THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

The case for integrating oral health into primary health care

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Abstract

Severe disparities in oral health and inequities in access to oral health care exist globally. In New Zealand, the cost of oral health services is high. Physician services and medicines are heavily subsidised by the government—however, in contrast, private financing, either as out-of-pocket payments or as private insurance, dominates dental care. Consequently, the use of services is often prompted by symptoms, and services are mostly oriented towards relief of pain. The high cost of dental care with insufficient emphasis on primary prevention of oral diseases, poses a considerable challenge for providing equitable access to health care as laid down by the Alma-Ata Declaration on Primary Health Care (PHC). While improving oral health is one of the health objectives of the New Zealand Health Strategy, providing accessible and affordable oral health services does not feature prominently in the current Primary Health Care Strategy.

This paper discusses current knowledge regarding oral health in relation to general health and health care strategies and frameworks, in order to highlight that oral health care is an important component of primary health care. The authors also propose that oral health care should be integrated into primary health care in New Zealand. This could be achieved by placing oral health within the broader framework of PHC as encapsulated by the Alma-Ata Declaration and the New Zealand Primary Health Care Strategy.

Severe disparities in oral health and inequities in access to oral health care exist globally.[1–4] These inequities are inconsistent with the vision of equity and social justice in global health as laid down by the non-binding Alma-Ata Declaration on Primary Health Care.[5] The original vision for Primary Health Care (PHC) encapsulated in the Alma Ata Declaration did not include a strategy to integrate oral health within general health programmes, however in 2002, in response to the global challenges of the burden of oral health diseases, the WHO Global Oral Health Programme was reoriented to give 'priority' to the integration of oral health with general health programmes.[6]

The World Health Organization's (WHO's) *The Global Goals for Oral Health* and *The Global Oral Health Programme* detail the means to address the unmet oral health needs of the world's population. *The Global Goals for Oral Health* proposed goals and objectives which are guided by the principles of disease prevention and health promotion in consideration of local realities—i.e. the epidemiology of oral diseases and the socioeconomic conditions.[7]

The Global Oral Health Programme, currently one of the priority programmes under the charge of the Department of Chronic Diseases and Health Promotion within the WHO, formulated policies and necessary actions to ensure the continuous improvement of oral health. The strategy emphasises that greater efforts should be put

on developing global policies based on the common-risk factor approaches, focussing on modifiable risk behaviours related to diet, nutrition, use of tobacco and excessive alcohol consumption.[8,9] It also emphasises that oral health is integral and essential to general health as the risks to health are linked, and that oral health is a determinant of general health.

Reaffirming its commitment to achieve oral health integrated within PHC, in 2007 the World Health Assembly adopted a resolution which called for an action plan for promotion and integrated disease prevention in oral health.[10] It emphasised the need to incorporate oral health into prevention and control of noncommunicable diseases (NCDs) within the framework of enhanced primary health care. The resolution also called for increased budgetary provisions for oral health care.

This paper discusses current knowledge regarding oral health in relation to general health and health care strategies and frameworks, to highlight that oral health care is an important component of primary health care. The authors also propose that oral health care should be integrated into primary health care in New Zealand. This could be achieved by placing oral health within the broader framework of PHC as encapsulated by the Alma-Ata Declaration and the New Zealand Primary Health Care Strategy, as discussed in the following sections.

Oral health and disease

The WHO definition of oral health highlights the physical, social, and psychological importance of oral health, defining oral health as:

> A natural, functional, acceptable dentition which enables an individual to eat, speak, and socialise without discomfort, pain or embarrassment, for a lifetime, and which contributes to general well being.[11]

The biological description of oral health is one that conceptualises oral health as the absence of oral diseases, such as dental caries (tooth decay), and periodontal diseases (gum disease).[11] The endpoint of these diseases (e.g. a hole in the tooth causing severe pain and discomfort) is typically when most people are likely to seek dental care.[12]

At first glance, treatment (e.g. filling the hole) appears to fit well with the biological description of oral health. However, in the majority of cases the endpoint treatment does not target the disease processes,[13] which leaves the diseases active. Moreover, there is a life-time risk of developing these diseases.[14,15] The WHO definition of Oral Health is therefore more constructive as it encapsulates the meaning of oral health and disease in its entirety.

It is important to note that oral diseases also include oral mucosal lesions and oropharyngeal cancers, human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS)-related oral disease and orodental trauma.[16] These are all major public health problems worldwide, and are impacted on by a number of different factors such as sociobehavioural, environmental, and host-genetics factors, and the general health of the individual.[16] However, because of their prevalence [17], the reasons for seeking dental care, and historically because they have been considered the most important global oral health burdens [16] we will focus on dental treatment of dental caries and periodontal diseases for the purpose of this paper.

Dental caries and periodontal diseases are complicated to treat as they are caused by a number of different bacteria present in the mouth (dental plaque) and are impacted on by a range of different factors.[14,15] These factors include socioeconomic position, host-genetics, and age. [16] The modifiable risk factors associated with these diseases, which are also common to other chronic diseases such as diabetes, include excess alcohol consumption, tobacco use, dietary habits, and hygiene. [18] The dynamic relationship between the host and the oral microflora means that there is a life-long need for everyone to have good oral health care.[15]

Poor oral health issues have been long neglected in New Zealand and elsewhere and are at "epidemic" proportions.[19] Common misconceptions include that dental caries have largely disappeared, are trivial and are easily treatable.[20] However, most New Zealanders have dental caries by adulthood, comparing unfavourably with Australia and the UK.[11]

Recent reports also show that childhood caries are at their highest since records began in 1990.[11,21] In 2004, nearly 50% of 5-year-old children had dental caries. This is particularly alarming as research suggests that oral health at age five predicts oral health in adulthood. [11] The prevalence of periodontal diseases in New Zealand is harder to gauge due to lack of epidemiological studies in this area. However, based on international records and current knowledge, advanced adult periodontitis, leading to severe loss of supporting periodontal tissues and tooth loss, does not tend to exceed a prevalence of 10–15 % in most populations.[22]

Gingivitis, a form of periodontal disease (gingival inflammation without any bone loss about teeth and no pockets deeper than 3 mm [23]) is more common. Based on a report from the US, approximately 50% of the adult population has gingivitis around three or four teeth at any given time.[24]

PHC, the Declaration of Alma Ata and the New Zealand Primary Health Care Strategy

The concept of PHC was granted recognition in 1978 at the International Conference on PHC. Its values, along with a set of principles and core activities, were spelled out in 10 articles that are known as The Declaration of Alma Ata.[5] It defines PHC as [5]:

> Primary health care is essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and the country can afford to maintain at every stage of their development in the spirit of self-reliance and self-determination. It forms an integral part of both the country's health system, of which it is the central function and main focus, and of the overall social and economic development of the community. It is the first level of contact of individuals, the family and the community with the national health system bringing health care as close as possible to where people live and work, and constitutes the first element of a continuing healthcare process.

New Zealand's Primary Health Care Strategy (PHCS), which borrows extensively from the Alma Ata Declaration in wording and ideology, defines quality primary health care as essential health care based on practical, scientifically sound, culturally appropriate, and socially acceptable methods[25] that is:

- Universally accessible to people in their communities.
- Involves community participation.

- Integral to, and a central function of, New Zealand's health system.
- The first level of contact with our health system.

This definition of primary health care represents a shift from the general practice model that has characterised New Zealand's primary health care system in the past. In New Zealand, as in much of the world, health policy is increasingly recognising primary health care as central to health service provision. Within the framework of the Alma Ata Declaration, health services are being reoriented with an increasing focus on reducing financial and other barriers to primary care.

Accompanying this reorientation is the increasing use of capitation funding for primary care services and the formation of non-profit primary health organisations (PHOs) with responsibility for enrolled populations.[25,26] These policy changes have resulted in a substantial reduction of GP charges and pharmaceutical charges.[27,28]

Dental care delivery

In New Zealand the cost of oral health services is high. Physician services and medicines are heavily subsidised by the government—however, in contrast, private financing (either as out-of-pocket payments or as private insurance) dominates dental care.

Public funding contributes only 25% of dental care expenditure in New Zealand, and is concentrated on children and adolescents.[29] Public funding for dental care for children up to the age 12 years is offered through a school-based dental therapist system.[30] Services offered include: oral examination and prophylaxis, fissure sealing, cavity preparation and placement of fillings, extraction of primary teeth, and referral of patients as required. For adolescents up to the age 18 to qualify for publicly-funded care, they must register with private dentists paid under public contract.

Most contracts are based on a capitation fee that covers a defined package of services; however, for some dentists, contracts for adolescent care remain on a fee-for-service basis. However, public subsidisation of adult dental care is very limited and targeted at particular groups at hospital-based dental clinics, such as special needs and medically compromised patients and some emergency dental services (relief of pain and infection only).[31] The majority of the adult population is responsible for the full costs of dental care services. The healthcare effect of this age-related change in entitlement to state assistance for dental care has been found to be associated with adverse oral-health.[32]

Cost barriers in access to dental care

The results of a recently conducted New Zealand study demonstrated that approximately 16%, 23%, and 7% of adults respectively reported deferring seeing their doctor, dentist, or collecting a prescription during the preceding year because they could not afford the cost of a visit or prescription.[33]

The access problem because of cost was significantly higher for dental care than for seeing a GP or collecting a prescription mainly because, unlike a GP's visit, which is largely government funded, individuals predominantly fund their own dental care.

In a five country survey (UK, USA, Canada, Australia, and New Zealand), the incidence of not visiting a dentist due to cost was much greater than not visiting a physician in all the countries surveyed; this is expected as access to dental care is more dependent on user contributions than is medical care in each country. However, cost seems more of a barrier in New Zealand than in the UK, Canada, and Australia.

New Zealand adults were the most likely (37%) and UK adults were the least likely (19%) to say that they needed dental care but did not see a dentist because of costs in the past year.[34] The US (35%), Australia (33%), and Canada (26%) were between the two extremes. The findings of this survey were correlated closely with countries' insurance systems and cost-sharing policies. Except for the UK, all these countries do not include dental care in the basic public program. The relatively high access to dental care in the UK reflects comprehensive dental funding.

Oral health and general health

The relationship between oral and general health has been increasingly recognised during the past two decades[35] and there is a growing body of evidence that indicates that specific oral conditions can be related to specific medical conditions [35,36] These have been shown to include heart disease[35,37], diabetes[38] and pre-term low weight babies.[39,40]

Oral health is integral to general health[38] primarily because oral diseases have risk factors in common with other chronic diseases and because, in the case of periodontal diseases, of their inflammatory and infectious nature.[16 36] The control of oral diseases is considered to be essential in the prevention and management of the other associated systemic conditions [35] although more research in this area is needed.

In the case of the association between periodontal disease and heart disease, a meta-analysis of 5 prospective cohort studies (86,092 patients) indicated that individuals with periodontal disease had a 1.14 times higher risk of developing coronary heart disease than the controls (relative risk 1.14, 95%CI 1.074–1.213, p<0.001).[37] The case-control studies (1423 patients) showed an even greater risk of developing coronary heart disease (OR 2.22, 95%CI 1.59–3.117, p<0.001).[37]

The authors concluded that periodontal disease may be a risk factor for coronary heart disease and called for prospective studies to be carried out to evaluate risk reduction with the treatment of periodontal disease. Other studies report similar findings and conclusions, calling for further research in this important area of public health. [41-43]

In 2007 over 200 articles were published in the English literature examining the relationship between periodontal disease and diabetes over a 50-year period.[44] Periodontal disease is considered one of the chronic complications of diabetes mellitus, both in Type 1and Type 2 forms.[45] Inflammatory periodontal diseases may increase insulin resistance in a way similar to obesity, thereby aggravating glycaemic control. However, further research is needed to clarify this aspect of the relationship between periodontal diseases and diabetes.[45]

A report on the relationships between diabetes and periodontal diseases and the effects of periodontal infection on glycaemic control and diabetes complications showed consistent evidence of greater prevalence, severity, extent, or progression of at least one manifestation of periodontal disease in 13 of the 17 studies reviewed.[46]

In the same report, treatment and longitudinal observational studies provided evidence to support periodontal infection having an adverse effect on glycaemic control, although not all investigations reported an improvement in glycaemic control after periodontal treatment, and requires further investigation.[46]

Dental caries are often associated with xerostomia (dry mouth) as a result of head and neck radiation, drug use (such as methamphetamine known as "meth mouth" [47] and salivary gland diseases such as Sjögren's syndrome (a multisystem auto-immune condition) and HIV disease.[48].

Integration of oral with primary health care

Integration of oral health and dental care into primary health care is important because of the integral nature of oral health with general health. Conventional dental treatment focuses primarily on the endpoint of disease and fixing it—e.g. in the case of dental caries, filling the cavity.[49] This, combined with the current dental delivery system is not effective in achieving sustainable oral health improvements across populations, nor in reducing the oral health equity gap.[50,51] This is because an endpoint treatment approach does not take into account the disease processes nor the multifactorial nature of oral diseases, or the commonality of risk factors with other chronic conditions.[13 16 50,52] Moreover, such an approach is less appropriate for prevention-based interventions at community levels and thus serves relatively few people at high costs.[13 50 52] As Mertz and O'Neil state, 'What is needed is a turn towards a system (of care) that meets the principles of primary health care'.[53]

Current evidence indicates that delaying dental care can lead to serious illness as adverse oral health has a profound impact on general health, quality of life, and economic wellbeing, as discussed in the preceding sections.[54,55] Failure to provide medically necessary dental care undermines the effectiveness and efficiency of general medical care. [56]

It is for the above described reasons that oral health policies and programmes should be an integral part of national primary health care. Integration of oral health into strategies for promoting general health will enhance both oral and general health. While improving oral health is one of the health objectives of the New Zealand Health Strategy,[57] providing accessible and affordable oral health services does not feature prominently in the current Primary Health Care Strategy. [25] This study emphasises that oral health care is primary health care and we need a health care system that meets the principles of primary health care.

What does it mean to integrate oral health with primary health care? It broadly means bringing dental care and primary health care under one roof, thus providing dental care services as part of comprehensive primary health care. It means having more public responsibility in financing, and delivery of oral health care with universal access to preventive as well as restorative dental care. Currently, unlike a GP visit, New Zealanders primarily meet the cost of their own dental and oral health services. However, treating the funding of basic dental services differently from other medical services is contrary to the view expressed by the WHO that oral health is integral to overall health and an important part of primary health care. [6]

Moreover, as mentioned before with the current oral health system, dental and oral health programmes tend to follow a biomedical approach (individual behaviour risk factors) and largely ignores the influence of socio-political factors as key determinants of health. The common risk factor approach, in which coordinated action is focussed upon a set of shared risk conditions and their associated behaviours, aims to address the common determinants of chronic conditions, including oral diseases.[58,59] Oral health and disease are impacted on by diet, hygiene, smoking, alcohol use, stress, and trauma.[16] As these risk factors are common to a number of other chronic diseases, adopting a collaborative approach would be more rational than one that looks at the diseases in isolation.

This above mentioned collaborative approach emphasises meeting the patient's needs early on, by reorienting oral health services towards prevention, self-management and early intervention, thus reducing avoidable hospital visits and admissions. Like primary health care, dental care should aim to maintain good oral health of the population and not merely treat the endpoints of oral diseases.

Currently, in New Zealand and elsewhere, the cost of oral health services is high. Consequently, the use of services is often prompted by symptoms; and publically funded oral health care is largely oriented towards select populations e.g. children, adolescents, low-income adults, special needs and medically compromised patients, with some emergency dental services (relief of pain and infection only).[31]

The insufficient emphasis on primary prevention of oral diseases, poses a considerable challenge for several groups of people, particularly women, older adults, and those from lower socioeconomic groups, who face greater barriers in accessing oral health due to cost barriers. [33] It remains a challenge in many countries, including New Zealand, to establish prevention-oriented oral health systems based on the Primary Health Care Approach and to reduce cost barriers to accessing oral health care.

It is encouraging to note that the New Zealand Government has started the process of integrating oral health with general health programmes with the publication of a strategic vision for oral health in New Zealand. [11] The challenge for national health authorities is to translate this strategic vision into practice for the benefit of those who have unmet oral health needs because of cost. Moreover, a number of primary care practices, such as Wellington People's Centre and Hokianga Health, provide dental services as part of integrated extended primary health care services.

In the future strong emphasis should be given to ensure integration of primary health care and oral health care to ensure overall good health, healthy individuals, and healthy populations.

Conclusion

This paper has highlighted the need for dental and oral health to be integrated within a PHC framework. It has shown that dental and oral health care clearly meet the requirements for PHC, and that there is need for a preventative orientated approach towards oral health care.

Competing interests: None known.

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References:

1. Chen M-S. Oral health of disadvantaged populations. In: Cohen LL, Gift HC, editors. Disease prevention and oral health promotion: socio-dental sciences in action. Copenhagen: Federation Dentaire International, Munksgaard, 1995:153–212.
2. Locker D. Deprivation and Oral health: a review. Community Dental Oral Epidemiology 2000;28:161–9.
3. Nuttall N. The prevention of social inequities in oral health. In: Murray J, Nunn J, Steele J, editors. Prevention of oral disease. Oxford: Oxford University Press, 2003:221–40.
4. Watt RG, Sheiham A. Inequalities in oral health: a review of evidence and recommendations for action. British Dental Journal 1998;187:6–12.
5. World Health Organisation. Alma-Ata 1978: Primary Health Care: Report of the International Conference. Geneva: World Health Organisation, 1978.
6. Petersen PE. World Oral Health Report 2003. Geneva: WHO, 2003.
7. Hobdell M, Petersen PE, Clarkson J, Johnson N. Global goals for oral health 2020. International Dentistry Journal 2003;53:285–8.
8. World Health Organisation. The Objectives of the WHO Global Oral Health Programme (OHP). 2004. http://www.who.int/oral_health/objectives/en.
9. World Health Organistaion. Global Strategy on Diet, Physical Activity and Health Diet and Physical Activity: 2004. Public Heath Policy http://www.who.int/dietphysicalactivity/strategy/en
10. World Health Organistaion. Sixtieth World Health Assembly: Oral Health: Action Plan for Promotion and Integrated Disease Prevention 2007. http://www.bfsweb.org/documents/A60_R17-en1.pdf
11. Ministry of Health. Good Oral Health for All, for Life: The Strategic Vision for Oral Health in New Zealand. Wellington: Ministry of Health, 2006.
12. Nuttall N. Review of attendance behaviour. Dent Update 1997;24(3):111–4.
13. Selwitz R, Ismail A, Pitts N. Dental caries. Lancet 2007;369(9555):51–9.
14. Jenkinson HF, Lamont RJ. Oral microbial communities in sickness and in health. TRENDS in Microbiology 2005;13(12):589–595.
15. Marsh PD, Percival RS. The oral microflora – friend or foe? Can we decide? Int Dent J 2006;56(4 Suppl 1):233–239.
16. Petersen PE, Bourgeois D, Ogawa H, et al. The global burden of oral diseases and risks to oral health. Bull World Health Organ 2005;83(9):661–9.
17. Marsh PD. Are dental diseases examples of ecological catastrophes? Microbiology 2003;149(Pt 2):279–294.
18. Petersen PE. Global policy for improvement of oral health in the 21st century--implications to oral health research of World Health Assembly 2007, World Health Organization. Community Dent Oral Epidemiol 2009;37(1):1–8.
19. Surgeon-General US. Oral Health in America: A Report of the Surgeon General: 2000. http://www.nidcr.nih.gov/sgr/sgrohweb/home.htm
20. Bowen WH. Do we need to be concerned about dental caries in the coming millenium? Critical Reviews in Oral Biology and Medicine 2002;13(2):126–31.

21. Press Release: . New oral health statistics worst on record. Scoop, Independent News, 2006.
22. Papapanou PN. Epidemiology of periodontal diseases: an update. J Int Acad Periodontol 1999;1(4):110–6.
23. Loesche W. Dental caries and periodontitis: contrasting two infections that have medical implications. Infectious Disease Clinics of North America 2007;21(2):471–502.
24. Oliver RC, Brown LJ, Loe H. Periodontal diseases in the United States population. J Periodontol 1998;69(2):269–78.
25. King A. The Primary Health Care Strategy: Ministry of Health, Wellington, New Zealand, 2001.
26. Hefford M, Crampton P, Foley J. Reducing health disparities through primary care reforms: the New Zealand experiment. Health Policy 2005;72:9–23.
27. Ministry of Health. General practitioner fees information: a summary of key findings from five reports. In: Ministry of Health, editor. 2004. http://www.moh.govt.nz/moh.nsf/0/1BF9A9B04AA23B8ACC256EF4000D3A8A/$File/GPfeesInfo.doc .
28. Ministry of Health. Primary health care: Pharmaceutical co-payments. Wellington, New Zealand, 2007. http://www.moh.govt.nz/moh.nsf
29. Birch S, Anderson R. Financing and delivering oral health care: What can we learn from other countries? Journal of the Canadian Dental Association 2005;71(4):243–243.
30. Ministry of Health. DHB Toolkit: Improve Oral Health. Wellington: Ministry of Health, 2004.
31. Ministry of Health. Quick guide to New Zealand Healthcare, 2006: http://www.immigration.govt.nz/NR/rdonlyres/240BE315-43AA-44F7-A55B-72213EA62D19/0/MoHQuickGuidetoNZHealthcare.pdf
32. Thomson WM. Use of dental services by 26-year-old New Zealanders. New Zealand Dental Journal 2001;97:44–8.
33. Jatrana S, Crampton P. Primary health care in New Zealand: Who has access? Health Policy (In Press), 2009.
34. Schoen C, Doty MM. Inequities in access to medical care in five countries: findings from the 2001 Commonwealth Fund International Health Policy Survey. Health Policy 2004a;67:309–322.
35. Seymour GJ, Ford PJ, Cullinan MP, et al. Relationship between periodontal infections and systemic disease. Clin Microbiol Infect 2007;13 Suppl 4:3–10.
36. Williams RC, Barnett AH, Claffey N, et al. The potential impact of periodontal disease on general health: a consensus view. Curr Med Res Opin 2008;24(6):1635–43.
37. Bahekar AA, Singh S, Saha S, et al. The prevalence and incidence of coronary heart disease is significantly increased in periodontitis: a meta-analysis. Am Heart J 2007;154(5):830–7.
38. Sandberg GE, Wikblad KF. Oral health and health-related quality of life in type 2 diabetic patients and non-diabetic controls. Acta Odontologica Scandinavica 2003;61:141–8.
39. Khader YS, Ta'ani Q. Periodontal diseases and the risk of preterm birth and low birth weight: a meta-analysis. J Periodontol 2005;76(2):161–5.
40. Sharma R, Maimanuku LR, Morse Z, Pack AR. Preterm low birth weights associated with periodontal disease in the Fiji Islands. Int Dent J 2007;57(4):257–60.
41. Cronin A. Periodontal disease is a risk marker for coronary heart disease? Evid Based Dent 2009;10(1):22.
42. Humphrey LL, Fu R, Buckley DI, et al. Periodontal disease and coronary heart disease incidence: a systematic review and meta-analysis. J Gen Intern Med 2008;23(12):2079–86.
43. Matthews D. Possible link between periodontal disease and coronary heart disease. Evid Based Dent 2008;9(1):8.
44. Mealey BL, Ocampo GL. Diabetes mellitus and periodontal disease. Periodontol 2000 2007;44:127–53.

45. Campus G, Salem A, Uzzau S, et al. Diabetes and periodontal disease: a case-control study. J Periodontol 2005;76(3):418–25.
46. Taylor GW, Borgnakke WS. Periodontal disease: associations with diabetes, glycemic control and complications. Oral Dis 2008;14(3):191–203.
47. Hamamoto DT, Rhodus NL. Methamphetamine abuse and dentistry. Oral Dis 2009;15(1):27–37.
48. Scully C, Felix DH. Oral medicine - update for the dental practitioner. Dry mouth and disorders of salivation. British Dental Journal 2005;199(7):423–7.
49. Fejerskov O, Kidd EAM. Clinical cardiology and operative dentistry in the twenty-first century. In: Fejerskov O, Kidd EAM, editors. Dental caries: The disease and its clinical management: Blackwell Munksgaard, 2003:3–6.
50. Caufield P, Dasanayake A, Li Y. The antimicrobial approach to caries management. J Dent Educ 2001;65(10):1091–5.
51. Kay L, Locker D. A systematic review of the effectiveness of health promotion aimed at promoting oral health. London: Health Education Authority, 1997.
52. Guzman-Armstrong S, Warren JJ. Management of high caries risk and high caries activity patients: rampant caries control program (RCCP). J Dent Educ 2007;71(6):767–75.
53. Mertz E, O'Neil E. The growing challenge of providing oral health care services to all Americans. Health Affairs 2002;21:65–77.
54. Hollister MC, Weintraub JA. The association of oral status with systemic health, quality of life and economic productivity. Journal of Dental Education 1993; 57(12):901-912
55. Mandel ID. Oral infections: impact on human health, well-being, and health-care costs. Compendium of Continuing Education and Dentistry 2002;23(5):403–6.
56. Rutkauskas J. The medical necessity of periodontal care. Periodontology 2000;23:151–6.
57. King A. The New Zealand Health Strategy: Ministry of Health, Wellington, New Zealand, 2000.
58. Sheiham A, Watt R. The common risk factor approach - a rational basis for promoting oral health. Community Dental Oral Epidemiology 2000;28:399–406.
59. World Health Organistaion. Risk factors and comprehensive control of chronic diseases. Geneva: WHO, 1980.