1 ORAL HEALTH EDUCATION TEAM

Health education is concerned with behaviour change and oral health education cannot and should not be divorced from education in general (Health Education Council 1971). There is no valid reason why any of the existing dental personnel should play his or her traditional role. The fundamental principle to follow is the maximum utilisation of all available personnel, so long as they are suitably trained to play the role expected of them.

Every member of the oral health team, including the dentist, dental assistants, dental hygienist and dental health worker, should be actively involved in the planning, implementation, and evaluation of patient education. Ideally a preventive programme should include every patient in the practice, providing them with in-depth educational materials and one-on-one personalised communication with a member of the office preventive team.

The team concept is a measure of utilising selected personnel, both dental and non-dental, who work in close co-operation as a team to carry out health education activities. The oral health team affords a perfect opportunity for the dental professional to render preventive oral health care. (Silverman 1976)

Utilisation of personnel other than dental for oral health education activities will relieve some pressure from the dental profession particularly in countries where there is a shortage of trained dental manpower. In 1972 Barmes and Bailey suggested that the bulk of oral health education work can be undertaken by non-dental personnel, such as school teachers, school nurses and health personnel, if they are properly briefed for it. Involvement of these personnel is of utmost importance to minimise loss of operating time by dental personnel. (Barmes and Bailey 1972)

In Iran the basic preventive dental team should consist of dentists, hygienists, dental assistants, and oral health workers. The oral health education team must learn to communicate with people and how to awaken their interest in oral health, particularly in the rural areas where the community is mostly ignorant and illiterate. Therefore, they must be sufficiently trained and should acquire adequate knowledge of oral health education before proceeding to work in the community.

The development of appropriate oral health education programmes at the national level requires close co-ordination between the responsible health administrators and public health dentists, health education specialists, and other health personnel.

4.1.1 Dentist

The dentist is licensed by state law to provide intraoral dental diagnosis and treatment. As the team leader, he/she establishes, preferably with the input from the team members, the goals and philosophies for the practice. To repeat, guidelines need to be determined and put into writing so that all team members understand what is expected of them. The dentist needs qualified team members who are in agreement with the basic philosophy if everything is to operate efficiently and the patient is to learn key oral hygiene skills.

The crucial person in the development of oral health education activities is the dentist himself, whether in a health institution or in private practice. As the head of the oral health team, he has the important mission of educating his patients and of seeing that other members of the health team make the best use of all opportunities for educating patients.

If the dentist is to accept and carry out his important educational functions and responsibilities, he must receive appropriate training during his undergraduate dental studies. The curriculum of dental schools should therefore provide opportunities for participation in a variety of oral health education activities, in school, hospital, clinic and industrial settings. In addition, basic concepts of oral health education should permeate the entire curriculum. (WHO 1970). The present curricula of those (many) dental schools, which are poorly orientated towards preventive and public health dentistry, makes it difficult to train dentists to carry out their educational functions.

The root cause of the ineffectiveness of many oral health education programmes may be due to the inadequate and inappropriate training the oral health educator has received, resulting in the lack of understanding and appreciation of the complexity of the problems associated with oral health education. *Imaginative undergraduate training programmes for dentists are sorely needed so that the preventive aspects of dentistry can receive proper emphasis.* (WHO 1970). As a leader of the oral health education team in the area, the dentist has the responsibility of formulating programmes, identifying target groups and planning strategy for carrying out oral health activities in the area.

4.1.2 School Dental Nurse (New Zealand type)

This type of auxiliary was established in New Zealand in 1923 to deal with a large amount of dental disease present among the school children.

These auxiliaries work under direct or indirect supervision of dentists, and are employed in government services. The school dental nurse is permitted to diagnose dental disease and to plan and carry out certain specified preventive and treatment measures, including some operative procedures, in the treatment of dental caries and periodontal disease in school children. Auxiliaries with similar functions to those of the New Zealand type of school dental nurse are found in about 29 other countries, many of which have started their own training schemes. (Elderton 1981)

The duties of the school dental nurse include: dental examination of school children and diagnosis and treatment of the most prevalent dental diseases, dental caries and periodontal disease; oral health education; prophylaxis; cavity preparation; placement of cement bases and amalgam, silicate, synthetic porcelain, or cement fillings; and the extraction of deciduous teeth using infiltration anaesthesia. They also apply topical fluoride solutions. These duties vary in different countries and may include extraction of permanent teeth, block local anaesthesia, fissure sealants and composites.

The role of the school dental nurse includes not only teaching the principles of oral hygiene and prevention of dental disease to individual children, but also to school classes, women's organisations, parent-teacher associations and similar bodies. Patients requiring treatment beyond the scope of the school dental nurse are referred to the dental officers.

(Slack 1981)

4.1.3 Dental Hygienist

The dental hygienist graduates from an accredited program and is licensed by law to perform numerous intraoral procedures under the supervision of a licensed dentist. The hygienist has training in both the behavioural and clinical sciences. This gives her an in-depth knowledge in scaling, polishing, use of ultrasonic scaler and oral hygiene instructions. Some expanded functions, if legally sanctioned, such as sealant placement, certain operative dentistry procedures, and orthodontic duties. The primary area of responsibility for the dental hygienist is prevention.

The training of a dental hygienist is usually of 1-2 years duration. An expert committee of the World Health Organization considered that one year is appropriate for countries wishing to train hygienists to enter their governmental health services (WHO 1959).

In the United Kingdom training is from nine months to one year, while many school in the USA offer a four-year degree programme in dental hygiene as well as the two-year certificate programme.

The dental hygienist is permitted to carry out, to the prescription of a supervising dentist, certain specified preventive and treatment measures including some operative procedures for the treatment of periodontal disease. (Elderton 1981)

The training of dental hygienists in Iran is a 2 year full time university course. The dental hygienist has been found to be very effective in carrying out preventive measure in dentistry and in the field of oral health education, but it is understood that the Iran government does not intend to employ them. Iran is experiencing a shortage of skilled manpower, both dentists and dental hygienists, in many cities and *dental hygienists could be effectively utilised in the government services* to help tackle the oral health problem of the county. The dental hygienist could be an asset to the oral health education team.

4.1.4 Oral Health Workers (in Iran)

The population of the IR IRAN is about 55,000,000, with 48 per cent of this population living in rural areas. The ratio of dentist to population in Tehran city is 1:8,000, in large cities 1:17,000, and in small cities 1:35,000. In this situation the Ministry of Health and Medical Education early in 1980 presented its proposal to Parliament for the training of Oral Health Workers as a type of auxiliary personnel for rural areas. This proposal was approved, and in 1981 about 264 students were accepted from rural areas. In 1984 the first group graduated from universities to work in their own rural area for five years.

Entrance requirements:

- High School Diploma required
- Birth place of candidate must be from a rural area which needs dental services
- Pass the National Entrance Examination for Higher Education
- Have no physical disabilities
- Must undertake to work in the rural area (under 10,000 population) for five years

Training:

The training period is 3 years full time, and training is particularly directed towards curative and preventive care of adults and children. The object of the training is to produce personnel who are capable of maintaining a specific group of all ages (children, adults, aged) in a rural area by means of treatment in a restricted field given at regular and frequent intervals, and by instruction in the principles of oral hygiene.

Subjects of the course:

- Basic science - general anatomy, physiology, pathology, chemistry (46 units)
- Dentistry subjects - dental surgery, periodontology, paediatric, oral pathology, radiography and diagnosis, operative dentistry, dental anatomy, dental materials, and prosthetics to the level of their job descriptions (67 units)

The duties of oral health workers include:

- Dental and oral examination of adults and children
- Diagnosis and treatment of prevalent dental disease
- Cavity preparation of class one and two amalgam fillings
- Acid etching and composite filling of anterior teeth
- Extraction of deciduous and permanent teeth
- Local infiltration and block anaesthesia
- Application of topical fluoride solutions
- Teaching the health principles of dental disease to individual patients, children, and school classes
- Cleaning of teeth
- Removal of plaque and calculus
- Root planing
- Fissure sealing
- Construction of full and partial dentures
- Referral to the dentist of those patients requiring diagnosis or treatment that he is not able to, or legally entitled to, carry out
- Writing of prescriptions to be provided only within the rural health center.

Their work experience in a number of villages has shown that they can be trained to a high standard of efficiency, and they exercise considerable and beneficial influence over a rural population, especially children and their parents through their advice on oral health and practice of oral hygiene. Their course of training should be directed towards this end. *They have played a very important role in the oral health of the rural areas which was one of the major problems of the Iranian community.*

4.1.5 Classroom Teacher

Authorities both in the field of education and in the field of health agree that the classroom teacher must carry a major share of the task of oral health education. According to the National Education Association of America, regardless of the extend of school dental services, the teaching of oral hygiene is, and must be, a primary responsibility of the classroom teacher.

The report goes on to say that the teacher's interest in securing corrections is a major factor in developing pupil interest and action. Teachers with enthusiasm and persistence who are properly instructed in the principles of oral hygiene can stimulate children to seek dental services. The report concludes by saying that the teacher is the keystone of the arch of dental health education.

Wong (1976) says that for young children, the classroom and the presence of the peer group form an ideal setting for acquiring dental health knowledge and developing good habits. In strongly supporting the above views, Dunning (1970) gives two other reasons. Firstly, the preponderance of teachers over dental health personnel in the school system and also because of the number of hours per year a classroom teacher is in contact with the pupils.

Secondly, the educational training of the classroom teacher and her constant practice in the understanding of the minds and motives of her pupils (Dunning 1970). Nyswander even goes further in saying that *"the child cannot be helped to assume responsibility for his health through campaigns. Sound attitudes can only be developed through unified teaching and through one sources of instruction - the teacher"*. (Nyswander 1942)

A more defeatist attitude towards the problems of oral health education is presented by Stoll and Catherman (1967). They say that the teacher does not have the facts or the initiative to teach prevention of dental disease. However, teachers can be motivated and stimulated to become effective tools in teaching oral health education in the classroom by proper training and acquisition of the relevant knowledge. Teachers can also use their influence to encourage school canteens to improve both general and dental health by serving appropriate foods.

The results of a survey carried out as part of a cancer education research program in teaching training establishments, showed that a majority of primary school teachers felt that as a teacher, their main role was to equip their pupils with basic skills and they for the most part, appeared to consider that health education came into this category, and were expecting to teach it. (Charlton 1981)

The role of the school teacher in oral health education cannot only include basic concepts of health education but should also provide opportunities for teaching practice related directly to health education.

The role of the school teacher in oral health education cannot be over emphasised. Oral health education should be included as part of a general health education programme. The dental team, with their specialised knowledge, can co-operate with teachers to make oral health education meaningful and interesting. (WHO 1970)

In Iran, training for classroom teachers should deal with health matters, which are an important aspect of their specialised job. The Teacher Training Colleges should conduct regular three-month in-service courses on health education and nutrition for teachers in Iran. This should be organised as a joint effort of the Ministry of Education and Ministry of Health and Medical Education. Teachers from primary school as well as lower secondary schools should attend these course, and dentists should be involved in giving lectures and demonstrations to the teachers undergoing the course.

4.1.6 Other Health Personnel

Dental health cannot be segregated from general health. Similarly, oral health education cannot and should not be divorced from health education in general.

(Health Education Council 1971)

Members of other health professions have an important role in oral health education and should therefore receive training appropriate to these specific roles. The physician occupies a special place in the health team. During his undergraduate medical training attention should be paid to oral health problems so that he can reinforce the educational efforts of the dental team.

All health personnel, such as nurses, home visitors, and social workers, who have direct contact with people either at home or in health facilities, should be aware of opportunities for oral health education related to specific needs. They should also be familiar with community dental resources so that appropriate referrals can be made when necessary.

In Iran, the oral and health personnel do work closely together. They are housed in the same building particularly in the main health centers and sub-health centers, and referral of patients between them is a common feature.

The health personnel could easily incorporate oral health measures into their preventive general health programmes for the ante-natal mothers, school children and the public. The health personnel are well aware that poor oral health in an individual affects the general health as well; they cannot afford to ignore the oral health problems of their patients.

Health personnel can contribute immensely as members of the oral health education team. While working in the health clinics or in the field in the rural area, these health personnel can carry the message of oral health with the aim of educating the public, allaying their fears, apprehensions, superstitions and traditional beliefs, and ultimately changing their attitudes and behaviour.

4.2 LEVEL OF PREVENTION

The health education requirements for each group of the community can be determined by the level of prevention that needs to be applied.

Prevention may be accomplished in the pre-pathogenesis period by measures designed to promote general optimum health or by the specific protection of man against disease agents or the establishment of barriers against agents in the environment. These procedures have been termed primary prevention.

As soon as the disease process is detectable, early in pathogenesis, secondary prevention may be accomplished by early diagnosis and prompt and adequate treatment. When the process of pathogenesis has progressed and the disease has advanced beyond its early stages, secondary prevention may also be accomplished by means of adequate treatment to prevent sequelae and limit disability. Later when defect or disability have been fixed, tertiary prevention may be accomplished by rehabilitation. (Leavell & Clark 1965)

Prevention in dentistry can be divided into these three major classifications and is defined by the stage at which it comes into effect. (WHO 1978) They could also be called the lines of defence. These three stages of prevention can be related to periodontal disease and are discussed under: *Primary prevention; Secondary prevention; and Tertiary prevention*

4.2.1 Primary Prevention

This stage of prevention is where early steps are taken to prevent the disease from occurring by using various preventive measures. True or primary prevention occurs in the pre-pathogenic period and involves first health promotion and then specific protection. (Dunning 1970)

In the prevention and control of periodontal disease, this is an important stage. This includes instructions on the maintenance of good oral hygiene, diet counselling, regular and periodontal visits to the dentist for check-up and oral health education.

The main role of dental personnel at this level of primary prevention should be in oral health education, the control of dental plaque, and the provision of treatment which will not introduce iatrogenic dental problems (Ewart et al 1983).

4.2.2 Secondary Prevention

This is the second line of defence presupposing that primary prevention has failed to provide the expected protection. This, therefore, involves early detection of periodontal disease and prompt treatment. The second category of the community, ie those at high risk, will require secondary prevention.

Those at high risk will have to undergo a behaviour change because the information disseminated to them earlier failed to prevent the disease. There is a need to make the high risk status socially recognisable so that people will feel that society disapproves of their action. (Blinkhorn 1981)

Secondary prevention requires active steps to be taken in the prevention of the disease: through dental recall system; screening surveys for early detection of periodontal disease; and for provision of treatment or removal of a state leading to the possibility of the disease. This means professional removal of plaque and calculus, recontouring of deficient fillings, redesigning poorly constructed dentures, and other measures to safeguard the oral tissues.

When establishing schedules for recall examinations and treatment, consideration should be given to individual variations; the policy of habitual recall at six-monthly intervals should be changed to relate to individual needs. This process could result in groups requiring recall at 3-month, 6-month, yearly or longer intervals according to apparent needs. (Ewart et al 1983)

4.2.3 Tertiary Prevention

Tertiary prevention is concerned with the third category of the community that has advanced periodontal disease. In this stage the disease has fully developed and the main consideration is stopping the process and mitigation of its effects, and an attempt to restore appearance and function. The patient is advised on the nature of the disease and the available cure. This is followed by advice on rehabilitation which is considered as a part of tertiary prevention.

As treated patients have already demonstrated that they are susceptible to periodontal disease, they will need long-term maintenance (control) treatment and care. Where appliances or occlusal adjustments form a part of the treatment, the individual must be educated to care for these appliances and the adjusted tissues. (Ewart et al 1983)

For the successful conclusion of any preventive periodontal programme undertaken, the consent, cooperation, and active participation of the community is vitally important.

It appears that *oral health education plays the most effective role in primary prevention of oral disease*, and it is obvious that actual education is applicable to all the three stages of prevention just described, and it should be rightfully so.

4.3 COMMUNITY PREVENTION OF DENTAL CARIES

Dental caries is a disease of bacterial origin. The causative bacteria are harboured in adherent dental plaque; the mouth is a natural reservoir for many of these bacteria. Certain of these bacteria, under specific conditions, can ferment sugars (and other simple carbohydrates to a lesser extent) to produce acid, which in turn can demineralise adjacent tooth enamel. At its earliest stage, this demineralisation process can be reversed under certain biochemical conditions. If demineralisation proceeds, clinical caries develops.

Caries is thus a disease which can only develop with;

- a. Bacterial agents, bacteria in the dental plaque capable of producing acid as one by-product of their metabolism;
- b. A suitable substrate-the acid producing bacteria require a suitable substrate to metabolise in the dental plaque: refined carbohydrate, especially sucrose and other sugars, are the most favourable substrate;
- c. A susceptible host-dental enamel which is susceptible to dissolution by plaque acid; and
- d. Time-clinical caries only develops after repeated and undisturbed acid action has led to sufficient demineralisation to allow further bacterial invasion of the tooth and eventual permanent loss of tooth substance.

Only if all four factors are present will clinical caries become evident, this is a good example of *disease ecology*. (Ericsson 1977)

Community-based preventive measures are those organised through the efforts of both the dental profession and the public to improve the dental health of the whole community. Some may require decision-making by government, such as water fluoridation and establishing a national food policy. Others, such as fluoridation of salt or incorporation of sugar substitutes in processed foods require corporate decisions, usually after appropriate government clearance of the specific agents concerned. Large-scale oral health education campaigns can be organised by the dental profession, government and lay groups. Such campaigns should be aimed where they are likely to produce most benefit, such as at expectant and nursing mothers through prenatal care centers, midwives, obstetricians, staff of maternity units and nursery schools. (Burt et al 1984)

4.3.1 Water Fluoridation

Water fluoridation is the upward adjustment of the fluoride concentration of a community's central water supply to the optimum level for the prevention of tooth decay. For those countries with established public water supply system, fluoridation is the most efficacious and cost-effective measure available to prevent tooth decay in the community. (Burt 1979)

Fluoridation of community water supplies is the least expensive and most effective way to provide fluoride to large groups of people of all ages. Wherever it is feasible, optimal adjustment of the fluoride concentration of community water supplies should be the foundation for all caries prevention programmes, because it is a nearly ideal public health method. *First and foremost, community fluoridation is highly effective.* (Newbrun 1980)

Hundreds of studies conducted throughout the world have shown that children who consume optimally fluoridated water from birth have from 50 to 70 per cent less dental decay than they would have experienced without fluoridation. Murray et al (1979) reviewed the findings of 94 studies in 20 countries on the cariostatic effects of controlled water fluoridation. As measured in 55 of these studies, the most frequently observed reduction in the prevalence of dental caries in primary teeth ranged from 40 to 50 per cent. Among 71 of these studies that measured protection in permanent teeth, the frequently observed range of protection was between 50 and 60 per cent .

Of equal importance with efficacy is the safety of consuming fluoride water. No other health measure has been so critically analysed. The procedure is also inexpensive, greatly reducing the per capita costs of dental treatment (Rugg-Gunn 1977) and benefits the entire community, regardless of socioeconomic level, educational achievement, individual motivation, or direct action needing to be taken by those who will benefit.

Russell et al in 1951 and Murray (1971) suggest the improvement in oral health is maintained for as long as the consumption of fluoridated water continues.

Another report (Stamm et al 1980) showed that life-long consumption of fluoridated water also significantly lowers the prevalence of root surface caries in older persons.

Abundant data show that fluoridated water not only acts systemically during tooth formation to make dental enamel resistance to decay, but also has some direct action as a topically applied agent. However, Marthaler (1979) has shown that consumption of fluoridated water should begin at birth for maximal protection of both permanent and primary teeth.

It has been estimated that some 170 million people in 38 countries were receiving fluoridated water in the homes (US Department of Health, Education and Welfare 1977).

Optimal fluoride concentration

Some fluoride is found in drinking water from all sources. In the optimal concentrations between 0.7 and 1.2 parts per million (ppm), fluoride reduces tooth decay experience by 50-60 per cent in population groups consuming such water continuously since birth. This range of concentrations allows for the fact that people in warmer climates drink more water, on average, than do people in cooler climates. Standards have been developed for optimum concentrations of fluoride in drinking water in different climates. (Simard 1976)

It is necessary to adjust the level of fluoride to the optimal value for the environment. In the first studies on fluoridation, the optimal level of 1 mg per litre was considered the general rule. However, there are other important factors relating to the environment such as the mean air temperature, water consumption, breaks in delivery of fluoridated water and dietary habits. Before recommending the general use of water fluoridation it is important to consider these factors in determining with sufficient precision the concentration of fluoride appropriate to each particular situation. (Bellemare 1982)

Reduction of Dental Caries

Early epidemiological studies established the relationship of natural fluoride in the drinking water to the prevention of dental decay (Burt et al 1981). Subsequently, three North American community experiments were begun in 1947 to determine whether the addition of fluoride to bring its concentration in drinking water to 1.0 ppm could significantly reduce the incidence of dental caries in the community. In each case, reductions of 50-70 per cent were found (Brown & Poplove 1965). While water fluoridation is principally associated with reduced tooth decay in children, those adults who were born, raised and continuing to live in fluoridated communities have demonstrated better dental health than have adults in non fluoridated communities.

Stamm and Banting (1980) have demonstrated that life long residence in a fluoridated community leads to a significant reduction of root caries in adults of all ages in comparison to the prevalence found in non-fluoridated communities. The painful lesson of stopping water fluoridation should not be forgotten. In Antigo, Wisconsin, where water fluoridation was begun in 1949 but discontinued in November 1960 and not reinstated until October 1965, the caries prevalence increased remarkably (about 100 per cent) between 1960 and 1966 (Lemke et al 1970). Similarly, in Wick, Scotland which started water fluoridation in 1969 but stopped it in 1979, the caries prevalence in five to six years-old children increased by 27 per cent between 1979 and 1984, despite a national decline in caries and increased availability of fluoride dentifrices. (Stephen et al 1987)

4.3.2 Salt Fluoridation

Salt fluoridation is the addition of a measured amount of fluoride to salt, prior to its distribution and marketing. The level of fluoride in salt should be such that the excretion levels of fluoride are similar to those found in areas of communal water fluoridation.

In the early programmes and studies, 90 mg of fluoride per kg of salt produced limited benefits. These findings led to recommendations to raise the concentration of fluoride in salt to between 200 and 300 mg per kg. (Wespi & Burgi 1971)

Salt intake is difficult to determine because of broad individual and cultural variations. Toth and Sugar (1975) found that salt sales in Hungary amounted to 10.97 g per person per day, but that only 34 per cent of this amount was actually consumed. This indicated that 250 ppm fluoride in salt would be optimal for countries such as Hungary. It is assumed that when the concentration of fluoride in salt produces excretion levels of urinary fluoride similar to those found in communities with optimally fluoridated water, the caries-preventive effects will be similar. (Marthaler et al 1978) Salt may be purchased directly by consumers and used to season food during its preparation or at the table. It may occur as pre-seasoning in some items or in processed foods, which are being increasingly consumed in many countries.

Nevertheless, fluoridation of salt may be an effective and practical method to prevent caries in some countries where water fluoridation is uncommon or unattainable and where the distribution of salt is state-controlled (Horowitz 1982). Data from Colombia (200 ppm F in salt) and Hungary (250 ppm F in salt) indicate that these higher concentrations lead to caries reduction in the order of 60 per cent (Marthaler et al 1978).

Most experience with salt fluoridation has been accumulated in Switzerland where, in 1970, 77 per cent of salt purchased for the domestic population of 5.5 million contained fluoride (Peter 1977). This salt contained 90 ppm fluoride, or just over one-third the concentration now regarded by the Swiss authorities as optimum and safe. Hence the observed caries reductions in Switzerland (Vaud and Glarus cantons excepted) had always been modest-with the DMF levels in 7-10-years-olds being 30-32 per cent lower than baseline figures.

The production of fluoridated salt in Switzerland has increased more than five times with a high degree of acceptance (Peter 1977). The cost of marketing fluoridated salt, based on per person year expenditure, is low. The technology for producing fluoridated salt is now well tested, and can be applied in most countries.

Salt fluoridation is probably the best method of systemic fluoridation in developing countries where piped water supplies are rare. (Federation Dentaire Internationale 1983)

4.3.3 Milk Fluoridation

There are only a few human studies that have explored the use of milk as a vehicle for fluoride supplementation and these have had few participants (Stephens 1981). Although the results have been encouraging, more clinical data are needed before the fluoridation of milk can be recommended as a caries preventive measure.

Theoretically, milk fluoridation has certain inherent disadvantages, the amount of milk consumed by children, particularly those in different socioeconomic group and countries, varies considerably. Also unlike consumption of water, the consumption of milk by children tends to decrease with age, whereas the need for fluoride to prevent dental decay increases with age. Therefore, the long-term benefits of milk fluoridation are likely to be smaller than those from continual exposure to fluoridated drinking water. Moreover, the absorption of fluoride from milk is lower than from water, and fluoride is incompletely ionised in milk (Hellstrom et al 1976).

Fluoridation of milk could be useful in school-based programmes in which an optimal daily dosage is provided at one time. However, the cost of fluoridating milk for distribution in schools are likely to be much greater than corresponding costs for a school-based fluoride tablet programme.

The clinical evidence for the effectiveness of milk fluoridation is sparse. When added to the inherent problems of variable consumption of milk, the cost and safety of production, and relative sophistication of production and distribution methods required (Stamm 1972), it is clear that milk fluoridation cannot be seriously considered as a community public health measure at present.

4.3.4 Dental Fluorosis

Fluorosis

Endemic dental fluorosis is a specific disturbance of tooth formation caused by excessive intake of fluoride during the formative period of the dentition (ie above the level of 2 ppm F⁻ or more). Clinical dental fluorosis is characterised by lustreless, opaque white patches in the enamel which may be striated, mottled and/or pitted. The opaque areas may become stained yellow to dark brown. The affected teeth may show a pronounced accentuation of the perikymata and, in more severe cases, multiple pits and larger areas of hypoplasia of the enamel appear to such an extent that the normal morphology of the tooth is lost. (Möller 1965, Murray 1976)

The manifestations of chronic fluoride intoxication depend upon the amount ingested, the duration of exposure and the age of the subject.

Defluoridation

Experimental work and practical applications of techniques for partial defluoridation have been carried out in India, Mexico, and Argentina. However, the need for special equipment, for operator training, and to frequently regenerate or replace the absorbing media has resulted in costs that are higher than for most other water treatment processes.

Partial defluoridation is most often needed in very small water supply systems, where there may be problems in housing the equipment, providing a skilled operator, maintaining adequate surveillance of the process, and obtaining engineering services. The need should be reemphasised to protect children against the disfiguring cosmetic effects of moderate/severe dental fluorosis by providing them with only optimally fluoridated water until they are about nine years. (Koop 1982)

Other methods for avoiding dental fluorosis in children while keeping the fluoride protection against caries include blending the water with a supply having a lower fluoride concentration, providing bottled water for children, and using individual treatment units in homes where there are children.

4.3.5 Promotion of Diet

The conclusion that caries is a diet dependent disease is supported by animal and human studies in vitro (Bibby 1970, Shaw 1979). Epidemiological evidence strongly supports the view (Burt & Eklund 1981, Rugg-Gunn et al 1981) that there is little, if any, relation between nutritional adequacy and dental caries. The world's lowest rates of dental caries are found in countries where generalised malnutrition is the norm, and the highest rate in those countries enjoying high standards of living. Caries is related to diet (defined as the total oral intake of substances that provided nourishment and/or calories), rather than to the nature of nutrients absorbed. However, the accepted association between sugar intake and dental caries, while direct, is not linear and may be affected by the nature of the diet, and frequency of ingestion.

Sugar consumption in developed countries has been around 45 kg (100 lbs) per person per year for many years. When sugar is readily available anywhere at a reasonable price it will be consumed; mankind apparently has an inherent 'Sweet tooth'. Low consumption is only seen when sugar is not available, as in much of the developing world, or when it is restricted in times of war (Toverud 1957) or by high prices.

Escalating prices of sugar in 1972 seemed to reduce consumption in Norway (as elsewhere), but consumption quickly returned to previous levels as prices dropped again (Molstad & Botten 1980). Even some of this apparent reduction in consumption with high sugar prices is illusory, because food manufacturers may substitute corn syrup (which is principally fructose) for sucrose.

Sucrose is the most abundant form of sugar consumed by humans. It is used widely in food processing because it has numerous attractive qualities. Apart from adding a sweet taste, sucrose adds lustre, gloss, body, plasticity, and aids emulsification of fat. Substitution of fructose, dextrose or other monosaccharides for sucrose, as happens when corn syrup is used in food processing instead of sucrose, is unlikely to produce any notable impact on caries incidence. (Newbrun & Frostell 1978)

As with salt, sugar is consumed from various sources. In the snack orientated society of developed countries, and with the widespread use of processed convenience food, much sugar consumed is now in the form of "*hidden*" sugar.

It has been long recognised that some food stuffs are more cariogenic than other. While existing tests are not entirely satisfactory, some progress is being made towards assessing the cariogenicity of individual foods (Newbrun 1982).

Prevention of caries by food modification

Replacement of sucrose by artificial sweeteners is one alternative, although biological, toxicological, economic and technical considerations, as well as taste preferences, complicate the issue. In Switzerland for example manufacturers may label their products (Safe for teeth) if in laboratory tests they do not lower the pH of interdental plaque below 5.7 for up to 30 minutes after ingestion. (Imfeld & Muhlemann 1977) Products which are safe for teeth usually contain non-acidogenic xylitol, or slowly fermenting sorbitol, mannitol, or maltitol. Fructose does not pass the test.

It seems that the use of non-sugar sweeteners on a small scale in certain medicines, lozenges, chewing gum and soft drinks may be acceptable to the public. (Dansk Tandlaegeforenings Sukkerudvalg 1979)

Though promising results were obtained in the studies in Turku, Finland by Scheinin and Makinen (1976), when sucrose was replaced by fructose or xylitol in most food stuffs for two years, it is difficult to ascertain the caries preventive effect of substitution of sucrose by artificial sweeteners in only a limited range of products. Xylitol remains the most promising sugar substitute in food processing at present, though others are being tested. (Shaw 1981)

Phosphates have been added to a variety of foods and drinks, mostly alone, but also in combination with fluoride. Phosphate in cereals, chewing gum and sweets have given variable results, probably because only one or a limited number of sugar-containing foods have been fortified.

Results with fluoride fortification are promising (Haugejorden & Helöe 1981). It would seem that sucrose, glucose, maltose and fructose are the most cariogenic sugars, while lactose would seem to be less cariogenic. The bulk sweeteners sorbitol, mannitol, hydrogenated glucose syrup, and isomalt are non-cariogenic or virtually so. Xylitol, saccharin, aspartame, and thaumatin are non-cariogenic.

Effective caries prevention by sugar control includes:

1. Deciding which types of food or eating habits are the most harmful: substitution of sugar in these foods by less cariogenic sweeteners might then be cost-effective;
2. Development of new technology to reduce the cost difference between sucrose, glucose, and fructose and other less cariogenic sweeteners;
3. Development of sweeteners free from adverse effect.

A national approach towards a healthier diet

In many countries, legislation and regulation to control production, labelling, advertising and marketing of certain foods might promote good dietary habits. At the other end of the scale, so might appropriate subsidies and tax credits to food manufacturers. However, severe restrictions, rationing or other methods of curtailing choice are unworkable in free societies unless there is general public acceptance of the measures taken.

Educational efforts to promote good nutrition and healthy dietary practices should be supported by dentistry in the interests of promoting the health of the public, though the impact on oral diseases may be related only to reduced frequency of consumption of sugary snack food. (Burt et al 1984)

Some researchers (Jackson 1978, Newbrun & Frostell 1978, Nizel 1979), suggested that a ban on sale of sweets and sugar-containing snacks at, and in the immediate vicinity of, schools may be effective in those societies where this form of restriction would be accepted.

Community-based efforts to alter dietary practices may in time prove more beneficial than education of the individual patient to avoid sugary snack food. This is because the pervasiveness of sugar in modern processed diets makes reduction of total sugar consumption difficult, and also because of the different cultural role of sweet snacks in communities.

Dietary control is a primary example of where educative action at community level is superior to individual exhortations. It simply is not realistic to expect children to refrain from sweet snacks, despite the countless hours devoted to prevent dental caries in community. Equally, it is not realistic to expect food processors to use non-cariogenic sugar substitutes unless they can be assured of sufficient demand for their products. Research, and education at several levels, are therefore required. Several acceptable sugar substitutes are now available and more are likely to be developed. Acceptance of non-cariogenic sweets, such as those found in Switzerland through the 'Zahnschonend' programme (Imfelel & Muhlemann 1977) is a good illustration of where prevention and education combine for the benefit of all.

4.4 INDIVIDUAL SELF CARE

Community-based measures for the prevention of dental caries have the advantage of reaching all (or many) members of the community, but their disadvantage is that they cannot be tailored to the needs of each individual.

Individually based measures can be applied in public programmes, usually under supervision, or applied in the private office where the best opportunity exists for meeting the specific needs of each individual (Burt et al 1984). A complete programme of caries control includes a number of procedures which the motivated individual can carry out at home. These procedures are conceptually simple, but require a good degree of interest and motivation to be applied with the necessary consistency. Not all individuals therefore are likely to apply them, and those that do will do so with varying effectiveness.

4.4.1 Fluoride Dentifrices

Toothbrushing is effective for caries prevention only when a fluoride-containing dentifrice is used. Results of clinical trials have shown that fluoride-containing dentifrices reduce the incidence of caries in children and young adults. The first successful clinical trials in the 1950s used a stannous fluoride/calcium pyrophosphate formulation (Muhler et al 1955). Reductions in caries incidence of around 15-30 per cent were obtained in many studies.

Brushing with a toothpaste containing fluoride is usually a home-based rather than a school-based procedure. Substantial data exist to show that ad libitum toothbrushing with an approved fluoride product will reduce dental caries by about 20 to 25 per cent.

(Heifetz et al 1975, Volpe 1982)

In many developed countries the use of fluoride-containing toothpastes, which comprise 80-90 per cent of all dentifrices, by children at home is already widespread. School-based toothbrushing programmes with fluoride dentifrices are unlikely to confer additional protection against decay. Moreover, purchasing toothpaste for school programmes is

expensive. The procedure should be performed daily and requires facilities for rinsing mouth and brushes. The need for sanitary storage of brushes is another disadvantage of this regimen when carried out in school.

Both children and adults should be encouraged to use a fluoride toothpaste regularly at home. However, children less than age six should be supervised when they brush their teeth with a fluoride toothpaste, or should have their teeth brushed for them by an adult to prevent ingestion of too much fluoride while their forming permanent teeth are able to develop fluorosis. The amount of fluoride toothpaste used for brushing a small child's teeth should be restricted in size to that of a small pea. (Horowitz 1982)

4.4.2 Dietary Control

Whatever community measures may be instituted for dietary control, and however well dentists educate their patients, an individual's ability to make wise dietary choices remains an important factor in determining that individual's dental health status. In societies where food is scarce, of course, individuals are in no position to make food choices in the way the term is understood in wealthier societies. The customary dental health pattern in economically undeveloped countries is one of low (though increasing) caries prevalence but high prevalence and severity of periodontal disease (Möller 1978).

There is strong evidence (Russell 1963, Makinen 1972) that the prevalence and incidence of caries in the community is likely to be high if:

1. a high proportion of total caloric intake comes from foods containing a lot of sugar; and
2. the frequency of consumption of these foods is high.

It is also widely believed that sugary foods are more cariogenic if they are in a sticky form. Dietary practices in many economically developed countries are becoming more oriented to quick snack and turning away from traditional meals. Because sugar is found in many convenience foods as well as in confectionery (Shannon 1977a,b), and because there is

increasing consumption of these prepared 'convenience foods' at the expense of home-prepared foods, it is frequently difficult for many individuals to avoid consuming large amounts of sugar.

A direct relationship between DMF scores and the frequency of sugar snacks consumed between meals has been demonstrated on many occasions (Gustafsson et al 1954, Bibby 1975, Burt & Eklund 1981). Accordingly, a major step that an individual can take to reduce their own incidence of caries, or that of their children, is to restrict the consumption of between-meal snacks of confectionery, other sugary foods, or baked goods such as cakes and cookies. It must be realised that for an individual to alter undesirable dietary practices usually requires more than just self-discipline. Eating practices are deeply ingrained, and can be influenced by upbringing, lifestyle, socioeconomic status, religion, emotional status, interest in personal health and appearance, outside commercial pressures, and availability of different types of food. An adult's decision to change undesirable eating patterns may be associated with a major shift in attitude toward life in general. The observed difficulty in inducing change in dietary patterns underscores the importance of parents bringing up their children into an eating pattern in which sugary snack foods play little part. Such statements assume a degree of family stability which often does not exist, but healthy dietary practices should be encouraged by dentists to the extent possible. (Burt et al 1984)

Correct nutrition is very important in the control of dental disease and also effective oral hygiene procedures. Reduced consumption of sugar and other sticky carbohydrates, both in terms of total intake and its frequency, is important in maintaining a sound dentition in a healthy mouth.

4.4.3 Home Use of Fluoride Rinses and Tablets.

Many dentists now prescribe the use of fluoride mouthrinses and/or tablets for their patients at home. In some countries these products are also available for over-the counter sale without prescription. Many dentally aware parents are ensuring that their children rinse with fluoride solutions as well as brush their teeth with a fluoridated toothpaste. In areas not served by fluoridated water, fluoride tablets can be added to this regimen.

(Burt et al 1984)

Two methods for self-applying fluorides, mouthrinsing with solutions and ingestion of dietary supplements, are eminently suitable for school-based programmes, because of their convenience, low cost, acceptability and effectiveness. The school children in these programmes may be supervised by dental auxiliary personnel or, after appropriate training, by teachers, nurses, teachers' aides or volunteers.

The daily consumption of a fluoride tablet in school reduces the incidence of children's dental caries by about 35 per cent (Horowitz 1982). These dietary fluoride supplements also provide a sizeable topical cariostatic effect to erupted teeth and their use in school-based programmes is increasing. Fluoride tablets have many advantages: they confer systemic fluoride exposure to unerupted teeth; they may be used safely by pre-school children who cannot control their swallowing reflex adequately to engage in a mouthrinsing programme; and no waste products result from their use. Of course, using fluoride tablets is unsuitable where the drinking water contains appreciable levels of fluoride (ie > 0.7ppm).

In areas of endemic fluorosis, fluoride tablets should never be used. Fluoride mouthrinses should be discouraged before 7 years of age, in order to avoid any possibility of inadvertent swallowing of excess fluoride material.

The long-term benefits of appropriate use of fluoride tablets and mouthrinses are proportional to the degree of compliance with the daily routine required. Use of these products should be prescribed or recommended only to those patients considered likely to comply reasonably well with the requirements. Dentists should also be certain that all patients using fluoride products at home are aware of the safety precautions associated with their use.

Recommended dosage for fluoride supplements is discussed in section (5.1.2).

Infants who are being totally breast fed receive a negligible amount of fluoride, so health professionals can prescribe or recommend fluoride supplements for them. For an infant who being partially breast fed but who is also receiving other foods or liquids, the appropriate dosages of fluoride supplements are more difficult to determine. This is particularly so if the infant lives in an area receiving fluoridated water. Unless the health professional is thoroughly familiar with the patient's history and living habits, caution in prescribing fluoride supplements is advisable. (Driscoll & Horowitz 1979)

Whether or not an individual is receiving fluoridated water, fluoride mouthrinses used at home can provide further protection from caries. Daily rinsing with 0.05 per cent sodium fluoride is recommended for home use. Again, as a precaution for home use, the American Dental Association (1979) has advised that mouthrinses be dispensed in containers holding no more than 264 mg of sodium fluoride (120 mg F).

4.5 PREVENTION OF PERIODONTAL DISEASE

Periodontal disease is a generic name given to those chronic inflammatory condition of bacterial origin which begin with inflammation of the gingivae and lead, in time to loss of attachment and bony support for the tooth. The causative bacteria are found in the dental plaque. The term gingivitis usually refers to the reversible inflammatory condition of the papillae and gingival margins, while destructive periodontal disease or periodontitis usually refers to that chronic progression of the inflammatory condition into pocket formation, loss of attachment and eventually loss of bony support. (Ranney 1977)

Some authorities believe that periodontal disease is really a group of diseases with similar clinical profiles but different aetiologies and clinical courses. (Burt et al 1984)

4.5.1 Community Measures

Unfortunately there is no equivalent to water fluoridation, or other community-based uses of fluorides, to prevent periodontal disease. The only preventive measure for periodontal disease, apart from limited use of antiseptic solutions, is regular and thorough removal of plaque. Plaque removal can be carried out by dental professionals to some extent, but ultimately the prevention of periodontal disease largely depends on preventive action by the individual.

Efforts to induce the public to practise affective oral hygiene procedures are frequently made through oral health education campaigns. The outcome of mass oral health education efforts is difficult to evaluate, but their impact is usually thought to be limited. They may be more effective if aimed at specific groups, such as pregnant woman and obstetricians and nurses who provide their prenatal care. Certainly there is not good evidence to support mass oral health education intended to change individual behaviour. (Frazier 1978)

Community-based diet and nutrition policies are unlikely to affect periodontal disease. Epidemiological surveys in Asia and South America lead to the conclusion that, although periodontal disease tends to be more severe in populations with nutritional deficiencies, there is no correlation between individual mouth condition and nutritional status. (Russell 1969)

Although improved nutrition might lead to some improvement of periodontal health in less developed countries where malnutrition is prevalent, there is no scope for expecting a corresponding change in developed countries. (Pennel et al 1977)

What then remains for prevention of periodontal disease are the various individual self-care measures for plaque control.

4.5.2 Individual Based Measures

Mechanical plaque removal by the individual

Self care by the individual is essential to periodontal health. Unless the individual is able to maintain a reasonable level of oral cleanliness by regular and consistent home care, the benefits of any treatment by dental professionals will be limited (Sheiham 1977). Individual efforts mean mechanical plaque removal with a toothbrush and aids like dental floss, an interproximal brush or wood points. Natural self-cleaning mechanisms are inadequate to remove plaque (Löe 1979) and the value of the 'chewing stick' used in some cultures for oral hygiene is limited.

Research (Lang et al 1973, Kelner et al 1973) indicates that a thorough oral cleansing should be carried out by individuals at 24-48 hour intervals. Given the time taken for plaque to mature, the advice to brush after every meal seems unnecessary. Thorough cleaning at 24 hour intervals appears to be the best regimen for dentists and hygienists to recommend for their patients.

Research (Horowitz 1980) suggests that the type of toothbrush used is unimportant. Children clearly should use a smaller brush than adults, and the dentist and hygienist may want to recommend different sizes and degrees of softness depending on each patient's manual dexterity, enthusiasm and oral health. But these recommendations are based on common sense rather than firm evidence.

The comparative effectiveness of manual and power-driven toothbrushes has been relatively well studied. It appears that both are effective if used properly (Federation Dentaire Internationale 1983). Power brushes may be particularly useful for handicapped persons or others with limited manual dexterity.

The mechanical method is the most reliable method of controlling and preventing bacterial plaque and other deposits. The toothbrush is the fundamental tool for this purpose. It has been shown that careful toothbrushing can keep the teeth free from plaque and maintain gingival health (Löe et al 1965). Conversely, if normal toothbrushing is discontinued, plaque develops on the tooth within a few hours, and the previously healthy gingivae shows clinical signs of inflammation within 7-12 days (Theilade et al 1966).

Hence, during health talks this important point should be stressed to the community.

Toothbrushing methods

Many toothbrushing methods have been described; proponents of one method or another have been vehement in their defence of these methods. However research indicates that there appears to be little difference between these methods in their ability to remove dental plaque (Schmid et al 1976). The scrub method emerges as the simplest method available and that is no less effective than any other; it requires minimal manual dexterity and patient concentration. For some individuals receiving treatment for advanced disease, more elaborate methods may be needed, always assuming the patient is able to manage them.

Various techniques of toothbrushing have been advocated. These include: the Bass technique of circular brushing; modified Bass technique, which consists of sweeping the bristles downward over tooth surfaces occlusally after completing the vibratory motion in the gingival sulcus. The roll technique seems to be the least effective method (Carranza et al 1984). However, no one method of toothbrushing is adequate to meet the needs of the patients according to Pawlak. She says the thoroughness of the removal of deposits is more important than the technique. (Pawlak et al 1980)

Toothbrushing, is practised by many people. An investigation carried out in Scandinavia of persons age 19-50 years, found that approximately 80 per cent of the females and 70 per cent of the males (except the Finns: 35 per cent) brushed their teeth twice a day or more, the rest brushed once a day or less (Helöe et al 1979). The proportion of the toothbrushing by young persons aged 5-22 in another study was found to be only 25-67 per cent. (Rugg-Gunn & MacGregor 1978)

Studies by Gjermo and Flotra (1970), Ableson et al (1981) and Lobene (1982) reveal that dental floss was effective in removing plaque from interproximal surfaces and substantially improved gingival health.

Floss probably helps many individuals to remove plaque from hard-to-clean contact areas. For cleaning in narrow gingival embrasures that are occupied by intact papillae and bordered by tight contact zones, dental floss is probably the most effective dental hygiene aid. Therefore aids to the efficiency of cleaning such as dental floss, often need to be recommended.

Mechanical plaque removal by professionals

Spectacular success at preventing gingivitis and caries in children has been reported by the Axelsson-Lindhe group in their studies at Karlstad, Sweden (Axelsson & Lindhe 1974). In their studies, children, aged 7-14 were provided intensive prophylactic procedures every 2 weeks over a 2-year period. In the third year, the time between these 'professional cleanings', as the authors refer to them, was increased to 4 weeks for the 7-11 year olds, and to 8 weeks for the 13-14 year olds. The continuing good results with this reduction frequency of cleaning were attributed to the background effects of the first 2 year (Axelsson et al 1975). The authors are firm in their belief that professional cleaning five-eight times per year are not enough to control gingivitis.

In Axelsson and Lindhe's study with adults in Karlstad (1978-1981), the professional cleaning was carried out every 2 months for the first 2 years, and every 3 months for the remaining 4 years. In line with the philosophy of the Karlstad researchers, intensive oral hygiene instruction for home care accompanied the professional cleaning.

The greatest benefits will be achieved in persons whose oral hygiene is best to begin with, and least success is achieved among those with initially poor hygiene.

In the United States, a 3-year study by Suomi et al (1969) showed that a prophylaxis plus oral hygiene instruction every 2-4 months lowered the level of plaque and gingivitis relative to a control group, and slowed the rate of loss of gingival attachment.

Treatment of established periodontal disease requires similar philosophies and treatment procedures as does prevention. Professional prophylaxis must include repair of defective restorations, especially gingival overhangs. Success in achieving gingival reattachment has resulted following curettage and professional cleaning at regular intervals (with or without prior surgery), accompanied by good self care. (Knowles et al 1979)

Professional plus personal care

While professional plaque removal has an important role in the prevention and control of periodontal disease, the best results have been obtained when scrupulous levels of home care were also practised by the individual.

The traditional annual prophylaxis appears inadequate to prevent loss of gingival attachment in most patient, especially those in middle-to-later years, though the optimum frequency of prophylaxis in such patient with excellent oral hygiene is variable.

Prophylaxis at 2-4 month intervals, combined with a high level of daily individual oral hygiene practiced at home, will maintain periodontal health in most periodontally healthy adults. In other words, these procedures are sufficient to prevent destructive periodontal disease leading to tooth loss.

Many persons, however, are unable to meet the necessary standards for home care for a variety of reasons. In such cases, dental professionals should probably consider carrying out the professional plaque-removal procedures more frequently. Regular professional plaque removal can be an expensive method of maintaining oral health (Burt & Warner 1981), however, the patient's own capabilities for self care should be developed to the highest degree.

Chemotherapeutics

Commercial mouthwashes for breath-sweetening do not remove plaque and thus are ineffective in preventing periodontal disease. But chlorhexidine gluconate, used as a mouthrinse (10 ml, 0.2% once or twice daily), a topical application (1.0-2.0% used daily), or in a dentifrice (0.4-1.0%) has been successful in reducing supragingival plaque in a number of studies (Löe 1973, Ainamo 1977). Alexidine dihydrochloride mouthrinse (10-15 ml, 0.035-0.05%) has given similar results, although the effectiveness of both compounds is not unqualified.

Löe and Schiott reported that two daily rinses with 0.2 per cent chlorhexidine gluconate inhibited the formation of supragingival plaque and the development of gingivitis (Löe & Schiott 1970).

Staining of teeth and restorations is a persistent problem. Results of long-term studies confirmed the reservations about the routine use of chlorhexidine.

(Johnsen et al 1975, Löe et al 1976)

Chlorhexidine is used in Europe as an antiseptic rinse before oral surgery, to facilitate plaque control up to 3-4 weeks after periodontal surgery, and as an oral hygiene aid for patients with immobilised jaws recovering from fractures (Ainamo 1977). This limited and selective application relegates chlorhexidine to a role as a useful adjunct to mechanical cleansing in those countries where it is available.

Wennstrom (1982) studied the effect of a new anti-plaque agent CK-0569-A on fourteen dental students using mouth rinses. His results demonstrated that CK-0569-A prevented the colonisation of motile + curved rods and spirochaetes in developing plaque. Furthermore, the agent significantly reduced dental plaque and retarded the development of gingivitis. (Wennstrom 1982)

5 TARGET GROUPS AND ORAL HEALTH

5.1 SCHOOLCHILDREN

Many school systems throughout the world have incorporated oral health education as part of the school curriculum because of the rationale that "*prevention is the key to controlling dental disease*" and that knowledge and dental health practices can be instilled from a younger age (Roder & Bart 1978). It is felt that the school environment is a logical place to teach oral health education and practices, as they are directed to different age groups of children and corresponding variations in learning abilities.

Haefner (1967) states that for long range gain the school setting offers a great potential for effective oral health education as it provides excellent opportunity for communication with virtually all persons within the entire school age group.

Studies by Jordan and Pugner (1967) and Bratthal (1967) have indicated that exposing children to, and increasing their knowledge of, oral health may be sufficient to motivate them to practise desirable habits and that constant reinforcement in as many different ways as possible is essential to develop good oral hygiene. The continuing educational influence can be exerted on this target audience over a considerable time period. Young and Striffler (1969) indicated that the process can begin at an early age when habit patterns are still in the process of being formed, rather than being firmly established and resistant to change, as they are in adults.

In a school setting both mass communication and a face to face approach can be used on the same audience. Individualising instructions to meet the needs and problems of individuals can serve as a powerful motivating force.

Rosenstock (1962) contends that health education should not merely be didactic and the cooperation of parents of children and the school system is actively required.

5.1.1 School Water Fluoridation

One effective way to provide children who live in areas without public water supplies with the benefits of fluoride, is to fluoridate their school water supplies. Rural schools usually have private wells, and water from these wells can easily be fluoridated.

Researchers in the late 1950s reasoned that part-time consumption of fluoridated water only on school days would prevent some dental decay, even if consumption did not begin until age five or six. Higher than optimal fluoride concentrations for community fluoridation were suggested for school fluoridation to compensate for the belated, part-time exposure.

Studies and programmes of school water fluoridation have been carried out only in the United States. After 12 years of school fluoridation at 5.0 ppm (four times the optimum level recommended for community fluoridation in the same geographic area) children at a school in Pennsylvania developed 40 per cent fewer DMF surfaces than their baseline counterparts (Horowitz et al 1972). The findings showed a differential effectiveness according to time of tooth eruption; earlier erupting teeth (incisors and molars) that were already in place when the children began to attend school had 31 per cent fewer DMF surfaces, whereas surface of later erupting teeth (canines, pre-molars and molars) that received both topical and systemic exposure to the fluoridated water in school developed 57 per cent fewer DMF surfaces. The rate of extractions per 100 teeth decreased by 65 per cent during the 12 year period of the study.

At fluoride concentrations of 4.5 times the optimum recommended for community fluoridation, school water fluoridation has produce significant caries reduction without dental fluorosis (Horowitz 1973). It seems that school water fluoridation has only been implemented in the United States. It has been estimated that in June 1981, 450 schools with 185,000 children were utilising school water fluoridation systems (Horowitz 1981).

5.1.2 Self Applied Fluorides

Fluoride Mouthrinsing

Mouthrinsing with fluoride solutions is a feasible and effective method for the prevention of dental caries in schoolchildren (American Dental Association 1975). The findings of more than 30 studies in several countries indicate that the incidence of dental decay can be reduced by about 35 per cent when this procedure is used daily, weekly or fortnightly. In most of these studies, children have rinsed either daily with 0.05 per cent sodium fluoride or weekly with 0.2 per cent sodium fluoride.

Mouthrinsing is usually supervised in classrooms by teachers, teacher's assistants, health assistants or trained volunteers.

The recommended regimen varies slightly in different countries; generally students rinse for one to two minutes with 7-10 ml of fluoride mouthrinsing solution. Younger children can usually manage only 5 ml of solution. Mouthrinsing by children younger than school age is contraindicated because many of them cannot control their swallowing.

Some advantage of weekly mouthrinsing with fluoride as a school-based caries preventive programme are:

1. Established effectiveness (consistently positive findings);
2. Little time is required (about 5 minutes per week for weekly mouthrinsing);
3. The technique is easy for school-age children to learn;
4. It is inexpensive- all needed materials(in the United States) currently cost about 80 cents US per child per year;
5. Non- dental personnel with minimal training are able to supervise the procedure;
6. Participants generally accept the procedure well.

(Horowitz 1980).

With respect to costs, locally-produced materials may cost more than 80 cent per child per year in some countries.

A few studies (Radike et al 1973, Driscoll et al 1981) show that mouthrinsing with fluoride is also effective in children who reside in fluoride communities. Because the procedure is so inexpensive, fluoride mouthrinse is also cost-effective in these communities.

Because there is no evidence of notably greater effectiveness from the daily procedure and because daily rinsing makes greater demands on participants and supervisory personnel, a weekly programme of mouthrinsing with 0.2 per cent sodium fluoride is recommended as the preferred school-based procedure. Daily rinsing with 0.05 per cent sodium fluoride is recommended for individual self-care as a procedure which fits in better with an individual's daily routine. (Burt et al 1984)

Fluoride tablets

In communities where the drinking water is deficient in fluoride, daily ingestion of dietary fluoride supplements from shortly after birth until at least age 13 can provide protection against dental caries of approximately the same magnitude as derived from the consumption of fluoridated water, that is about a 50-60 per cent lower prevalence of dental caries (Thylstrup et al 1979). There is some variation in the dosage schedule recommended in different countries for dietary fluoride supplements. This variation reflects different opinions of authorities rather than different needs.

The regimen in the United States as shown in **Table 4** is that recommended by the American Dental Association's Council on Dental Therapeutics (1979) and the American Academy of Paediatrics (1979).

Table 4
Dosage level of supplemental fluoride recommended in the U.S.A.
Source: American Academy of Paediatrics (1979)

Adjusted allowance in total mg of fluoride per day
for three range of concentration of fluoride in water (ppm)

Age	<0.3 ppm	0.3-0.7 ppm	>0.7 ppm
0- 2 years	0.25 mg	0	0
2- 3 years	0.50 mg	0.25 mg	0
3-13 years	1.00 mg	0.50 mg	0

Studies have shown that few parents and children follow the consistent daily regimen necessary for maximal caries prevention with dietary fluoride supplements (Newbrun 1980). Therefore, supplying fluoride tablets for children's use at home is not as affective a public health method as community water fluoridation, though private practitioners may prescribe their home use for selected, motivated patients.

Several studies have shown, however, that dental caries can be reduce by approximately 30-35 per cent when children ingest fluoride tablets under supervision in a school-based programme and not from birth. (Driscoll 1974, Binder et al 1978)

Fluoride tablets confer systemic benefits to unerupted developing teeth as well as topical benefits to erupted teeth. Because fluoride tablets are ingested, they should be used only in areas where fluoride in drinking water is deficient.

Supervised brushing with fluoride solution, gels and pastes

Researchers (Bibby 1966, Barenie et al 1973) suggested that brushing and flossing per se, without the use of a therapeutic dentifrice, solution, paste or gel, is not an effective means of preventing caries. Probably the reasons are the inherent inability of the toothbrush to penetrate fissures and interdental areas, a problem made worse by inefficient brushing action. A study by (Horowitz & Heifetz 1975) has been shown that supervised self application of concentrated solution and gels containing fluoride by schoolchildren in Scandinavia, Canada, and the United State (about five times per school year), reduces the increment of dental caries by about 25 per cent. However, the cost-effectiveness of this method compares unfavourably with weekly mouthrinsing with dilute fluoride solutions.

Most studies of programmes of toothbrushing with fluoride containing prophylaxis pastes involved the use of 9.0 per cent stannous fluoride with a zirconium silicate abrasive. The recommended frequency of application is one to three times a year and large numbers of children may apply the paste at one time. (Heifetz 1979)

Children generally dislike the astringent taste of stannous fluoride paste, and consequently compliance has not been good. As with brushing with solution and gel, claims of educational and instructional value for this method have not been substantiated. This method of caries prevention cannot be recommended. (Burt 1984)

5.1.3 Professional Methods

Topical application of fluorides

There are many studies to show that professionally applied topical applications of solutions of 2.0 per cent sodium fluoride (NaF), 8.0 per cent stannous fluoride (SnF_2) and acidulated phosphate fluoride (APF, 1.2 per cent fluoride ion in 0.1 M phosphoric acid either in a solution or gel) can reduce the incidence of dental caries. Children in areas with insufficient fluoride in their water supplies have been shown to develop 30-40 per cent less decay when these agents are applied semi-annually. (Horowitz & Heifetz 1975)

Applications of APF or SnF_2 solutions are recommended at least annually for public health programmes, though better results have been achieved with 6-month applications (Horowitz 1973). APF is frequently preferred because it does not discolour decalcified enamel, has an acceptable taste and is stable when kept in a plastic container. APF in gel form also has the advantage that application time can be reduced by making whole-month applications with flexible pre-formed trays. (Ripa 1981)

Professionally applied topical fluorides in public health programmes in fluoridated areas, are usually not considered justified on cost-effectiveness grounds. Even in non fluoridated areas, professionally applied topical applications are an expensive way to provide the dental benefit of fluoride in public programmes when compared to water fluoridation or self-administration by mouth rinsing (Corpron 1979). Professionally applied topical fluorides may, however, be more appropriate for special groups such as the mentally retarded and physically handicapped.

In the private dental office, professionally applied topical fluorides are relatively expensive, though suitable for use with selected patients. (Burt et al 1984)

Pit and Fissure Sealants

The pits and fissures of occlusal surfaces are the tooth sites where caries most commonly begins (Graves & Burt 1975). They are also the sites which benefit least from fluoride.

Fissure sealants are materials which are designed to prevent pit and fissure caries. Fissure sealing is a very conservative way of tackling the problem of occlusal caries, and involves a minimum of pre operative treatment, usually no more than polishing the teeth in order to remove plaque and food debris. There is now considerable evidence that fissure sealants substantially reduce the incidence of occlusal caries. Most trials 2 years after application demonstrate reductions in occlusal caries greater than 70 per cent (Ripa 1980).

Some sealants require ultraviolet light to induce polymerisation, while others rely on a chemical polymerising system. Acid etching of the enamel surface is necessary to produce satisfactory bonding between enamel and sealant. There are studies which have shown that auxiliary dental personnel, with adequate training, have applied the material as effectively as dentists. (Leske et al 1976)

The consensus is that fissure sealing is expensive, in some instances perhaps more expensive than the alternative of restoring decayed occlusal tooth surfaces, though sealants provide the intangible benefit of preserving intact natural teeth. (Horowitz 1980)

Prophylaxis and plaque removal

Because the bacterial agents causing dental caries are in the dental plaque, caries is theoretically preventable by regular and careful oral hygiene procedures to remove that plaque. Studies show that the professional prophylaxis technique can be applied at 2-weeks intervals to young children by trained dental auxiliaries. In older children, the interval between cleaning was extended to 8 weeks after an initial 2 years at 2-weeks intervals. Reported reductions in caries were remarkably high, up to 98 per cent, and were attributed to plaque removal rather than to fluoride effects. (Axelsson & Lindhe 1974)

The high cost of professional involvement required makes it difficult to recommend the Karlstad procedures for general use as a caries-control measure in either public programmes or the private office. There may be specific patients, however, such as the mentally or physically handicapped, who would benefit from such care.

5.1.4 Self - Applied and Profession Methods

There may be a particular rationale for combining the infrequent use of concentrated fluorides (to achieve deposition of fluoride in enamel and kill bacteria) with fluorides applied often (to remineralise enamel). The use of various topical fluoride has been shown to be effective in fluoridated area, providing benefits beyond those received in fluoridated water alone (Wei 1974). The combined use of fluorides with pit and fissure sealants is another logical combined regimen that may produce added benefits.

Although additive caries protection may occur from multiple preventive regimens, not all combinations are necessarily cost-effective for public health programmes (Wei 1974). However, studies show that mouth rinsing with fluoride solution in fluoridated communities or combination of mouthrinsing, fluoride supplements and use of a fluoride dentifrice in areas with negligible fluoride concentration in drinking water (Horowitz et al 1980) provide highly effective, economical protection to the teeth of children.

Combined fluoride therapies have been successful in controlling rampant caries in patients who have been irradiated during treatment for oral cancer. (Dreizen et al 1977)

Dental practitioners should consider similar approaches with their own patients who are especially caries prone. The benefit of these treatments will be enhanced if the patient practices adequate dietary control.

5.2 PRE-SCHOOL CHILDREN

The principal objective should be to teach and motivate parents and their children to practise oral hygiene so as to prevent the onset of dental disease.

Particular attention should be paid to:

1. Increasing the resistance of the tooth to bacterial invasion by the use of fluoride in one or more of the many forms described above. The parent should be made to understand that dentists advocate a continuous supply of fluoride ions to the teeth of every child from birth to adolescence. It should be explained to parents that the objective is to build fluoride into the enamel structure and thus increase the stability of the enamel and limit acid activity in the plaque. We should also explain that fluoride encourages remineralisation of the enamel where demineralisation has occurred, perhaps best described as an 'ionic see-saw'.
2. Teaching parents plaque control means systematic brushing at least once per day preferably at night. In the very young the parents or teacher must use disclosing tablets and assist with brushing and the use of dental floss.
3. Teaching parents and teachers the importance of avoiding harmful nutritional habits, i.e. they must aim for a minimum intake of fermentable carbohydrate, especially no in between meals snacks, and elimination of the use of comforters.
4. Establishing confidence at a very early age by arranging visits by parents and their young children to the dentist and his team.

The ability of the child to learn depends on the age of development. Health education, therefore, should be planned according to the needs of different stages of age development. (Leatherman 1982)

Dunning (1970) quotes Freud who says that as the child develops, the foundations laid during the primary process can be broadened, particularly when the dentition starts appearing. The child can be conditioned for further acquisition and utilisation of important health preventive information. It is later necessary to maintain a supply of this information throughout life and the individual should continue to absorb and utilise this information.

In Iran the dental nurses should be involved in the pre-school children dental health programme. They should visit kindergarten schools, health clinics and baby care centers periodically.

5.3 PRE-NATAL AND NURSING MOTHERS

After the school children and the pre-school children, the pre-natal mothers and nursing mother should be next priority group for special attention in Iran.

Dunning (1970) says that expectant mothers and nursing mothers are almost always in need of dental health information, and are motivated to make use of it. He says that they have a great influence on growing children and should, therefore, be an important object for oral health education.

Lamb and Ford (1960) state *"A clear cut dental health education program needs to be initiated for the mother during the child's prenatal period as well as for the pre-school and the school- aged children through informed parents...."*. Davies (1967) suggests that a start should be made in antenatal clinics, in consulting rooms and in the home; and that there is a need to get the doctor and family health visitors to include concerns for dental health with the total health of the child.

Various investigations into the relationship between pregnancy and gingival inflammation have, in general, shown that there is increased gingival inflammation in pregnancy with partial resolution during parturition. (Löe & Silness 1963, Cohen et al 1969)

Pre-natal mothers must also be informed of the dangers of using antibiotics such as tetracycline which damage teeth of their children.

Oral contraceptive have been shown to affect the periodontal health of patients (Pankhurst et al 1981). Studies concluded in India by Das et al (1971) indicated that women taking oral contraceptives exhibited more gingival and periodontal disease than comparable groups. The ingestion of hormones contained in the drug is said to have affected the gingival inflammation which ranges from measurable increases in gingival exudate to pregnancy-like gingivitis and tumour. There is also a possibility that hormones increase the inflammatory response of the gingivae to overcome irritants.

Hence, patients should be informed of the effects of oral contraceptives on periodontal tissues and the need to maintain good oral hygiene.

5.4 ADULTS

All elements essential for a school-based fluoride regimen should be included in other organised community programs for adults. Activities should focus on day care centers, retirement centers, work sites, adult education, ambulatory care centers and health fairs.

Although oral health has not been emphasised in such settings as it has in schools, these sites have great potential for implementing fluoride procedures. (Horowitz & Frazier 1980)

Most adult are not informed about the causes and hazards of periodontal disease, and that it can be prevented by maintaining good oral hygiene. This ignorance and unawareness of periodontal disease can be attributed to the fact that in the past very little or even no oral health education activities and facilities were available for the general public. Most oral health education activities were concentrated on school children and other priority groups, so that the general public was neglected and only received treatment. Young (1969) quotes Douglas and Ore who said that if a choice must be made between cleaning time and patient education time, the latter would serve the cause of oral health better.

The objective must be to motivate and encourage the youth within society to accept full personal responsibility for the maintenance of their mouth and teeth by carrying out themselves regular oral hygiene practice, eating proper food, maintaining fluoride therapy and visiting the dentist and his team regularly.

In Iran dental caries and periodontal disease in children and adults are common and not under proper control and there is a high prevalence of dentofacial anomalies requiring early treatment. What is needed in relation to oral hygiene for children and young adults are manpower, materials and oral health education.

There is a need for all children and adults in Iran for:

- a) Increasing the resistance of the teeth by the use of fluoride;
- b) The control of plaque;
- c) Correct nutrition;
- d) Oral health education;
- e) Early recognition of major disorders of the orofacial complex; and
- f) Regular visits to the dentist and his auxiliary help.

5.5 HANDICAPPED PERSONS

Handicapping conditions have been defined as disorders which impair normal social, educational, recreation activities. An individual is considered to be handicapped from a dental viewpoint if he or she is unable to obtain treatment in the ordinary way and requires some special services or skill in the delivery of dental care, or is at risk from the consequences of dental disease or treatment (Scottish Home and Health Department 1984).

Difficulties also exist in defining oral health in special groups. This has led Beck and Hunt (1985) to conclude that categorisation by the diagnosis label of developmental disability may be inappropriate, as it may not be the disability itself that influences dental disease rates, but how profound is the level of the disease. However, very few authors actually categorise their study groups in such a way.

The largest group of disabled children encountered are those with a mental handicap, and it is their dental disease experience which will be discussed first. Problems arise in the dental care of mentally handicapped persons with self-mutilation involving the oral or orofacial tissues; a poor standard of oral hygiene; often exacerbated by a high intake of cariogenic foods; behavioural disturbances, particularly in the case of institutionalised patient; the inability of patient to co-operate sufficiently to allow treatment to be carried out under local anaesthesia; the inability of many patients to manage dentures; and difficulties arising from abnormalities.

In addition, there may also be a medical complication (eg many of the children with Down's syndrome also have cardiac problems and in many handicapped children there is a combination of physical, and mental factors) and the co-operation of consultants in other specialties is required, along with special facilities and skilled and experienced staff to provide an appropriate general anaesthetic service in order to render treatment possible.

As with all handicapped persons, a high standard of oral hygiene and preventive care is paramount. Regular inspections are essential in the case of mentally handicapped persons who are unable to communicate adequately with others, and staff responsible for their care should take all possible steps to ensure that serious dental problems do not arise. Where eating is difficult, because of caries, gum infection, or denture difficulties, an inadequate diet may result in metabolic disturbances. A survey carried out by the Scottish Hospital Advisory service in (1974) comments on cases of undiagnosed pain being ultimately traced to dental origins.

Although clinical prosthetic work with the mentally handicapped can present problems, these may sometimes be overcome by a dentist with special experience in treating such handicapped persons and special expertise in prosthodontics.

Many of the physically handicapped have difficulty in obtaining regular dental care because of problems of transport and access to surgeries. Patients restricted to wheel chairs can sometimes remain in them while receiving dental treatment; in other cases they may be lifted, or manoeuvred, by sliding across a board, onto the dental chair. Once in the dental chair, the treatment may well present no particular dental problems. It is important that physically handicapped persons should not be discouraged from seeking dental care in the community where appropriate.

The more severely handicapped will frequently require specialised treatment facilities. These facilities will also be required for treating mentally handicapped patients.

Difficulties arising in the dental management of handicapped persons vary according to the type and severity of the handicap. Such difficulties include: involuntary movements of lips, tongue and head and the effects of mouth breathing in older children with cerebral palsy; epilepsy; problems relating to posture and mobility; drooling, caused by poor control of the oral tissues and of head posture; and malocclusion, thought to be caused by abnormal muscular behaviour.

Many physical and mental problems affect the elderly. These can cause significant problems in the provision of dental care. Consequently a large number of elderly people have great difficulty in reaching facilities for dental care and treatment and many receive no dental care whatsoever. It is necessary to provide transport and improve the domiciliary treatment system to ensure that these patients are not neglected.

However, it would appear that handicapped children and adults are assuming such numbers that the problem of their care, including their dental care, can no longer be an issue to be side-stepped. Care of the chronically sick and of the handicapped in particular have always been neglected area of the Iran Health Services, with dentistry the poor relation of medicine.

Dentistry at present has relied heavily on demand for its services so that the handicapped population have inevitably lost out. Providing for the dental care of the handicapped requires a two-pronged approach. In the first place, patients, parents and caring staff require, from an early stage, oral health education and active involvement in preventive programmes to reduce the need for treatment. Secondly, an adequate service should be developed to provide a high level of dental care. Prevention of dental disease is a fundamentally important part of dental care of the handicapped.

Handicapped persons require a level of dental care which is at least as comprehensive as that provided to the remainder of the population. Since persons suffering from handicap may have difficulty in making their dental needs known, responsibility for the provision of guidance and care must rest ultimately with the dental profession. It is also essential that those responsible for the care of handicapped persons, especially those resident in long-stay hospitals and local authority homes, appreciate the importance of ensuring a high standard of oral hygiene. To this end, it is recommended that oral health education and preventive programmes, aimed specially at the handicapped and those who care for them, should be instituted.

6 DISCUSSION AND CONCLUSIONS

In most countries the dental profession is a well-organised interest group and has considerable political and economic influence at all levels of society. This influence must be used in a responsible way to advance the goals of the profession in improving oral health.

This thesis suggests that the IRAN government needs to be informed that the battle against oral disease is far from over. Large segments of society, usually the poor and elderly, suffer from substantial oral disease and need professional dental care. Further, to reduce oral disease a large investment in services, education and research will be required.

Organised dentistry also has to raise levels of expectation about what can be achieved through preventive and curative care. A fully dentate population is now in the realm of the possible and government and the general public must be motivated to organise resources towards this goal.

At the patient level, these objectives for oral health challenge individual dentists (and the organised profession) *not to provide care that is of marginal benefit to patients*, unless fully informed patients seek this care. In contrast, large numbers of patients who are infrequent or *non-users of care need to understand that dentistry can assist them in preserving their dentition* and that edentulousness is no longer an inevitable outcome of advanced age.

The objective of all informal and formal health education is *to achieve a level of oral cleanliness* which is compatible with maintaining a functional, aesthetically acceptable natural dentition for all individuals throughout their lives. The aim is to elicit, to facilitate, and to maintain *efficient oral hygiene practices*.

To achieve both the objective and aim, a planned, consistent, integrated series of educational, economic and political strategies should be adopted.

The plan should be based on the following principles:

1. Oral health education should be integrated with general health education. It should be integrated into the activities of teachers, all health workers, community teachers, trade unionists, sports persons and all members of the oral team.
2. A health education programme must incorporate a number of diverse educational approaches because each subpopulation in the community will respond differently to any given approach. Individual instruction, group discussion, behaviour modification, mass media and community organisational methods can be utilised. These educational methods must be cumulative and consistent. There is no best method. A given combination of methods may be effective for some, but not others.
3. The earlier the intervention in the health career of individuals, the more effective is the result. In health careers, various agencies and influences impinge on the developing individuals. *The influence of primary socialisation is paramount.*
4. Community, patient and staff *participation in the planning* of health education programmes should increase the probability of their success.
5. The objectives should be expressed in terms of behavioral outcomes. Each objective should answer the question, '*who is expected to achieve how much of what by when?*' The '*who*' refers to the target groups or individuals expected to change, '*what*' to the actions to be carried out, '*how much*' to the desired reduction of disease and '*when*' to the time by which the reduction is to be achieved.
6. *Evaluation is needed* to assess whether the education programs are achieving their aims, whether they are doing so effectively and efficiently, and whether their planning methods are sound.

Preserving the dentition for life requires the prevention or control of two distinct diseases which tend to occur at two different stages of life; dental caries in childhood and periodontal disease in adulthood. Dental caries can be controlled through water fluoridation, through school-or home-based fluoride rinse and tablet programs, and through less frequent consumption of sugar-rich foods. Periodontal disease can be controlled through effective, personal oral hygiene supplemented by professional prophylaxis.

While this armamentarium is impressive, having methods to prevent and control dental caries is not synonymous with achieving disease reduction. Throughout most of the world, the public's acceptance of measures that preserve the dentition is far from optimal. In general, even in countries with adequate dental manpower, large segments of the population neither practise effective oral hygiene nor seek regular professional prophylaxis. Frequent consumption of sugar-rich foods is a common practice in virtually all developed countries and in many developing ones.

The adoption of specific behaviours by individuals, and communities supports the goal of prevention. Influences on individual oral health behaviour and how communities make decisions to adopt fluoride programmes and other preventive dental measures have been discussed. Broadly speaking, it is difficult to draw specific conclusions about how best to promote adoption of the recommended behaviours and programmes.

Dentistry is moving toward a preventive orientation in many countries. Such a trend is to be encouraged everywhere, even where dentists feel themselves overwhelmed by the need to treat existing disease, because the global problems of oral disease will never be adequately controlled by reparative treatment alone. In addition, current methods available for prevention of oral disease are both simple and effective.

Even if it is utopian to think in term of preventing all oral disease, current methods of prevention and control are effective enough to prevent wide-scale loss of teeth.

The application of preventive procedures in IRAN presents problems, but much is still possible. Periodontal disease remain severe in Iran and caries prevalence is high in many of the cities. Financial and personnel resources to treat existing disease are seriously deficient. However it is possible to train personnel to carry out the straight-forward procedures required for prevention of caries and periodontal disease.

The first step is for the government to be made aware of the importance of oral health, so that resources appropriate to the country's situation can then be allocated for the prevention of oral disease. While Iran has more pressing basic public health needs, such as provision of reliable food, safe drinking water and public sanitation, *the prevention of oral disease has its place in the priorities of health*. The dental professional, has an important role to play in the education of public authorities in the country.

Education of the general public, and of individual patients, to develop sound oral health practices is of fundamental importance. There should be an education component of all preventive procedures, both at the community level and for the individual patient. Considerable public education is required to achieve acceptance of water fluoridation, school-based prevention programmes and the use of non-cariogenic sweeteners.

Motivation in some individuals may be enhanced by the encouragement of a dentist or hygienist to the extent where these patients can prevent further oral disease largely by their own effects. Continued behavioural science research is still needed, however, to make dentistry's education activities more productive.

The government may determine which procedures can, or cannot, be used. The following procedures for the prevention of caries and periodontal disease are recommended.

1. ***Fluoridation of community water supplies*** is the most effective action which can be taken to prevent dental caries in the community. Fluoridation will reduce, cheaply and safely, the prevalence of caries to a substantial degree, regardless of motivational levels or whether a dentist is visited or not.
2. Where water fluoridation is not feasible, community-based alternatives are ***salt fluoridation, school-water fluoridation, or supervised ingestion of fluoride supplements***.
3. ***Supervised mouthrinsing with fluoride solution***, preferably as a school-based procedure, is effective in fluoridated and non-fluoridated areas. Where appropriate, *fluoride solutions, gels and varnishes* can be applied to individual patients by dentists or auxiliaries in accordance with the legal requirements of the country.

4. The ***use of fluoride-containing dentifrices*** is recommended as a routine part of self care. Because toothbrushing is a standard practice in many parts of the world, its use with fluoride dentifrices brings the benefits of fluoride to a great many people.

5. Approval of community preventive measures requires both the prior ***education of the appropriate public authorities*** and the continuous reinforcement of this educative message. Because all community leaders are dental patients at some time, the dental office can be used for the necessary education of community leaders.

Compliance by the individual patient with preventive regimens can be expected only when the patient understands the reason for them. *Education of individual patients should concentrate on developing home-care procedures in oral hygiene, appropriate use of fluoride tablets, rinses and dentifrices, restricting the frequency of eating sugary snacks between meals, and the necessity for regular dental visits.*

Not all persons will respond equally to education stimuli. Oral health education of the public should be directed to *special target groups*, such as schoolchildren, expectant mothers and teenagers, in order to concentrate resources and allow specificity of the information provided.

Yet another facet of education is the provision of *up-to-date information on prevention for dentists and auxiliaries.*

6. Because dental caries is a public-health problem in Iran, public policy for ***control of the availability of highly cariogenic foods*** should be considered. The adoption of safe and acceptable non-cariogenic substitutes for cariogenic sugar is to be encouraged.

7. ***Fissure sealants*** are highly effective in preventing caries in occlusal surfaces. Their use is recommended on newly erupted teeth in susceptible patients, and they may be of particular value in handicapped persons.

Trained operators and modern dental office equipment are required to apply fissure sealants, factors which may restrict their use in public health programmes where resources are limited.

8. ***Regular prophylaxis*** (plaque removal) by dental professionals two to four times per year, is necessary to control periodontal disease in many adults. The ability of the individual patient to control plaque by personal methods such as *toothbrushing and flossing*, however, must still be developed to the utmost as the first step in *controlling periodontal disease*. Public-health programmes of regular plaque removal in children are of doubtful cost-effectiveness, although they can be appropriate for special groups such as institutionalised children.

9. Recall procedures are recommended to encourage *regular dental visits*. They should be used for administration of preventive procedures, measurement of oral hygiene status and existing disease, and further instruction and encouragement in self-care procedures. The time period between periodic recall visits should be based on each individual patient's needs rather than be standardised.

Successful prevention of caries and periodontal disease for patients, or for the community, requires perseverance and dedication. The eventual benefits, however, are seen in the improved oral health of the society and thus an improved quality of life. The dental profession has the means to lead the public it serves toward that desirable goal.

Oral health education at all ages is complementary to, and forms a vital part of, all oral hygiene practices. In relation to children this means that members of the dental team, particularly the dental auxiliary and the health educator have the major role in educating parents (especially mothers), teachers, doctors and nurses, and the children themselves.

Oral health can be improved by moving societal norms as well as individual and professional beliefs and actions into the preventive orientation. The goals at the professional, individual and community levels are simple to identify but hard to achieve. Iran may have its specific activities planned for prevention of oral diseases, but the following might serve as examples of priorities.

Priorities for dentists

1. Ensure the transmission of up-to-date information on aetiology, prevention, diagnosis and care of oral diseases to dentists.
2. Improve interest of the general dentist in oral diseases.
3. Improve motivation of the general dentist to provide patient support for preventive and therapeutic services.
4. Improve skills of the general dentists in diagnosis, oral hygiene, education and prevention.
5. Improve the oral disease treatment provided by the general dentists, his referral system, and patient approach.

Priorities for patients and the public

1. Teach patients basic knowledge about oral structures.
2. Teach patients to recognise signs and symptoms of oral diseases.
3. Train patients to develop habits that encourage the maintenance of a clean mouth.
4. Improve public awareness and knowledge of causes and care for oral diseases.
5. Develop messages and routes to train the public (non-patient) in identification of signs and symptoms of oral diseases.
6. Use health promotion and educational strategies, combining public and private efforts, to achieve these changes at the individual, professional and community/environmental level.

Priorities for improving the community environment

1. Ensure the availability of, and access to, appropriately trained dental professionals.
2. Ensure the availability of a variety of appropriate, good quality, easy-to-use oral hygiene aids in the market place.
3. Improve the availability of opportunities to clean the oral structures after eating at school, worksites, recreational centres, and other community centers.
4. Understand, and work to improve, the positive involvement of appropriate support groups for prevention and oral health education.
5. Understand and improve existing lifestyles conducive to good oral health behaviour.

As preventive modalities change, the priorities that have been outlined may become more directed towards the promotion of oral health rather than prevention of oral disease.

7 REFERENCES

- ABLESON DC, BARTON E, MAIETTE M, COWH ERD (1981).
Evaluation of interproximal cleansing by two types of dental floss.
J Clin Prev Dent 3:19-21.
- AGRAS WS, OLIVEAU DC (1969).
The epidemiology of common fears and phobias.
Comprehensive Psychiatry 10:151.
- AINAMO J (1977).
Control of plaque by chemical agents.
J Clin Periodontol 4:23.
- AMERICAN ACADEMY OF PEDIATRICS (1979).
Supplementation: revised dosage schedule.
Pediatrics 63:150.
- AMERICAN DENTAL ASSOCIATION, COUNCIL ON DENTAL THERAPEUTICS (1975).
Council classifies fluoride mouthrinses.
J Am Dent Assoc. 91:1250.
- AMERICAN DENTAL ASSOCIATION, COUNCIL ON DENTAL THERAPEUTICS (1979).
Accepted dental therapeutics. 38th ed.
Chicago: American Dental Association. p.321.
- ANDREASEN JO, RAVN JJ (1972).
Epidemiology of traumatic dental injuries to primary and permanent teeth in a Danish population sample.
Cited by: Andreasen JO, Pindborg JJ, Hjorting-Hansen E. Oral health care: more than caries and periodontal disease. Int Dent J 1986;36:207-214.
- ANDREASEN JO, PINDBORG JJ, HJORTING-HANSEN E (1986).
Oral health care: more than caries and periodontal disease. A survey of epidemiological studies on oral disease.
Int Dent J 36:207-214.
- ARTHUR C (1979).
Update: FTC hearing on Kidvid ad ban.
Nutr Action 6:8.
- ASHLEY FP (1989).
Role of dentist health education in preventive dentistry. p406.
In: Murray JJ. The prevention of dental disease. 2nd ed.
New York: Oxford University Press.
- AXELSSON P, LINDHE J (1974).
The effect of a preventive programme on dental plaque, gingivitis and caries in school children. Results after one and two years.
J Clin Periodontol 1:125.
- AXELSSON P, LINDHE J (1975).
Effect of fluoride on gingivitis and dental caries in a preventive programme based on plaque control.
Community Dent Oral Epidemiol 3:156.

AXELSSON P, LINDHE J (1981).

Effect of controlled oral hygiene procedures on caries and periodontal disease in adults.
J Clin Periodontol 8:239-248.

BARENIE J, RIPA LW, LESKE G (1973).

The relationship of frequency of toothbrushing, oral hygiene, gingival health and caries experience in school children.
J Public Health Dent 33:160-171.

BARIC L, BLINKHORN AS, MacARTHUR C (1974).

A health education approach of nutrition and dental health education.
Health Educ J 33:79.

BARMES DE, BAILEY KY (1972).

Dental health services and manpower. First regional workshop on dental health services.
Manila: WHO Regional Office for the Western Pacific.

BAROCAS R, KAROLY P (1972).

Effects of physical appearance on social responsiveness.
Psychol Rep 31:495.

BECK JD, HUNT RJ (1985).

Oral health status in the United States: problems of special patients.
J Dent Educ 49:407-426.

BELL CE, LASSATER TM, SAWYER JF et al (1973).

Communicating dental hygiene practices to chronically, emotionally ill, hospitalized patients.
Am J Public Health 63:778.

BELLEMER M (1981).

La population face a la fluoration. Union Medical du Canada tome 110.
In: FDI/WHO Conference on Fluorides. ORH/F.CONF/82.10. Vienna, Austria.

BENSAID N (1981).

La Lumiere Medicale. Paris: Editions du Seuil.

Cited by: Kellermann MR. What are the psychosocial factors involved in motivating individuals to retain their teeth? Int Dent J 1984 34:105-109.

BIBBY BG (1966).

Do we tell the truth about preventing caries?
J Dent Child 33:269.

BIBBY BG ed (1970).

Role of human food stuffs in caries: proceedings of a workshop conference.
J Dent Res 49 (Suppl 1):1191-1199.

BIBBY BG (1975).

Cariogenicity and caries prediction.

In: Bibby BG, Shern XX eds. Proceedings. Methods of caries prediction.
Microbial Abstr 65 (Spec Suppl):65.

BINDER K, DRISCOLL WS, SCHUTZMANNSKY G (1978).

Caries preventive fluoride tablet programmes.
Caries Res 12 (Suppl 1):22.

- BIRD WF, HAZEL DR (1976).
Parental dental health education: Non-effect on oral hygiene among American Indian pre-school (Headstart) children.
J Prev Dent 3:5.
- BLINKHORN AS (1978).
Influence of social norms on toothbrushing behaviour of preschool children.
Community Dent Oral Epidemiol 6:222-226.
- BLINKHORN AS (1981).
Dental health education. p274.
In: Slack GL. Dental public health. 2nd ed. Bristol: John Wright.
- BLINKHORN AS, VERITY JM (1979).
Assessment of the readability of dental health education literature.
Community Dent Oral Epidemiol 7:195-198.
- BRATTHAL D (1967).
Programmed self instructions on oral hygiene.
J Periodont Res 2:207-214.
- BRODY JE (1980).
We are what we eat, but only some of us.
New York Times, 10 February, Section 4 10E.
- BROWN HK, POPLOVE M (1965).
Brantfort-Sarnia-Stratford fluoridation caries study: final survey.
J Can Dent Assoc 31:505.
- BURT BA (1978).
Influences for change in the dental health status of population: an historical perspective.
J Public Health Dent 38:272-288.
- BURT BA (1979).
The relative efficiency of methods of caries prevention in dental public health.
Ann Arbor, Michigan: University of Michigan. p14.
- BURT BA, EKLUND SA (1981).
Sugar consumption and dental caries: Some epidemiological patterns in the United States.
In: Hefferen JJ, Ayer WA, Koehler HM eds. Foods, nutrition and dental health; Fourth Annual Conference, Park Forest South, Ill. Patho-tox 3:171-180.
- BURT BA, WARNER KE (1981).
Prevention of oral disease; its potential for containing the cost of dental care.
In: Kudrle RT, Meskin LH eds. Opportunities for cost-containment in dentistry.
Minneapolis: University of Minnesota Press.
- BURT BA, HAUGE JORDEN, HEIN W et al (1984).
The prevention of dental caries and periodontal disease.
Federation Dentaire Internationale. Technical Report No.20.
Int Dent J 34:141-158.
- CARRANZA FA, ODONT JR (1984).
Clinical periodontology. 6th ed.
Philadelphia-London: Saunders. p675.

- CARTWRIGHT D (1949).
Some principles of mass persuasion; selected findings of research on the sale of United States War Bonds.
Human Relations 2:253.
- CHAMBERS DW (1977).
Patient susceptibility limits to the effectiveness of preventive oral health education.
J Am Dent Assoc 95:1159-1163.
- CHARLTON A (1981).
Health education related to the teacher's role.
Int J Health Education XXIV:
- COHEN DW, FRIEDMAN L, SHAPIRO J, RYLE EC (1969).
A longitudinal investigation of the periodontal changes during pregnancy.
J Periodontol 40:563-570.
- CONGER JJ (1976).
Current issues in adolescent development.
APA JSAS Catalogue of Selected Documents in Psychology 6:94 (MS 1334).
- CORPRON RE (1979).
Reaction to Dr Heifetz' paper. p105-109.
In: Burt BA ed. The relative efficiency of methods of caries prevention in dental public health. Ann Arbor, Michigan: University of Michigan.
- CRAFT M (1984).
Dental health education and periodontal disease: Health policies, disease trends, target groups and strategies.
In: Frandsen A ed. Public health aspects of periodontal disease.
Chicago: Quintessence. p149-160.
- DANSK TANDLAEGEFØRENINGS SUKKERUDVALG (1979).
Sukker-Sukkersubstitutter og sodemidler.
Mimeograph. p30.
- DAS AK, BHAWRNICKS, DUTTA A (1971).
Oral contraceptives and periodontal disease, prevalence and severity.
J Indian Dent Assoc 43:155-159.
- DAVIES HC (1967).
A creative approach to teaching dental care.
Dental Health 6:3.
- DAVIS P (1980).
The social context of dentistry.
London: Croom Helm.
- DREIZEN S, BROWN LR, DALY TE, ET AL (1977).
Prevention of xerostomia-related dental caries in irradiated dental patients.
J Dent Res 56:99-104.
- DRISCOLL WS (1974).
The use of fluoride tablets for the prevention of dental caries. p25-93.
In: Forrester DJ, Schulz EM Jr eds. International workshop on fluorides and dental caries reductions. Baltimore: University of Maryland.

- DRISCOLL WS, HOROWITZ HS (1979).
Dosage recommendation for dietary fluoride supplements.
Am J Dis Child 133:683-684.
- DRISCOLL WS, SWANGO RA, HOROWITZ AM (1981).
Caries preventive effects of daily and weekly fluoride mouthrinsing in an optimally fluoridated community: findings after 18 months.
J Pediatr Dent 3:316.
- DUNNING JM (1970).
Principles of dental public health. 2nd ed.
Cambridge: Harvard University Press. p356.
- DUNNING JM (1979).
Principles of dental public health. 3rd ed.
Cambridge: Harvard University Press.
- ELDERTON RJ (1981).
Dental ancillaries. p208.
In: Slack GL. Dental public health. An introduction to community dental health. 2nd ed.
Bristol: Wright.
- ELKIND D (1978).
Understanding the young adolescent.
Adolescence 13:127.
- ERICSSON Y (1977).
Cariostatic mechanisms of fluorides: Clinical observations.
Caries Res 11 (Suppl 1):2.
- EVANS RI, ROZELLE RM, LASATER TM (1970).
Fear arousal, persuasion, and actual versus implied behavioural change: New perspective utilizing a real-life dental hygiene program.
J Pers Soc Psychol 16:220.
- EWART NP, HARVEY PM, NEILS R (1983).
The prevention and management of periodontal disease.
NZ Dent J 79:49.
- FDI (1967).
Guideline for developing dental health education programmes - 1967 Paris.
In: Policy statements of the Federation Dentaire Internationale, 1952-1969.
London: Federation Dentaire Internationale.
- FEDERATION DENTAIRE INTERNATIONALE (1983).
Commission on Oral Health, Research and Epidemiology.
Final report on the prevention of dental caries and periodontal disease. Tokyo.
London: Federation Dentaire Internationale.
- FLAY BR, DITECCO D, SCHLEGEL RP (1980).
Mass media in health promotion: an analysis using an extended information-processing model.
Health Educ Q 7:127.
- FRANDSEN A (1985).
Changing patterns of attitudes and oral health behaviour.
Int Dent J 35:284-290.

- FRAZIER PJ (1978).
A new look at dental health education in community programs.
Dent Hygiene 52:179.
- FRAZIER JP (1980).
School based instruction for improving oral health: Closing the knowledge gap.
Int Dent J 30:257-268.
- FRENCH J (1985).
To educate or promote health?
Health Educ J. 44:115-16.
- GARCIA-GODOY F, SANCHEZ R, SANCHEZ JR (1981).
Traumatic dental injuries in a sample of Dominican schoolchildren.
Community Dent Oral Epidemiol 9:193-194.
- GJERMO P, FLOTRA L (1970).
The effects of different methods of interdental cleansing.
J Periodont Res 5:230-236.
- GOCHMAN DS (1973).
A context for dental health education.
Int J Health Educ 16:37-41.
- GRAVES RC, BURT BA (1975).
The pattern of the carious attack in children as a consideration in the use of fissure sealants.
J Prev Dent 2:28.
- GREEN LW (1978).
Determining the impact and effectiveness of health education as it relates to federal policy.
Health Educ Monogr 6 (Suppl 1):28.
- GUSTAFSSON BE, QUENSEL CE, LANK LS (1954).
The Vipeholm dental caries study. The effect of different level of carbohydrate intake on caries activity in 436 individuals observed for five years.
Acta Odontol Scand 11:232.
- HAEFNER DP (1967).
Preventive action in central disease, tuberculosis and cancer.
Public Health Rep 82:45, 1-9 (May).
- HAMM NH, HOVING KL (1971).
Conformity in children as a function of grade level, and real versus hypothetical adult and peer models.
J Gen Psychol 118:253.
- HARRIS NO, CHRISTEN AG eds (1987).
Primary preventive dentistry.
Norwalk, Los Altos: Appleton & Lange.
- HARTY S (1979).
Hucksters in the classroom: A review of industry propaganda in schools.
Washington, DC: Center for Study of Responsive Law.
- HAUGEJORDEN O, HELÖE LA (1981).
Fluorides for everyone: school-based or community programmes.
Community Dent Oral Epidemiol 9:159-169.

HEALTH EDUCATION COUNCIL (1971).

Consolidated report of the conference of dental health education.

London: Health Education Council. p7.

HEIFETZ SB (1979).

Cost-effectiveness of topically applied fluorides. p69-104.

In: Burt BA ed. The relative efficiency of methods of caries prevention in dental public health. Michigan: University of Michigan.

HEIFETZ SB, HOROWITZ HS (1975).

Fluoride dentifrices. p31-45.

In: Newbrun E ed. Fluorides and dental caries. 2nd ed. Springfield, Illinois: Thomas.

HELLSÖM C, EKSTRAND J (1976).

Fluoride reactions with the dental enamel following different forms of fluoride supply.

Scand J Dent Res 84:255.

HELÖE LA, AINAMO J, BARENTHIN I (1979).

Tannhelsen i Norden. Holdninger, interess, kunnskap. Rapport fra en enqueteundersogelse foretatt 1977. Oslo,

Cited by: Frandsen A. Changing patterns of attitudes and oral health behaviour.

Int Dent J 1985;35:284-290.

HOLT RD, WINTER GB, FOX B, ASKEW R (1985).

Effects of dental health education for mothers with young children in London.

Community Dent Oral Epidemiol 13:148-51.

HOROWITZ AM (1980).

Oral hygiene measures.

J Can Dent Assoc 46:43-46.

HOROWITZ AM, HOROWITZ HS (1980).

School-based fluoride programmes: a critique.

J Prev Dent 6:89.

HOROWITZ HS (1973).

Fluoride: research on clinical and public health applications.

J Am Dent Assoc 87:1013.

HOROWITZ HS (1982).

Epidemiology of fluoride. Range of effectiveness. p1-16.

FDI/WHO/KELLOGG FOUNDATION. Joint Conference of Fluorides. Vienna, Austria 3-5 Oct.

HOROWITZ HS, HEIFETZ SB (1975).

The current status of topically applied fluorides in preventive dentistry. p46-80.

In: Newbrun E ed. Fluoride and dental caries. 2nd ed. Springfield, Illinois: Thomas.

HOROWITZ HS, HEIFETZ SB, LAW FE (1972).

Effect of school water fluoridation on dental caries: final results in Elk Lake, PA, after 12 years.

J Am Dent Assoc 84: 832.

HUGOSSON A, KOCH G, BERGEDAL T et al (1986).

Oral health of individuals aged 3-80 years in Jonkoping, Sweden, in 1973 and 1983.

Swed Dent J 10:103.

- IMFELD TH, MUHLEMANN HR (1977).
Evaluation of sugar substitutes in preventive cariology.
J Prev Dent 4:8.
- JAKSON D (1978).
Sugar and dental caries: myth and fact.
London: Bouverie.
- JENKINS CD (1979).
An approach to the diagnosis and treatment of problems of health related behaviour.
Int J Health Educ 22 (Suppl 2):1-24.
- JOHANSEN JR, GJERMO P, ERIKSEN HM (1975).
Effect of 2 years use of chlorhexidine-containing dentifrices on plaque, gingivitis and caries.
J Dent Res 83:288.
- JORDAN WA, PUGNER VA (1967).
Evaluation of dental health education in the Greater Leek Lake.
Dental project of Cass country.
J Public Health Dent 27:21-29.
- JUDITH EA, LISA AT, GRANT TP (1982).
Social and psychological problems of adolescence and their relevance to dental care.
Int Dent J 32: 184-193.
- KATZ E, LAZARSFELD PF (1955).
Personal influence: The part played by people in the flow of mass communication.
New York: Free Press.
- KEGELES SS (1980).
Book review. 'Becker MH ed. The health belief model and personal health behaviour'.
Soc Sci Med 14c:227.
- KELNER RM, WOHL BR, DEASY MJ (1973).
Gingival inflammation as related to frequency of plaque removal. IADR Abstr 154.
J Dent Res 52 (Spec Issue):97.
- KING JM (1978).
Patterns of sugar consumption in early infancy.
Community Dent Oral Epidemiol 6:47-52.
- KNOWLES JW, BURGETT FG, NISSLE RR, (1979).
Results of periodontal treatment related to pocket depth and attachment level - eight years.
J Periodontol 50:225-233.
- KOOP CE (1982).
Concerning health and cosmetic effects of water fluoride in the United States.
In: Small JS. Progress of fluoridation and defluoridation.
FDI/WHO/KELLOGG FOUNDATION. Joint Conference on Fluorides. Vienna, Austria 3-5 Oct.
- KRUGER E, SCHILLI W (1982).
Oral and maxillofacial traumatology.
Chicago: Quintessence.
- LAMB MW, FORD E (1960).
Dental health of children in the fourth grade of four elementary schools in Lubbock, Texas.
Dent Abstr 5:688-689.

- LANG NP, CUMMING BR, LÖE H (1973).
Toothbrushing frequency as it relates to plaque development and gingival health.
J Periodontol 44:396.
- LANGE DE (1984).
Attitude and behaviour with respect to hygiene and periodontal treatment need in a selected group in West Germany.
In: Frandsen A ed. Public health aspects of periodontal disease. London: Quintessence.
- LAU R, KANE R, BERRY S (1980).
Channeling health: a review of the evaluation of televised health campaigns.
Health Educ Q 7:56.
- LAUTCH H (1971).
Dental phobia.
Br J Psychiatr 119:151.
- LEATHERMAN GH (1982).
Oral hygiene for children: a look at what we must have and what we should do.
Int Dent J 32:253-258.
- LEAVELL HR, CLARK EG (1965).
Preventive medicine for the doctor. p216.
Cited in: Dunning JM. Principles of dental public health. 2nd ed.
Cambridge: Harvard University Press. 1970.
- LEE AJ (1978).
Parental attendance at a school dental program: its impact upon the dental behaviour of the children.
J School Health 48:423.
- LEMKE CW, DOHERTY JM, ARRA MC (1970).
Controlled fluoridation: the dental effects of discontinuation in Antigo. Wisconsin.
J Am Dent Assoc 80:782-6.
- LESKE GS, POLLARD S, CONS N (1976).
The effectiveness of dental hygiene team in applying a pit and fissure sealant.
J Prev Dent 3: 33.
- LIGHTFOOT SL (1978).
World apart: Relationships between families and schools.
New York: Basic Books.
- LINN EL (1974).
What dental patients don't know about preventive care.
J Public Health Dent 34:39-41.
- LOBENE RR (1982).
Use of dental floss - effects on plaque and gingivitis.
J Clin Prev Dent 4:5-21.
- LÖE H (1973).
Does chlorhexidine have a place in the prophylaxis of dental disease?
J Periodontol Res 8 (Suppl 12):93.
- LÖE H (1979).
Mechanical and chemical control of dental plaque.
J Clin Periodontol 6:32-35.

LÖE H, SCHIOTT CR (1970).

Dental plaque, Chlorhexidine in the prevention of gingivitis.

Cited by: Eastoe JE, Picton DCA, Alexander AC. The prevention of periodontal disease.

London: Henry Kimpton. 1971. p224.

LÖE H, SILNESS J (1963).

Periodontal disease in pregnancy.

Acta Odont Scand 21:553-562.

LÖE H, THEILADE E, JENSEN JB (1965).

Experimental gingivitis in man.

J Periodontol 36:177.

LÖE H, RINDOM-SCHIOTT C, GLAVIND L, (1976).

Two years use of chlorhexidine in man. Part I. General design and clinical effects.

J Periodontol Res 11:135.

MAKINEN KK (1972).

The role of sucrose and other sugars in the development of dental caries: a review.

Int Dent J 22:363-382.

MANUAL OF HEALTH EDUCATION (1969).

Issued by Division of Health Education, Dept of Public Health N.S.W.

MARKKULA J, MURTOMAA H, AINAMO J (1977).

Conception of Finnish people about the etiology and prevention of dental caries and periodontal diseases.

Community Dent Oral Epidemiol 5:108.

MARTHALER TM (1979).

Fluoride supplements for systemic effects in caries prevention. p33.

In: Johansen E, Taves D, Olsen J eds. Continuing education on the use of fluorides.

Boulder, Colorado: Westview Press.

MARTHALER TM, MEJIA R, TOTH K et al (1978).

Caries-preventive salt fluoridation.

Caries Res 12 (Suppl 1):15.

McDILL MS (1975).

Structure of social systems determining attitude, knowledge, and behaviour toward disease: micro social structures. p18.

In: Enelow AJ, Henderson JB eds. Applying behavioral science to cardiovascular risk.

Dallas: American Health Association.

McDONALD RE (1974).

Dentistry for children and adolescent. 2nd ed.

St Louis: Mosby.

McKINLAY JB (1975).

A case for refocussing upstream-the political economy of illness. p7.

In: Enelow AJ, Henderson JB ed. Applying behavioral science to cardiovascular risk.

Dallas: American Health Association.

MÖLLER IJ (1965).

Dental fluorose og caries. Rhodos Publ. Copenhagen.

Cited by: Möller IJ. Occurrence of fluorides. FDI/WHO/KELLOGG FOUNDATION. Joint Conference on Fluorides. Vienna, Austria 3-5 Oct. 1982.

MÖLLER IJ (1978).

Impact of oral diseases across cultures.

Int Dent J 28:376-382.

- MOLSTAD P AND BOTTEN G (1980).
Helsemessige konsekvenser av et høyt sukkerforbruk. (English summary).
Naeringsforskning 24:47.
- MOYER G (1981).
Self wars fought with 'push' ads.
Nutr Action 8:11.
- MUHLER JC, RADIKE AW, NEBERGALL WH (1955).
Comparison between the anticariogenic effects of dentifrices containing stannous fluoride and sodium fluoride.
J Am Dent Assoc 51:556.
- MURRAY J (1971).
Adult dental health in fluoride and non-fluoride areas. I. Mean DMF values by age.
Br Dent J 131:391.
- MURRAY JJ (1976).
Fluorides in caries prevention.
Bristol: John Wright.
- MURRAY JJ, RUGG-GUNN AJ (1979).
A review of the effectiveness of artificial water fluoridation throughout the world. Abstr 65.
ORCA XXVI Congress, Scotland.
Cited by: Horowitz HS. Epidemiology of fluorides - range of effectiveness.
FDI/WHO/ Joint Conference on Fluorides. Vienna, Austria 3-5 Oct. 1985.
- MURTI PR, BHONSLE RB, PINDBORG JJ (1985).
Malignant transformation rate in oral submucous fibrosis over a 17-years period.
Community Dent Oral Epidemiol 13:340-341.
- NEWBRUN E (1980).
Systemic fluorides - an overview.
J Can Dent Assoc 46:31-37.
- NEWBRUN E (1982).
Criteria of cariogenicity for labelling foods.
J Can Dent Assoc 105:627-635.
- NEWBRUN E, FROSTELL G (1978).
Sugar restriction and substitution for caries prevention.
Caries Res 12 (Suppl 1):65.
- NIZEL AE (1979).
Diet and nutrition in the prevention of dental caries.
In: Burt BA ed. The relative efficiency of methods of caries prevention in dental public health. Ann Arbor, Michigan: University of Michigan.
- NYSWANDER DB (1942).
Solving school health problems. p355.
Cited by: Dunning JM. Principles of dental public health. 2nd ed.
Philadelphia: Harvard University Press.
- PANKHURST CL, WAITE IM, HICKS KA, ALLEN Y, HARKNESS RD (1981).
The influence of oral contraceptive therapy on the periodontium: duration of drug therapy.
J Periodontol 25:617-620.
- PAWLAK EA, HOGG PM (1980).
Essentials of periodontics.
St. Louis: Mosby. p116.

PELTON WJ, WISAN JM (1955).
Dentistry in public health.
Philadelphia: Saunders.

PENNEL BM, KEAGLE JG (1977).
Predisposing factors in the etiology of chronic inflammatory periodontal disease.
J Periodontol 48:517-526.

PETERS E (1977).
30 Jahre Salzfluoridierung in der Schweiz. Zahnaerztl Mitt 67:1250,
Cited by: Burt BA et al. The prevention of dental caries and periodontal disease.
Int Dent J 1984;34:141-158.

PIAGET J, INHELDER B (1969).
The psychology of the child.
New York: Basic Books.

PLAMPING D, THORNE S, GELBIER S (1980).
Children as teachers of dental health education.
Br Dent J 146:113-115.

QUELCH JA (1980).
Marketing principles and the future of preventive health care.
Milbank Mem Fund Q 58:310.

RADIKE AW, GISH CW, PETERSON JK (1973).
Clinical evaluation of stannous fluoride as an anticaries mouthrinse.
J Am Dent Assoc 86:404.

RAMIREZ A, LASATER TM, ANDERSON RL (1971).
Use of fear appeal in dental health education.
J Am Dent Assoc 83:1086.

RANNEY RR (1977).
Pathogenesis of periodontal disease. p223-300.
In: International conference on research in the biology of periodontal disease.
Chicago: University of Illinois.

RAO YNL (1972).
The practice of mass communication: Some lessons from research.
Paris: UNESCO. p27.

RAYNER JF (1970).
Socioeconomic status and factors influencing the dental health practices of mothers.
Am J Public Health 60:1250.

RAYNER JF (1974).
Critique of Haefner's paper.
Health Education Monogr 2:220-235.

RAYNER JF, COHEN LK (1974).
A position on school dental health education.
J Prev Dent 1:11.

READ DA, GREEN WH (1971).
Creative teaching in health.
New York: MacMillan. p5.

RICHMAN LC, HARPER DC (1978).
School adjustment of children with observable disabilities.
J Abnorm Child Psychol 6:11.

- RIPA LW (1980).
Occlusal sealants: rationale and review of clinical trials.
Int Dent J 30:127-139.
- RIPA LW (1981).
Professionally (operator) applied topical fluoride therapy: a critique.
Int Dent J 31: 105-120.
- RODER DM, BART SM (1978).
Evaluation of dental health education in a school dental care program.
J Public Health Dent 38:44-45.
- ROSE C, ROGERS EW, KLEINMAN PR (1979).
An assessment of the Alabama Smile Keeper school dental health education program.
J Am Dent Assoc 98:51.
- ROSENSTOCK IM (1962).
Presenting a public health programme. p300.
Cited by: Young WO, Striffer WD, The dentist, his practice and his community. 2nd ed.
Philadelphia: Saunders. 1969.
- ROSENSTOCK IM (1974).
Historical origins of the health belief model.
Health Educ Monogr 2:328.
- ROTTER JB (1966).
Generalized expectancies for internal versus external control of reinforcement.
Psychol Monogr 80:609.
- RUEL-KELLERMANN M (1980).
De L'interet d'une connaissance clinique psychopathologie clinique
Cited In: Kellermann MR. What are the psychosocial factors involved in motivating individuals to retain their teeth? Dreams and facts. Int Dent J 1984;34:105-109.
- RUEL-KELLERMANN M (1982).
Potentialites depressives de la pratique odonto-stomatologique.
Cited In: Kellermann MR. What are the psychosocial factors involved in motivating individuals to retain their teeth? Dreams and facts. Int Dent J 1984;34:105-109.
- RUGG-GUNN AJ, (1977).
Fluoridation in Newcastle and Northumberland. A clinical study of 5-year-old children.
Br Dent J 142:395-402.
- RUGG-GUNN AJ, MacGREGOR IDM (1978).
A survey toothbrushing behaviour in children and young adults.
J Periodont Res 13:382.
- RUGG-GUNN AG, EDGAR WM, JENKINS GN (1981).
The effect of altering the position of a sugary food in a meal upon plaque pH in human subjects.
J Dent Res 60:867-872.
- RUSSELL AL (1963).
International nutrition surveys: a summary of preliminary dental findings.
J Dent Res 42:233-244.
- RUSSELL AL (1969).
The epidemiology of dental caries and periodontal disease. p73.
In: Young WO, Striffer DF eds. The dentist, his practice, and his community. 2nd ed.
Philadelphia: Saunders.

- RUSSELL AL, ELVOVE E (1951).
Domestic water and dental caries. VII.
A study of the fluoride dental caries relationship in an adult population.
Public Health Rep 66:1389.
- SCHAUB RMH (1984).
Barrier of effective periodontal care.
Sweden: Department of Social Science in Dentistry, University of Groningen.
- SCHEININ A (1976).
Caries control through the use of sugar substitutes.
Int Dent J 26:4-13.
- SCHEININ A, MAKINEN KK (1976).
An overview of the Turku sugar studies.
Acta Odont Scand 34:405.
- SCHERP HW (1970).
Introduction: Why another conference?
J Dent Res 49:1191-1199.
- SCHMID MO, BALMELLI OP, SAXER UP (1976).
Plaque removing effects of a toothbrush, dental floss and a toothpick.
J Clin Periodontol 3:157.
- SCOTTISH HOME AND HEALTH DEPARTMENT (1984).
Dental services for the handicapped. Report of a subcommittee, Edinburgh.
London: Her Majesty's Stationery Office.
- SCOTTISH HOSPITAL ADVISORY SERVICE (1974).
Dental care in 'long-stay' Hospital in Scotland. SHAS.
- SHANNON IL (1978).
Concentration of sugar in commercial baby foods.
J Dent Child 45:451.
- SHANNON IL (1979a).
Brand name guide to sugar.
Chicago: Nelson-Hall.
- SHANNON IL (1979b).
Sucrose - the tooth's mortal enemy; fluoride - the tooth best friend.
J Dent Child 44:429.
- SHAW JH (1979).
Reaction to Dr Nizel's paper. p189-199.
In; Burt BA ed. The relative efficiency of preventive methods in dental public health.
Ann Arbor, Michigan: University of Michigan.
- SHAW JH (1981).
Sweeteners-an overview. Part II.
Dent Abstr 26:172-175.
- SHAW JH, WITSCHI JC (1984).
Is the diet for preventing dental caries physiologically adequate? p166-172.
In: Guggenheim B ed. Cariology today. New York: S Karger.
- SHEIHAM A (1977).
Prevention and control of periodontal disease. p309-367.
In: International conference on research in the biology of periodontal disease.
Chicago: University of Illinois School of Dentistry.

SHEIHAM A (1980).
Educating the public about sugar.
J Dent Res 59:2203-2209.

SHEIHAM A (1983).
Promoting periodontal health-effective programmes of education and promotion.
Int Dent J 33:187.

SHEIHAM A (1984).
An analysis of existing dental services in relation to periodontal care. p59-68.
In: Frandsen A ed. Public health aspects of periodontal disease. Chicago: Quintessence.

SILVERMAN RH (1976).
The method of increasing clinical output to provide education and other related activities.
Manila: WHO Regional Office for the Western Pacific. Document WPR/ORH/76: 5. p1-5.

SILVERMAN S, GORSKY M, LOZADA-NUR F (1985).
A prospective follow-up study of 570 patients with oral lichen planus: persistence, remission, and malignant association.
Cited by: Andreasen JJ, Pindborg E et al. Oral health care: more than caries and periodontal disease. Int Dent J 1986;36:207-214.

SIMARD P (1976).
La teneur ideale en fluor est de 1.2 ppm et non de 1ppm (Pour Les eaux de Consommation du Quebec). Annex II in Dossier technique sur la fluoration.
Quebec: Ministere des Affaires Sociales.
Cited by: Burt BA et al. The prevention of dental caries and periodontal disease.
Int Dent J (1984) 34: 141-158.

SIMMONS RG, ROSENBERG F, ROSENBERG M (1973).
Disturbance in the self-image at adolescence.
Sociol Rev 38:553.

SLACK GL (1981).
Dental public health. An introduction to community dental health. 2nd ed.
Bristol: John Wright.

STAMM JW (1972).
Milk fluoridation as a public health measure.
J Can Dent Assoc 38:446.

STAMM JW, BANTING DW (1980).
Comparison of root caries in adults with life long residence in fluoridated and non-fluoridated communities. IADR Abstr 552.
J Dent Res 59 (Spec Issue A):405.

STEPHEN KW, McCALL DR, TALLIS JI (1987).
Caries prevalence in nothern Scotland before and 5 years after water defluoridation.
Brit Dent J 163: 324-326.

STEPHENS KW (1981).
A 4-years double blind fluoridated school milk study in a vitamin-D deficient area.
Brit Dent J 151:287-292.

STOLL FA, CATHERMAN JL (1967).
Dental health education. 3rd ed.
Philadelphia: Lea & Febiger. p126.

STOLL FA (1977).
Dental health education. 5th ed.
Philadelphia: Lea & Febiger.

STUART GW (1975).

The people, motivation, education and action.
Bull NY Acad Med 51:174.

SUOMI JD, GREENE JC, VERMILLION JC (1969).

The effect of controlled oral hygiene procedures on the progression of periodontal disease in adults. Results after third and final year.
J Periodontol 40:416-420.

SWINEHART JW (1974).

Critique of Thornton's paper.
Health Educ Monogr 2:209.

THEILADE E, WRIGHT WH, JANSEN SB, LÖE H (1966).

Experimental gingivitis in man. A longitudinal clinical and bacteriological investigation.
J Periodontol Res 45:5-13.

THYLSTRUP A, FEJERKOV O, BRUUN C (1979).

Enamel changes and dental caries in 7-year-old children given fluoride tablets from shortly after birth.
Caries Res 13:265.

THORNTON AW (1974).

Mass communication and dental health behaviour.
Health Educ Monogr 2:201.

TOTH K, SUGAR E (1975).

Über den taglichen, auf das korpergewicht bezogenen verbrauch von speisesalz.
Dtsch Zahnärztl Z 30:231.

Cited by: Burt BA et al. The prevention of dental caries and periodontal disease.
Int Dent J 1984;34:141-158.

TOVERUD G (1957).

The influence of war and post-war conditions on the teeth of Norwegian school children.
Milbank Memorial Fund Quarterly II and III 35:127-373.

TURNER CE (1964).

Dental health education.
Geneva: WHO. WHO/DH 172.

U.S. DEPARTMENT OF HEALTH EDUCATION AND WELFARE CENTER FOR DISEASE CONTROL (1977).

Fluoridation census (1975).
Atlanta: Government Printing Office.

VAN PALENSTEIN HELDERMAN WH (1981).

Microbial aetiology periodontal disease.
J Clin Periodont 8:261-280.

VOLPE AR (1982).

Dentifrices and mouthrinses. p170-216.
In: Stallard RE. A textbook of preventive dentistry. 2nd ed. Philadelphia: Saunders,

WALLSTON KA, WALLSTON BC (1984).

Who is responsible for your health? The construct of health locus of control.
In: Saunders G, Suls J et al. Social psychology of health and illness. J Soc Psych 78:267.

WEI SHY (1974).

The potential benefits to be derived from topical fluorides in fluoridated communities.
In: Forrester DJ, Schulz EM eds. International workshop on fluorides and dental caries reductions. Baltimore: University of Maryland. p178-258.

WENNSTRON JL (1982).
Effect of a new anti-plaque agent (CK-O569 A) on developing plaque and gingivitis in man.
J Periodontol 53:188-194.

WESPI HJ, BURGI W (1971).
Salt-fluoridation and urinary fluoride excretion.
Caries Res 5:89.

WHO (1945).
Report of an expert committee on health education of the public.
Geneva: WHO Technical Report Series No. 89.

WHO (1959).
Expert committee on auxiliary dental personnel.
Geneva: WHO Tech Rep Series No. 163.

WHO (1961).
Periodontal disease. Report of an expert committee on dental health.
Geneva: WHO Tech Rep Series No. 207. p3.

WHO (1970).
Dental health education: Report of a WHO expert committee.
Geneva: WHO Tech Rep Series No. 449. p13.

WHO (1978).
Epidemiology, etiology and prevention of periodontal diseases. Report of a WHO scientific group.
Geneva: WHO Tech Rep Series No. 621. p20.

WHO (1979).
Principles and models of health education.
Copenhagen: WHO Euro Rep Series 11.

WHO (1987).
Prevention of oral diseases.
Geneva: WHO Offset publication No. 103.

WINTER GB, FOX B, HOLT RD (1981).
Dental health education of mothers with young children in the Borough of Hillingdon.
London: General Dental Council.

WONG HD (1972).
Dental health education. Report on the first regional workshop on dental health services.
Manila: WHO Regional Office for the Western Pacific. p177-189.

WONG HD (1976).
Guidelines for organizing a dental health education service. Working group on dental health education.
Manila: WHO Regional Office for the Western Pacific. WPR/ORH/76:8. p1-7.

YOUNG WO, STRIFFLER DF (1969).
The dentist: his practice and his community. 2nd ed.
Philadelphia: WB Saunders.

YOUNG MAG (1969).
Dental health education: an overview of selected concepts and principles relevant to program planning.
Geneva: WHO DH/ WP/69:4.