

Global oral health of older people – Call for public health action

P.E. Petersen¹, D. Kandelman², S. Arpin² and H. Ogawa³

¹World Health Organization, Global Oral Health Programme, Chronic Disease and Health Promotion, Geneva, Switzerland; ²Division of Preventive and Community Dentistry, Faculty of Dental Medicine, University of Montreal, Montreal, Canada; ³World Health Organization Collaborating Centre for Translation of Oral Health Science, University of Niigata, Niigata, Japan.

Background: The aim of this report is 1) to provide a global overview of oral health conditions in older people, use of oral health services, and self care practices; 2) to explore what types of oral health services are available to older people, and 3) to identify some major barriers to and opportunities for the establishment of oral health services and health promotion programmes. **Methods:** A postal questionnaire designed by the World Health Organization (WHO) was distributed worldwide to the Chief Dental Officers or country oral health focal points at ministries of health. WHO received 46 questionnaires from countries (39% response rate). In addition, systematic data were collected from the WHO Global Oral Health Data Bank and the World Health Survey in order to include oral health information on the remaining countries. In total, the data base covers 136 out of 193 countries, i.e. 71% of all WHO Member States. **Results:** Dental caries and periodontal disease comprise a considerable public health problem in the majority of countries. Significant disparities within and between regions are observed in epidemiologic indicators of oral disease. The prevalence rates of tooth loss and experience of oral problems vary substantially by WHO Region and national income. Experience of oral problems among older people is high in low income countries; meanwhile, access to health care is poor, in particular in rural areas. Although tooth brushing is the most popular oral hygiene practice across the world, regular tooth brushing appears less common among older people than the population at large. In particular, this practice is less frequent in low income countries; in contrast, traditional oral self-care is prevalent in several countries of Africa and Asia. While fluoridated toothpaste is widely used in developed countries, it is extremely infrequent in most developing countries. Oral health services are available in developed countries; however, the use of such services is low among the older people. Lack of financial support from government and/or lack of third party payment systems render oral health services unaffordable to them. According to the country reports, health promotion programmes targeting older people are rare and this reflects the lack of oral health policies. Although some countries have introduced oral health promotion initiatives, worldwide there are few population-oriented preventive or curative activities currently implemented that focus specifically on the elderly. Barriers to the organization of such programmes relate to weak national health policy, lack of economic resources, the impact of poor oral health, and lack of tradition in oral health. Opportunities for oral health programmes for old-age people are related to updated information on the burden of oral disease and need for care, fair financing of age-friendly primary health care, integration of oral health into national health programmes, availability of oral health services, and ancillary personnel. **Conclusion:** It is highly recommended that countries establish oral health programmes to meet the needs of the elderly. Relevant and measurable goals must be defined to direct the selection of suitable interventions to improve their oral health. The common risk factors approach must be applied in public health interventions for disease prevention. The integration of oral health into national general health programmes may be effective to improve the oral health status and quality of life of this population group.

Key words: Global oral health status, need for oral health care, older people, oral health services, risk factors.

Introduction

As a result of decreased fertility and increased life-expectancy, the populations of most countries are ageing rapidly. By the year 2050 it is expected that an increase in the population aged 60 years or over will account for about half of the total growth of the world population (United Nations, 2007). The proportion of older persons in developed countries is currently much higher than in developing countries; however, from a global perspective the majority of older persons live in developing countries (United Nations, 2007). A notable aspect of population ageing is the progressive demographic ageing of the older population itself. Worldwide the most rapidly growing age group consists of persons aged 80 years or over. Although this age group now accounts for less than 2% of the total world population, the number of very old

people is expected to more than quadruple over the next four decades from less than 90 million in 2005 to almost 400 million in 2050 (United Nations, 2007).

This demographic transition constitutes a significant challenge for health authorities worldwide, particularly because disease patterns will shift concurrently. WHO in its Health Report 2002 (World Health Organization, 2002a) analyzed the global burden of disease and the major risks of disease, disability and death. The prevalence of non-communicable chronic diseases (NCDs) such as cardiovascular disease, chronic respiratory disease, cancer and diabetes, increases dramatically with age, which partly explains why these diseases are rapidly becoming the leading causes of disability and mortality worldwide.

With age the risk of loss of healthy life years is aggravated because of low individual resistance, poor nutritional status, chronic disease and adverse socio-environmental

conditions (World Health Organization, 2002b). Although most people now may look forward to living longer, the risk of developing at least one chronic disease increases with age; this reflects the cumulative effect of a life-long exposure to risk factors and is not related to chronological age per se (World Health Organization, 2002b). A core group of modifiable risk factors is common to many chronic diseases and injuries, including oral disease. These common risk factors include unhealthy diet, tobacco use, harmful alcohol use, and stress (Petersen, 2003).

Health authorities worldwide are now confronting an increasing public health problem, including a growing burden of oral disease among older people (Petersen and Ueda, 2006; Harford, 2009). Globally, poor oral health among older people has been illustrated particularly in high levels of tooth loss, dental caries experience, periodontal disease, xerostomia, and oral cancer (Schou, 1995; Petersen and Yamamoto, 2005; Kandelman et al., 2008). Among the negative impacts on daily life of poor oral health are reduced chewing performance, constrained food choice, weight loss, impaired communication, low self-esteem and well-being (Kandelman et al., 2008; Jensen et al., 2008; Locker et al., 2002; Locker et al., 2000; Naito et al., 2006). A systematic review of the scientific literature (Kandelman et al., 2008) was recently carried out to assess the impact of oral disease on the general health of older people. Strong associations were established between periodontal disease and diabetes, and tooth loss with poor nutrition. Obviously, such conditions influence the quality of life. Increased life expectancy without enhanced quality of life has a direct impact on public health expenditures and is becoming a key public health issue in the more developed countries. It will also be of major concern to developing countries and countries with high population densities and emerging economies, such as China and India.

Oral health for older people is a priority action area in the WHO Global Oral Health Programme (Petersen, 2003). Age-friendly primary oral health care, disease prevention and oral health promotion are of major concern to WHO. The public health challenge related to oral health intervention for older people was emphasized by the 2007 World Health Assembly Resolution WHA60.17 on an action plan for oral health (Petersen, 2008; Petersen, 2009a). In 2007, WHO initiated a global survey to highlight the needs for improving oral health of older people. The objectives of the present report are as follows:

1. To provide a situation analysis of the oral health status and use of oral health services among older people worldwide.
2. To explore what type of oral health services and programmes are available to older people in developing and developed countries.
3. To identify important barriers to the establishment of oral health services for older people, disease prevention and oral health promotion programmes as well as to explore key facilitating factors relevant to the organization of oral health programmes or modification of existing programmes for older people.

Materials and methods

A postal questionnaire designed by WHO was distributed worldwide to Chief Dental Officers (CDOs) or country oral health focal points at ministries of health. The oral questions covered the following areas: 1) Oral health status of older people; 2) Oral health behaviour; 3) Use of oral health services available; 4) Workforce for oral health care of the elderly; 6) Type of oral health care provided to older people; 7) Training for service and care, and 8) Possibilities for and barriers to oral health care of older people.

In total, WHO received 46 questionnaires completed by CDOs, representing 39 % of the reported number of CDOs. In addition, information was obtained from consultants in oral health or other focal points at ministries of health. All six WHO Regions (**Figure 1**) were covered by the survey as follows; the African Region (AFRO), the Americas (AMRO), the Eastern Mediterranean Region (EMRO), the European Region (EURO), the South-East Asia Region (SEARO), and the Western Pacific Region (WPRO). In the absence of a response from a country, information for the year of study was derived from the WHO Global Oral Health Data Bank (WHO, 2007) (www.who.int/oral_health). Moreover, oral epidemiological data from the so-called WHO World Health Survey (WHS) (Petersen, 2009b; World Health Organization, 2006) were selected. Scientific publications in the dental public health literature were identified via databases and this work was carried out by the WHO Global Oral Health Programme for the future publication on the *Global Burden of Disease*. Finally, country reports submitted to the WHO Global Oral Health Programme by national health authorities were utilized. In this way, information on oral health status and national oral health systems was gained from an additional 93 countries. The present report thus includes data from 136 out of 193 countries, representing 71 % of all WHO Member States. Data were entered into a project data base and analyzed by means of the SPSS Version 16 (Statistical Package for the Social Sciences). The statistical description of the reported data was based on proportions or means. In addition, the questionnaire included open-ended questions and the answers from countries were subjected to qualitative data analysis.

Results

Dental caries

Fig. 2 summarizes the information on dentition status among older people aged 65 years or more. Dental caries experience is measured by the mean number of Decayed, Missing and Filled Teeth index (DMFT) and country information is categorized by WHO Region. As illustrated dental caries remains a significant problem worldwide, in particular for countries within AMRO, EMRO, and EURO. The M-component of the dental caries index is surprisingly high in all regions of the world. The African countries report the mean DMFT as being relatively low. However, the ratio M/DMF is extraordinarily high whereas the F/DMF ratio appears to be very low. These findings suggest that oral health care for older people consists of radical treatment in terms of tooth extraction. Meanwhile, considerable disparities are observed in the total DMFT

WHO Regional Offices and the areas they serve

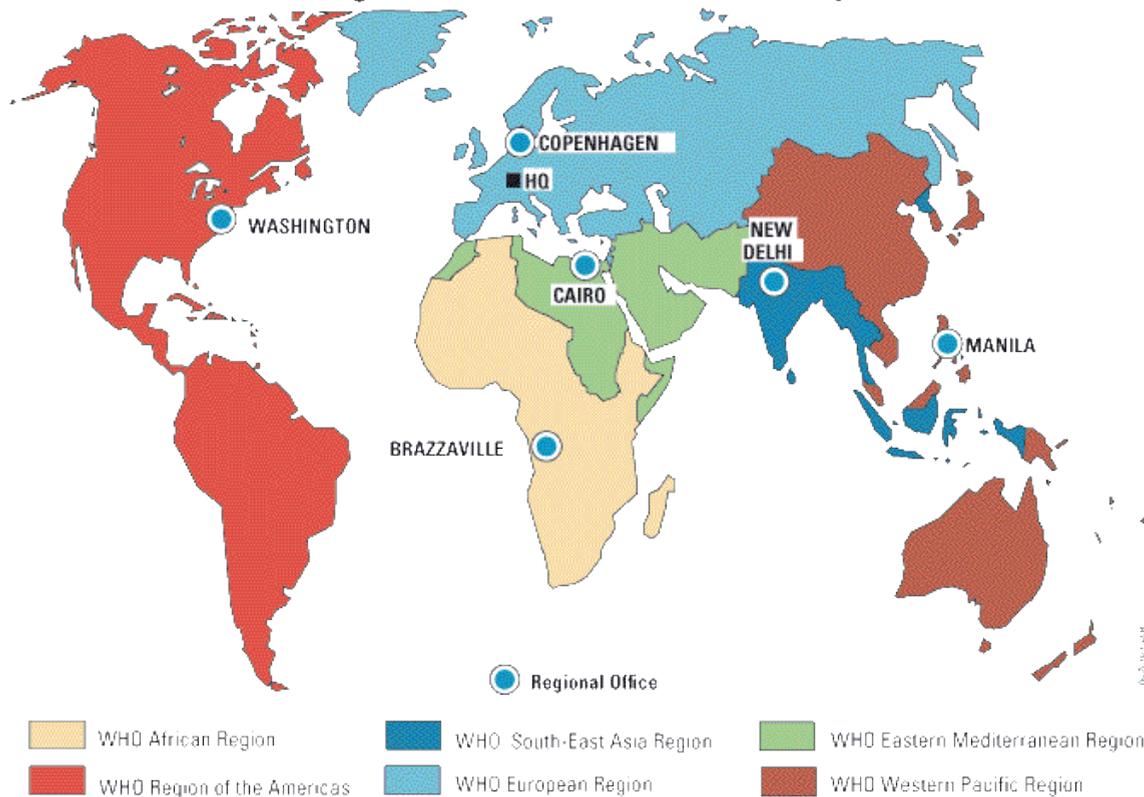


Figure 1. Global map showing the Regions of the World Health Organization

Mean DMFT of older people 65 years or more by WHO Region

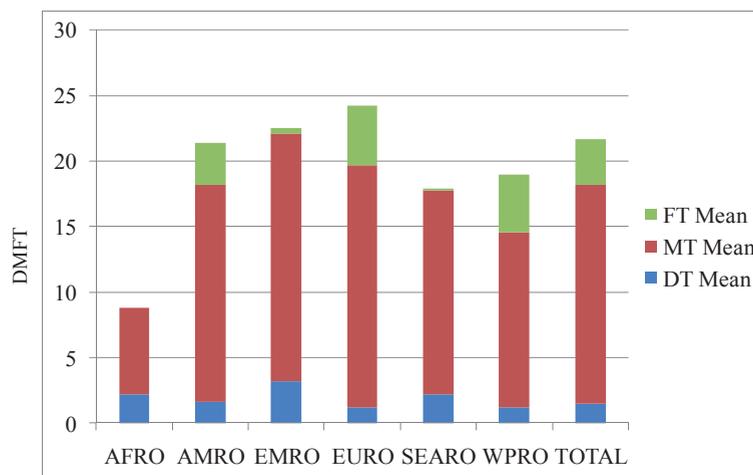


Figure 2. Mean dental caries experience (DMFT) among older people 65 years or more across WHO Regions (WHO, 2007).

scores of the countries of Africa; the figure is reported to be very high in Madagascar (DMFT 20.9-24.6) but low in Ghana (DMFT 1.4) in West Africa; figures from East Africa range from 3.7 DMFT in Tanzania to 4.5 DMFT in Zimbabwe.

Periodontal disease

Figs. 3-6 illustrate periodontal status of 65-74-year-olds across countries of the world as measured by the Community Periodontal Index (World Health Organization, 1997; Petersen and Ogawa, 2005). This index categorizes persons or sextants according to the following ordinal

criteria: Score 0= healthy periodontal conditions; Score 1= gingival bleeding; Score 2=gingival bleeding and calculus; Score 3=moderate pockets 3-5 mm; and Score 4=deep pockets 6 mm or more (Score 9= excluded; Score X= not recorded or not visible). In the majority of countries the prevalence rates of CPI-2 and CPI-3 are the most frequent and to a large extent these scores reflect poor oral hygiene. CPI-4 is the most severe or sign of periodontal disease. The inter-country variation in prevalence rates of this condition is high; the mean number of older people affected by CPI-4 ranges from 5 to 20% although some countries exceed these levels

Mean percentages of maximal CPI scores in 65 to 74 year olds by countries

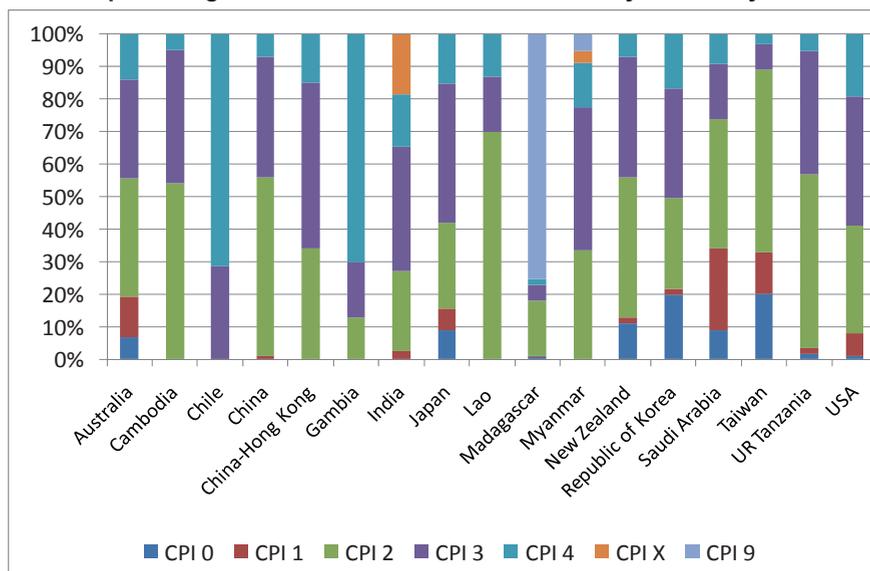


Figure 3. Periodontal health status as measured by the Community Periodontal Index (CPI) among people 65-74 years old in selected countries: Mean percentage of persons with maximal CPI score (WHO, 2007).

Mean percentages of maximal CPI scores in 65 to 74 year olds by EURO countries

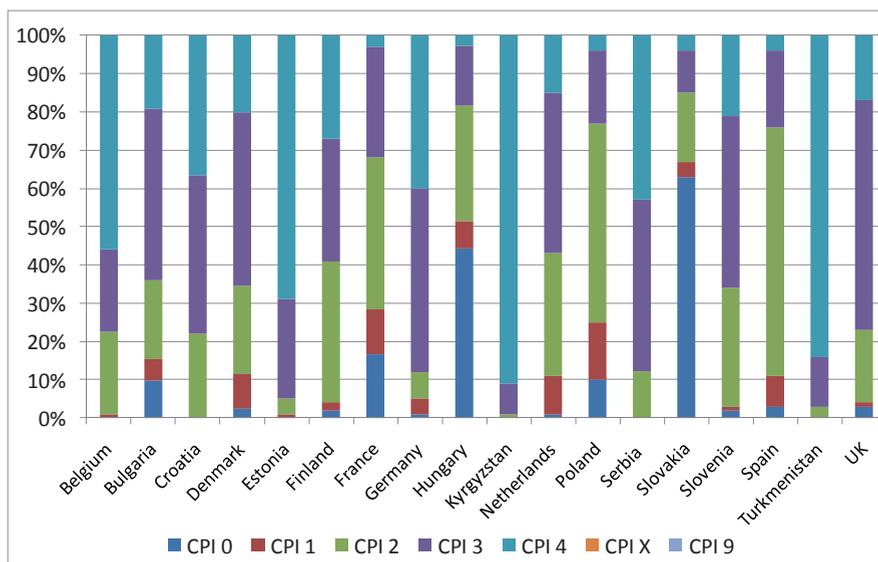


Figure 4. Periodontal health status as measured by the Community Periodontal Index (CPI) among people 65-74 years old in selected European countries: Mean percentage of persons with maximal CPI scores (WHO, 2007).

Mean numbers of sextants with CPI scores in 65 to 74 year olds by countries

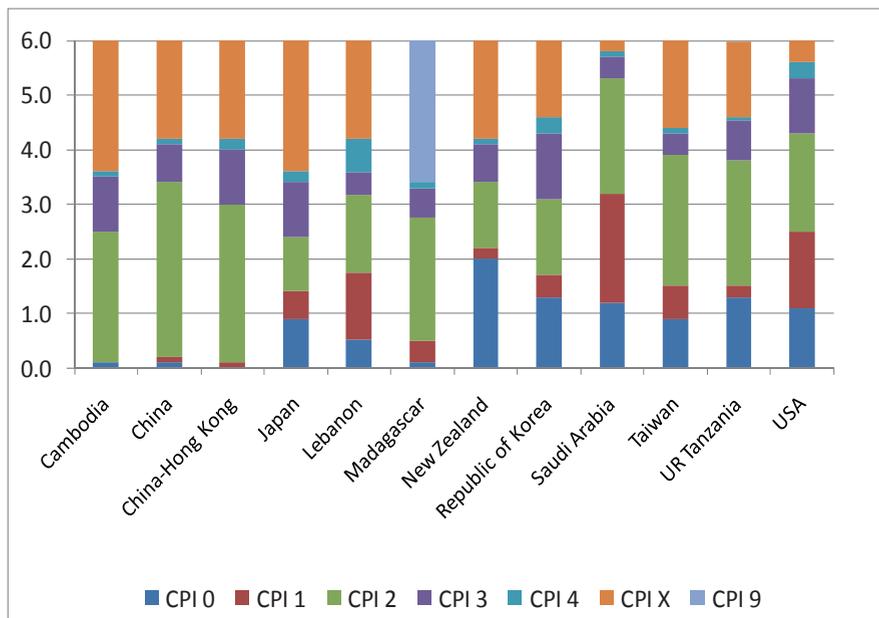


Figure 5. Periodontal health status as measured by the Community Periodontal Index (CPI) among older people in selected countries: Mean percentage of sextants with CPI scores (WHO, 2007).

Mean numbers of sextants with CPI scores in 65 to 74 year olds by EURO countries

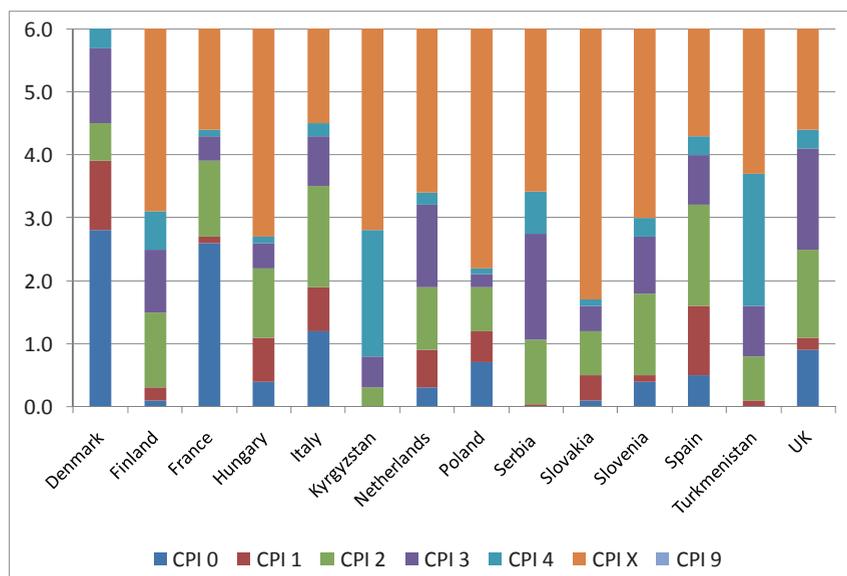


Figure 6. Periodontal health status as measured by the Community Periodontal Index (CPI) in people 65-74 years old in selected countries: Mean percentage of sextants with CPI scores (WHO, 2007).

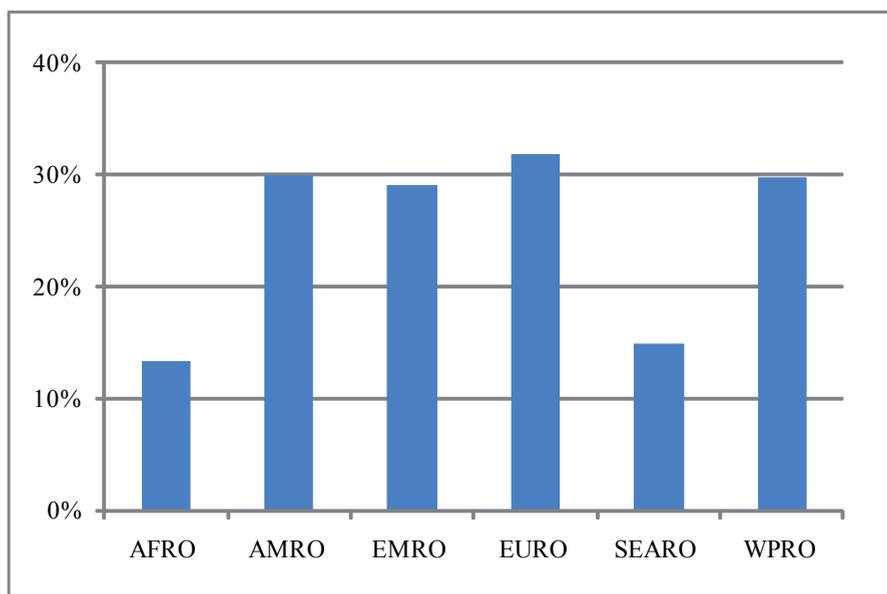


Figure 7. Percentages of 65-74 year old people with loss of all natural teeth according to WHO Regions – The World Health Survey (Petersen, 2009b; World Health Organization, 2006).

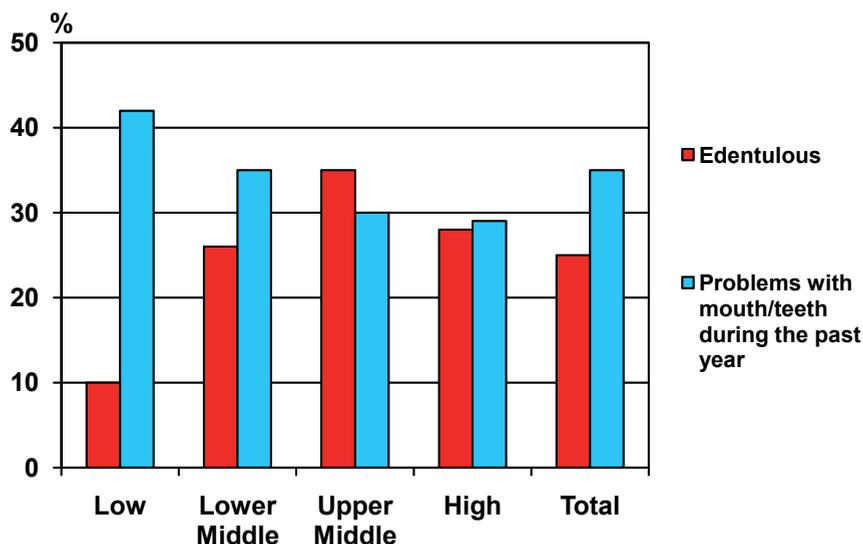


Figure 8. Percentage of people 65-74-years old in low-, middle- and high income countries with no natural teeth and percentage of people having experienced problems with mouth/teeth during the past year - The World Health Survey (Petersen, 2009b; World Health Organization, 2006).

(Petersen and Ogawa, 2005). It is noteworthy that epidemiological data on periodontal health conditions are scarce as regards the developing countries.

Tooth loss

Dental caries and periodontal disease are the major causes of tooth loss which is a significant component of the global burden of oral disease. The burden of tooth loss is highlighted in the World Health Survey (WHS) (Petersen, 2009b; World Health Organization, 2006). The WHS is a world-wide survey covering the adult population of all ages in selected countries. The survey was designed in order to obtain national representative data on the state of health and on the performance of health

systems; 72 countries took part in the survey and data have been collected by standardized personal interviews.

Fig. 7 illustrates the Regional variation in edentulism and it appears that the loss of teeth is lower in older people of the African and South East Asia Regions. In addition, the participating countries have been categorized into low-, middle- and high income countries based on their gross national income consistent to the World Bank criteria (World Bank, 2010). This categorization provides for the assessment of social inequalities in oral health at a global level. **Fig. 8** gives an overview of the burden of tooth loss among 65-74 year-olds according to national income level. The prevalence rate of edentulism is high (35%) in upper-middle income countries, but currently low (10%) in low income countries.

In several high income countries older people have often had their teeth extracted early in life due to pain or discomfort, leading to reduced quality of life (Petersen and Yamamoto, 2005). Remarkably, in recent years many of these countries have seen a positive trend of significant reduction in tooth loss among older adults (Petersen and Yamamoto, 2005). Meanwhile, extensive social inequalities are noted with tooth loss persistently being most prevalent among older people with poor education or low income. Studies of the oral health status of disadvantaged groups of old-age people have been conducted in some industrialized countries and these indicate that the home-bound and institutionalized suffer worse oral health conditions than do seniors living in the same community (Saub and Evans, 2001; Dye et al., 2007; Slade et al., 1990).

The loss of teeth without replacement with dentures implies severe loss of oral functioning; according to several CDOs and other reports from the countries, this condition is common among the poor and disadvantaged population groups of both developed and developing countries. Oral disability appears to be prevalent in the developing countries of Africa, Asia and Latin America where a poor dentate status reflects insufficient dental care and limited access to oral health services. In addition, country reports indicate that there is huge unmet need for denture treatment and restorative dental care, particularly among older people.

The CDOs of some countries informed that national or sub-national studies have been undertaken to highlight denture related conditions. These country reports indicate that the percentage of denture users with stomatitis and traumatic ulcer is high, ranging up to 45%. These conditions are exacerbated by poor nutrition and unhealthy life styles such as poor oral hygiene, excessive alcohol consumption, and use of tobacco.

Experience of oral health problems

The WHS (Petersen, 2009b; World Health Organization, 2006) also incorporates information on perceived health problems and the capacity of – including responsiveness – of national health systems. **Fig. 9** shows the percentages of older people having suffered from oral health problems during the past year by WHO Region; the scores were somewhat higher for the African, Eastern Mediterranean, and Western Pacific Regions. At global level, a pattern of social inequality is found in the experience of problems with mouth/teeth among the elderly (**Fig. 8**). In low income countries, about 40 % of 65-74 year-olds report oral health problems. The corresponding figure for high income countries is about 30%, which is remarkable in light of the availability of oral health services.

Oral health care

To ascertain whether the health system meets the oral health needs of older people, participants in the WHS were asked whether they received care for their oral health problems. People of the European Region score high on this question whereas relatively lower figures are noted for the Regions of Africa and South East Asia (**Fig. 10**). As demonstrated in **Fig. 11**, the social inequality in health care is profound at the global level; people of high income countries have received care for their oral health problems considerably more often than people of

low and middle income countries. Interestingly, the WHS data reveal huge disparities within countries as well; systematically, the poor and less educated older people are exceedingly underserved (Petersen, 2009b; World Health Organization, 2005). Moreover, for both low- and middle income countries the WHS survey verifies that people living in rural areas are less likely to have oral health care. This is in contrast to high income countries where equal proportions of older people living in urban and rural areas receive such care.

Oral hygiene behaviour

Remarkably, only a few countries appear to have national data on oral hygiene habits among older people (Schou, 1995; Petersen, 2007). Where such information is available, major differences between countries and across regions are found in the frequency and the type of oral hygiene practices of older people. Tooth brushing remains the most popular oral hygiene practice worldwide; however, according to the country reports this practice is less frequent in developing countries than in developed countries. Meanwhile, traditional oral self-care by use of chew sticks or powder is common in developing countries. Within regions, substantial variation is reported in the percentage of older people performing regular oral hygiene. Based on the present reports given by the countries the range is different from Africa (7.9-41.7%), to South-East Asia (32-84%), and Europe (22.2-93%). Toothpaste containing fluoride is widely used by older people in high-income countries, somewhat less frequent in middle income countries, but the use of toothpaste is rather infrequent in low-income countries.

Qualitative data: Barriers and opportunities related to the establishment of oral health programmes for older people

The responses to the questions concerning barriers to and possibilities for developing oral health care for older people were subjected to qualitative data analysis. The CDOs or ministries of health report several barriers to the establishment of oral health services for older adults and to implementation of oral disease prevention and oral health promotion. These barriers appear to relate predominantly to four principal factors: 1) national health policy and development level of oral health services; 2) economic standard of countries and resources available for oral health; 3) factors related to illness and health; and 4) barriers related to oral health attitudes and traditions among older people. These factors manifest differently in developed and developing countries respectively.

In the *developed countries*, the economic conditions allow financing of oral health systems, yet most of these countries appear to prioritize traditional treatment of disease over prevention. In several countries, the burden of disease is high in the disadvantaged population segment, including older people, and little attention is given to oral health intervention for such groups. Traditional treatment of oral diseases is extremely costly for older people, even in advanced industrialized countries. According to the CDOs, policies are primarily formulated for administration of oral health services and less often to achieve optimal oral health. It is stressed by CDOs or ministries of health from

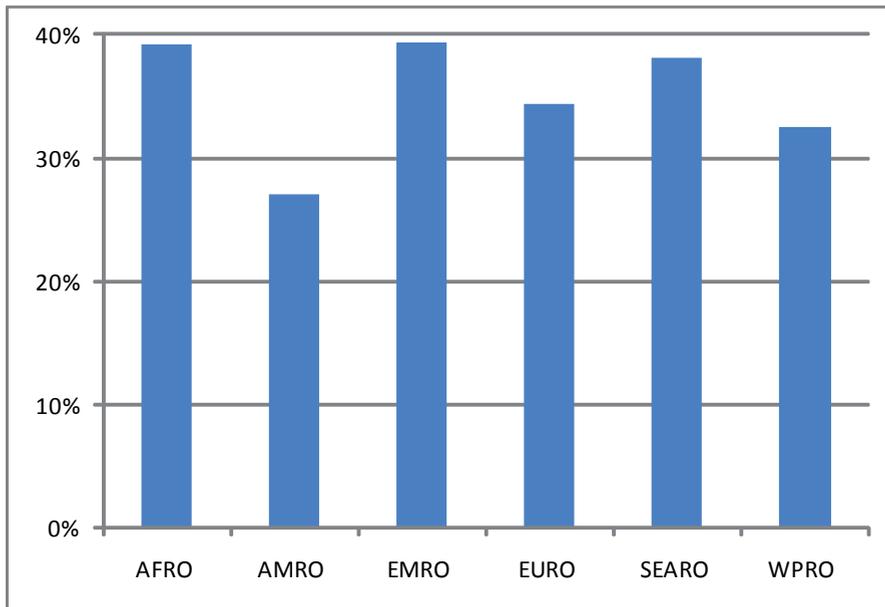


Figure 9. Percentages of 65-74-year-olds having experienced problems by teeth/mouth during the past year by WHO Regions – The World Health Survey (Petersen, 2009b; World Health Organization, 2006).

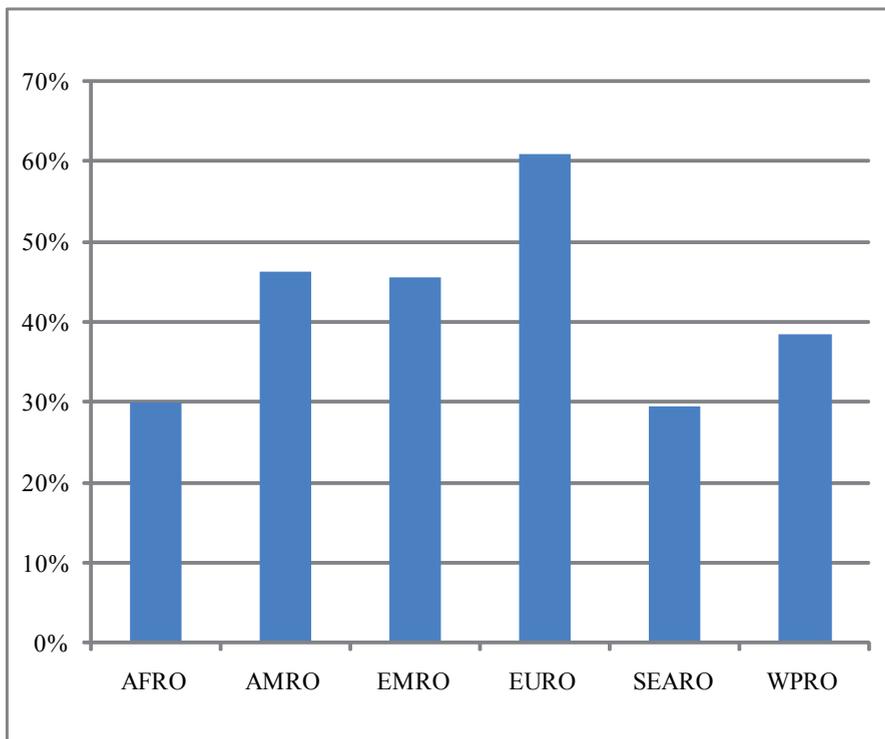


Figure 10. Percentages of people 65-74 years old who had health care related to problems with mouth/teeth according to WHO Regions – The World Health Survey (Petersen, 2009b; World Health Organization, 2006).

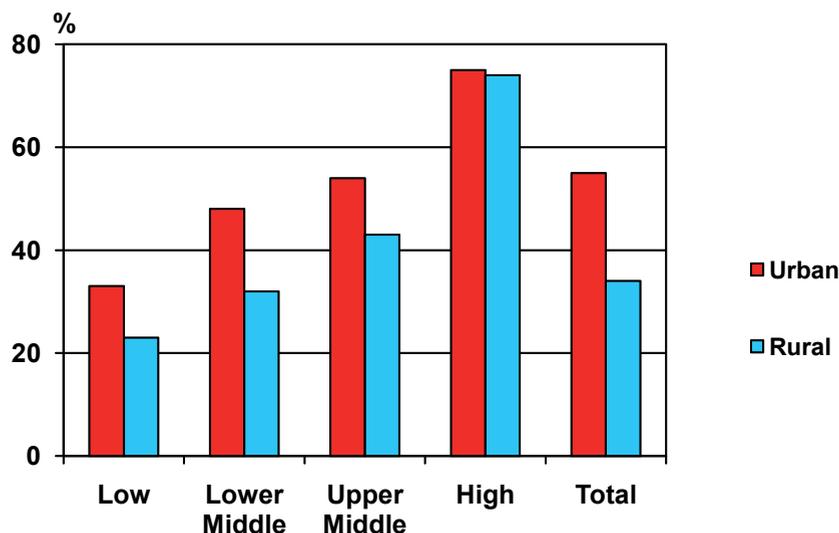


Figure 11. Percentage of people 65-74 years old in low-, middle- and high income countries who received health care related to problems with mouth and teeth, by urbanization - The World Health Survey (Petersen, 2009b; World Health

developed countries that the oral health of older people is largely neglected by health authorities. It is also noted that oral health systems clearly need to be reoriented towards prevention, oral health promotion, and outreach care. The CDOs of the Nordic countries report that government directives exist for establishment of oral health services; these imply that population based programmes are to be implemented for improving the oral health and the quality of life of older people. It is worth noting that evaluation of community programmes for old-age pensioners demonstrates positive results in terms of control of oral disease, better self-care, effective use of oral health service, and improved well-being (Petersen and Nörtov, 1994).

Despite the fact that poor oral health conditions are a major public health concern in *developing countries*, there is a sizeable gap between resources allocated and population needs. As reported by CDOs or ministries of health, the oral health problems of older people are neglected by the dental profession. In the vast majority of these countries policies for oral health have not been formulated, oral health services targeting this population group are rare, and services are primarily devoted to emergency care of pain and symptoms. Availability and access to oral health services are limited as care is for the most part offered by hospitals in major urban centres. Older people living in rural and remote areas in particular are left without any oral health care as health care providers here are scarce. Even simple dental care is unaffordable to the poor older people of the developing countries and third party payment is extremely rare. This fosters radical care treatment of disease, e.g. tooth extraction. Against this background, older people in these countries hardly ever receive appropriate oral health care. The poor oral health care situation for older people in developing countries is clearly documented for countries around the world by WHS (World Health Organization, 2006; Petersen, 2009b).

A number of important *opportunities* for establishing national oral health programmes for older people were

mentioned by the CDOs or oral health focal points of ministries of health:

1. The availability of updated information on oral health status, oral health behaviour, and use of oral health services by older people will help justify their specific needs and facilitate the formulation of policies and development of programmes for oral health and quality of life. WHO has a role to play, especially in relation to developing countries, in ensuring the capacity of ministries of health in survey methodology and in lending practical support to the collection of systematic oral health information.
2. Although it is an important determinant of general health and quality of life of older people, oral health is often considered a separate or isolated concern. Consequently, the incorporation of age-related oral health concerns into the promotion of general health may facilitate the development of oral health care for older people.
3. Given that some older people may experience financial hardship following retirement, the cost or perceived cost of treatment, together with lack of dental care tradition and negative attitudes to oral health, may deter them from visiting a dentist or other health care worker. Only a few countries have established public health programmes for older people thereby eliminating the financial barrier in oral health care. In most countries around the globe, oral health care is offered by private dental practitioners and there is a substantial lack of insurance coverage for oral health care of older people. The introduction of financially fair third-party payment schemes will help to finance oral health care and effective disease control, particularly among the poor and disadvantaged older people.

4. Adequate oral health manpower and primary health personnel trained in oral health care for the elderly will ensure appropriate oral health care as an integral part of primary health services.
5. Integrated approaches in health care based on collaboration between oral health personnel and other medical professionals trained in geriatric health care will help increase awareness of the importance of oral health and improve the quality of care.
6. Involving auxiliary oral health staff, health nurses, or primary health care workers in the oral health care of older people may increase the national capacity of oral health systems and help outreach to underserved population groups of older people.
7. Transportation is a serious barrier to oral health care of older people; use of mobile dental units or portable equipment can facilitate outreach to older people and ensure effective service. In some countries, residence homes or assisted housing may be practical settings for the establishment of appropriate oral health care of the dependent older people. Moreover, involving non-dental care takers in the responsibility of oral health care may increase the awareness of oral health problems among old age people and the importance of appropriate self-care. As emphasized by a few country reports, senior clubs may also be relevant platforms for community-based oral health services.

Conclusion

Where limitations were encountered in information from the questionnaires about oral health systems and programmes for promotion of oral health of the elderly, a review of the related scientific literature has been undertaken by WHO. The literature review in itself indicates a considerable need for operational research into innovative oral health intervention programmes and community initiatives for oral health promotion or curative care programmes for older people. According to the present questionnaire survey, only a few countries have implemented population-oriented programmes for oral disease prevention, promotion of oral health, and systematic oral health services targeting older people. It is primarily the Nordic countries that have established such programmes; here, oral health promotion activities for older people are a public health responsibility.

This report suggests some significant barriers to oral health care of older people. Most importantly, policy makers and health care providers often give low priority to care for this population group and are not sufficiently aware of the need for regular dental care. The survey responses confirm the profound oral health disparities among older people across and within countries and by WHO Region. In addition, the poor socioeconomic conditions of older people contribute to their under-utilization of oral health services even when these are available.

This questionnaire survey and the selected epidemiological literature indicate that updated information on the oral health of older people is needed, particularly in developing countries. Only a limited number of countries

have systematic data available on the use of oral health services by this population group and self-care practices in oral health. While certain industrialized countries may have data on the use of services by older people, such data are noticeably rare for developing and emerging countries and rural nations. Thus, there is a need to strengthen public health research on oral health conditions of older people.

Recommendations

This report indicates an urgent need to raise awareness about the poor oral health and low quality of life of older people. It clearly states the necessity to resolve the global burden of oral disease among the aged around the globe. The disease burden is already a significant public health problem in the developed countries; likewise, this burden is anticipated to grow dramatically in developing countries. As emphasized by the WHO World Health Assembly in 2007 (Petersen, 2008, 2009a), policy makers and national health authorities are called upon to take action to strengthen oral health care and research in relation not only to the existing disease burden and social risk factors but also to public health interventions that will improve oral health attitudes and healthy lifestyles among older people (Kwan and Petersen, 2010). The 1986 Ottawa Charter (World Health Organization, 1986) on Health Promotion established the core principles of promoting the health of people and underlined the importance of meeting the health needs of the poor and disadvantaged population groups. In 2005, the Bangkok Charter on Health Promotion (World Health Organization, 2005) made a global call for formulation of national policies for health promotion programmes. More recently, the implementation gap between the effective application of evidence based health promotion and disease prevention was considered at the Nairobi 7th Global Conference on Health Promotion (2009) (Petersen and Kwan, 2010).

The present report strongly advocates the translation of sound knowledge on oral health interventions into public health practice for the benefit of older people. Such interventions will require a range of actions by national health authorities. As risk factors for chronic systemic diseases are common to most oral diseases, the common risk factors approach will be instrumental in the organization and surveillance of oral health promotion and oral disease intervention programmes (Petersen, 2003; Petersen and Yamamoto, 2005). Public health planners and administrators are encouraged to use these principles in integrating oral health promotion for older people into general health programmes.

As for general health, oral health policies must consider the life-course perspective in order to achieve good oral health and oral function, and maintain quality of life. Preserving good oral health starts early in life by developing healthy lifestyles, practising appropriate self-care, and regularly using oral health services when available. In developing countries in particular, public health policies must support the establishment of age-friendly primary oral health care and ensure the training of personnel dedicated to taking care of older people. Interdisciplinary work involving medical professionals and ancillary health personnel in addition to oral health staff is the key to comprehensive care. Portable dental equipment or mobile dental units are relevant and

need to be considered by certain countries to treat older people with loss of autonomy either at home and/or in institutions. Currently, treatment of oral disease is almost unaffordable for older people. Thus, in order to meet the needs of poor and disadvantaged elderly it is crucial that oral health care is offered under financially fair third-party payment schemes.

In conclusion, planning of future oral health services will require great effort on the part of both the private and the public health sectors. The WHO Global Oral Health Programme recommends that countries develop national public health programmes for older people that are carefully planned and based on systematic information on oral health needs and on interventions considered effective in achieving defined measurable goals for health (Petersen, 2003; Petersen and Yamamoto, 2005). Such public health programmes must not be confined to treatment of disease and symptoms only, but be appropriately designed to attain better oral health and quality of life for older people.

Acknowledgments

The authors wish to express their sincere appreciation to Health Canada and the Canadian Dental Association for having offered financial support to this WHO project; we are also grateful to Colgate-Palmolive International for having provided grants for the compilation of the data. We are indebted to Dr Peter Cooney, Chief Dental Officer Health Canada; to Dr Benoit Soucy, Director of Professional Services, Canadian Dental Association; to Mr Pierre Rompré, Faculty of Dental Medicine, University of Montreal, Canada, and to Drs Sayaka Matsumoto and Naoko Okuyama, WHO Collaborating Centre for Translation of Oral Health Science, Niigata University, Japan.

References

- Dye, B.A., Tan, S., Smith, V., Lewis, B.G., Barker, L.K., Thornton-Evans, G., Eke, P.I., Beltrán-Aguilar, E.D., Horowitz, A.M. and Li, C.H. (2007): Trends in oral health status: United States, 1988-1994 and 1999-2004. *Vital and Health Statistics. Series 11, Data from the National Health Survey* **248**, 1-92.
- Harford, J. (2009): Population ageing and dental care. *Community Dentistry and Oral Epidemiology* **37**, 97-103.
- Jensen, P.M., Saunders, R.L., Thierer, T. and Friedman, B. (2008): Factors associated with oral health-related quality of life in community-dwelling elderly persons with disabilities. *The Journal of the American Society for Geriatric Dentistry* **56**, 711-717.
- Kandelman, D., Petersen, P.E. and Ueda, H. (2008): Oral health, general health, and quality of life in older people. *Special Care in Dentistry* **28**, 224-236.
- Kwan, S. and Petersen, P.E. (2010): Oral health: equity and social determinants. In: *Equity, social determinants and public health programmes*, eds. Blas E. and Kurup A.S. pp159-176. Geneva: WHO.
- Locker, D., Clarke, M. and Payne, B. (2000): Self-perceived oral health status, psychological well-being, and life satisfaction in an older adult population. *Journal of Dental Research* **79**, 970-975.
- Locker, D., Matear, D., Stephens, M. and Jokovic, A. (2002): Oral health-related quality of life of a population of medically compromised elderly people. *Community Dental Health* **19**, 90-97.
- Naito, M., Yuasa, H., Nomura, Y., Nakayama, T., Hamajima, N. and Hanada, N. (2006): Oral health status and health-related quality of life: a systematic review. *Journal of Oral Related Quality* **48**, 1-7.
- Petersen, P.E. (2003): The World Oral Health Report 2003: continuous improvement of oral health in the 21st century - the approach of the WHO Global Oral Health Programme. *Community Dentistry and Oral Epidemiology* **31**, 3-24.
- Petersen, P.E. (2007): Inequalities in oral health: the social context for oral health. In: *Community Oral Health*, eds. Pine C. and Harris R. pp31-58. London: *Quintessence*.
- Petersen, P.E. (2008): World Health Organization global policy for improvement of oral health - World Health Assembly 2007. *International Dental Journal* **58**, 115-121.
- Petersen, P.E. (2009a): 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 Dentistry and Oral Epidemiology* **37**, 1-8.
- Petersen, P.E. (2009b): The World Health Survey - The global burden of oral disease. Geneva: WHO.
- Petersen, P.E. and Kwan, S. (2010): The 7th WHO Global Conference on Health Promotion - towards integration of oral health (Nairobi, Kenya 2009). *Community Dental Health* **27** (Supplement 1), 129-136.
- Petersen, P.E. and Nörtov, B. (1994): Evaluation of a dental health programme for old-age pensioners in Denmark. *Journal of Public Health Dentistry* **54**, 73-79.
- Petersen, P.E. and Ogawa, H. (2005): Strengthening the prevention of periodontal disease: The WHO Approach. *Journal of Periodontology* **76**, 2187-2193.
- Petersen, P.E. and Ueda, H. (2006): Oral health in ageing societies. Integration of oral health and general health. Geneva: WHO.
- Petersen, P.E. and Yamamoto, T. (2005): Improving the oral health of older people: the approach of the WHO Global Oral health Programme. *Community Dentistry and Oral Epidemiology* **33**, 81-92.
- Saub, R. and Evans, R.W. (2001): Dental needs of elderly hostels residents in inner Melbourne. *Australian Dental Journal* **46**, 198-202.
- Schou, L. (1995): Oral health, oral health care, and oral health promotion among older adults: social and behavioral dimensions. In: *Disease Prevention and Oral Health Promotion*; eds. Cohen, L.K. and Gift, H.C. Copenhagen: Munksgaard.
- Slade, G.D., Locker, D., Leake, J.L., Price, S.A. and Chao, I. (1990): Differences in oral health status between institutionalized and non-institutionalized older adults. *Community Dentistry and Oral Epidemiology* **18**, 272-276.
- United Nations (2007): *World Economic and Social Survey 2007*. New York: United Nations Department of Public Information.
- World Bank (2010): *List of Economies April 2010*. New York: World Bank.
- World Health Organization (1986): *Ottawa Charter for Health Promotion: First International Conference on Health Promotion*. Geneva: WHO.
- World Health Organization (1997): *Oral health surveys- Basic methods (4th Edition)*. Geneva: WHO.
- World Health Organization (2002a): *The World Health Report 2002: Reducing Risks, Promoting Healthy Life*. Geneva: WHO.
- World Health Organization (2002b): *Active ageing: a Policy Framework*. Geneva: WHO.
- World Health Organization (2005): *The Bangkok Charter for Health Promotion in a Globalized World*. Geneva: WHO.
- World Health Organization (2006): *World Health Survey (WHS)*. Geneva: WHO. (<http://www.who.int/healthinfo/survey/en/index.html>).
- World Health Organization (2007): *WHO Global Oral Health Data Bank*. Geneva: WHO. (http://www.who.int/oral_health)

