CHAPTER 2

REVIEW OF LITERATURE

This chapter attempts to review in brief the various studies and surveys conducted by the experts, scholars and organizations relating to the prevalence of various oral health problems, patients’ knowledge attitude and practice towards oral health. It is presented in three sections.

SECTION: I

This section presents studies related to prevalence of various oral health problems, patient’s knowledge attitude and practice towards oral health, relationship between socio-economic status and oral health practices.

Dumitrescu and Kawamura (2009) conducted a field investigation on prevalence of caries in Bucharest, Romania. They found that “hopeless” participants were more likely to self evaluate their dental health as poor/very poor to be less satisfied by the appearance of their teeth, to report more non-treated caries, to brush their teeth less than twice a day and never use mouth rinse. They also found ‘hopeless’ participants were apt to have lower educational level, brush less frequently, have higher financial problems as the reason for not visiting the dentist, and report higher anxiety. Forty seven of 64 ‘hopeless’ participants and 90 of 112 ‘non-hopeless’ participants were correctly predicted by the above variables.

The result of their study found that impaired oral health and financial problems may pose an increased risk for hopelessness. Poor oral health can be regarded as a risk marker for the level of hopelessness.
Dumitrescu et al., (2009) conducted a study on dental care in Romanian population. They concluded that significant differences were found on the public self-consciousness (SC) scale in relation to denture/removable false teeth and on the total SC scale in relation to periodontal problems. When oral health behaviours were analyzed private SC was associated with oral health behaviours (flossing, use of mouth rinse, and dental visit frequency). There was no association between tooth brushing frequency and the self-consciousness subscales.

Fukuda et al., (2009) have studied the oral health status among low income people in Japan. A total of 109 inpatients received dental examinations. All participants were male. About half of the subjects (49%) did not have any medical insurance, and the percentage of the subjects who had 20 or more teeth was smaller than in a national survey in all age groups. The subjects had a higher reported frequency of oral symptoms compared with respondents to the national survey. Accessibility to dental clinics among the subjects was notably low. Dental condition and perceived oral symptoms among the subjects studied were poor compared to national survey respondents. They suggested that dental care to improve the oral health conditions of this segment of the population is needed.

Jain et al., (2009) made a study on oral health status of mentally disabled subjects in a special school in Udaipur, India. They found that there was a statistically significant difference between all the age groups in all the variables of oral hygiene index. The oldest age group has the highest scores for all the indices measured. Having Down’s syndrome, parents with lower educational status and low I.Q. were the most important predictors for poor oral health status. Their study highlighted that the oral health status of
the mentally retarded population was poor and was influenced by aetiology of the
disability, I.Q. level, and parent’s level of education.

A study performed by Marin et al., (2009) observed significant associations
between lack of dental care and poverty levels, living in the suburbs or at a remote
distance from dental clinics, and the lack of health insurance. However, in a multiple
regression analysis, only the geographical and socioeconomic characteristics of the
respondents and their households had statistical significance. They have concluded that
the section of the society that is less likely to visit their dentist regularly is those with
higher socio-economic risk. Having health insurance or having a dental clinic close to
home does not ensure more frequent check-ups.

According to the study undertaken by Milsom et al., (2009) Dental Access Centre
(DAC) patients were younger and from a more disadvantaged background than patients
attending ‘high street’ practices. They had worse oral health than high street dental
patients and experienced more frequent episodes of dental pain than ‘high street’ dental
patients and were more likely to be dentally anxious. They had different attitudes to
dental health than their ‘high street’ counterparts.

The study suggests that the DACs in Halton, St. Helens and Warrington are
offering treatment to a different population of patients to that seen in neighboring ‘high
street’ practices and therefore the DACs are fulfilling the function expected of them
locally.

According to the study undertaken by Muirhead et al., (2009) sacrificing goods or
services to pay for dental treatment were associated with visiting the dentist within the
past year. The predictors of visiting the dentist only when in pain/trouble were lone
parent status, immigrant status, paying for dental care with cash or credit, a history of an inability to afford dental care, a satisfactory/poor/very poor self rated oral health, number of teeth and having a perceived need for dental treatment.

This study identified that dental care utilisation was associated with relinquish spending on other goods and services, which suggests that dental care utilisation is a competing financial demand for economically constrained adults.

Sabbah et al., (2009) conducted a study on the role for cognitive ability in socio economic inequalities in oral health in London. Oral health was indicated by extent of gingival bleeding, extent of loss of periodontal attachment and tooth loss. Simple reaction time test, symbol digit substitution test and serial digit learning test indicated cognitive ability. Education and poverty-income ratio were used as markers of socio-economic position. Participants with poorer cognitive ability had poorer oral health for all indicators. The association between oral health and socio-economic position attenuated after adjustment for cognitive ability. Cognitive ability explained part, but not all of the socio-economic inequalities in oral health.

Sabbah et al., (2009) in their study found that the probabilities of poorer oral health were higher among African-American, Mexican-Americans and other ethnic groups than in White Americans. Adjusting for income and education resulted in a reduction in the (ORs) odds ratios for having poorer perceived oral health (44%), tooth loss (29%), gingival bleeding (61%) and periodontitis (30%) among African-Americans than White Americans. From this study, they have concluded that education and income play an important role in ethnic differences in oral health. Despite the major impact of
socio economic position, the results imply that there are causes additional to socio
economic position for ethnic differences in oral health.

Spencer et al., (2009) in their study on oral health status of Vietnamese, observed
that dental care utilization was low and mostly problem driven. Further, one third of the
adults had periodontal pockets; calculus was highly prevalent; caries level was moderate
with most as untreated decay. Factors related to caries were gender, hygiene practices,
socio economic status, location and dental visiting. The oral health status of the
Vietnamese adult population was compromised by various factors. There was indication
of deteriorating oral health of this population.

A study instituted by Alam et al., (2008) revealed that an overall 16.5% of the
study population (33% men and 4.7% women) used tobacco on a daily basis. Modes of
tobacco use included cigarette smoking (68.5%), oral tobacco (13.5), hukka (12%) and
cigarette smoking plus oral tobacco (6%). Among those not using tobacco products, 56%
were exposed to environmental tobacco smoke. Illiteracy was found significantly
associated with tobacco use. Population attributed percentage of tobacco use increases
steadily as the gap between no formal education and level of education widens. They
have concluded that there was a positive association between tobacco use and rural area
of residence, male gender and low education levels. Low education could be a proxy for
low awareness and consumer information on tobacco products.

A study was made by Allen et al., (2008) in order to assess the knowledge that
diabetic patients have of their risk for periodontal disease and their oral health related
quality of life (OHRQOL). Thirty-three percent of participants were aware of their
increased risk for periodontal disease, 84% of their increased risk for heart disease, 98%
for eye disease, 99% for circulatory problems and 94% for kidney disease. Half of the participants who were aware of their increased risk for periodontal disease had received this information from a dentist. Dental attendance was sporadic, with 43% reporting attendance within the last year. OHRQOL was not significantly affected by the presence of diabetes in the group surveyed, in comparison with a previous survey of non-diabetic patients. Awareness of the potential associations between diabetes, oral health and general health needs to be increased in diabetic patients.

A similar study was performed by Bakhshandeh et al., (2008) in order to investigate the oral health behaviour and the smoking habits among diabetic adults in Helsinki, Finland. They found that 29% reported brushing their teeth on twice-daily basis. Women (p=0.05) reported higher frequencies of twice-daily tooth brushing. Subjects with moderate diabetic control showed the highest rate for twice-daily tooth brushing (p<0.001). Of all the subjects, 47% reported having visited a clinician within the past 12 months. This rate was the highest among those without diabetes-related complications. Subjects who had a physician referral were more likely to report having had a dental visit within the past 12 months. They suggested that the present results call for improvement in the level of oral self care and the regularity of dental checkups among diabetic adults to compensate for their increased risk for oral diseases.

Barbadoro et al., (2008) accomplished a study on “Improvement of knowledge, attitude and behaviour about oral health in a population of alcohol addicted persons” in Italy. The result showed that seventy six individuals participated in the study. About half had been addicted to alcohol for more than 10 years; 81.6% smoked at the time of survey; 31% declared that they never used toothbrushes or that they brushed less than once a day.
At one year from the intervention, the 42 participants who reached follow-up showed a great improvement in knowledge and attitude towards oral health. In particular, tooth brushing had become a daily routine affair after every meal for 67.1% of participants. They suggest that education of alcohol dependent individuals in a rehabilitation setting may contribute to their attention to oral health and willingness to change habits.

Another attempt was made by Chaves and Vieira-da-Silva (2008) on “Inequalities in oral health practices and social space” in Salvador, Brazil. This study analyzed that differences were found between the two study groups both with respect to action of personal care and in seeking and using dental services. This, in addition to poor material and living conditions, and difficult access to restorative dental work in the public sector, may explain part of the pattern of tooth loss found in the adult Brazilian population. The adoption of effective communicative and educational actions by health professionals should be stimulated.

De Reu et al., (2008) found that concerning oral health behaviour 67% reported nutritional habits conducive to poor oral health whereas 64% reported good oral hygiene habits. Statistical analysis by means of a logistic regression model revealed that only the living condition had a significant influence on oral health behaviour (p < 0.05) and care-index (p < 0.05). There was no significant correlation between the parent’s occupation and subject’s educational level and the oral health behaviour and oral health status of the study group.

A similar study was done by Dumitrescu et al., (2008) in oral health to investigate whether self-conscious; self reported oral health status and oral health related behaviours were associated. Significant differences were found in public self-consciousness and
social anxiety according to several variables: anxiety, stress, depression and current non-treated caries. A significant difference was found in public self-consciousness for the reason for dental visits (p<0.05). Oral health behaviours such as tooth brushing, flossing, mouth washing and last dental visit were not influenced by each of the self-consciousness subscales. The results suggest that self-consciousness might be a psychological risk marker that influences self-reported oral health status.

Another study was undertaken by Gurkan et al., (2008) in order to evaluate the oral health status and oral hygiene habits of dialysis patients in Izmir, Turkey. They described that 61.4% were presently candidates for renal transplantation, 13.1% were edentulous and nearly 47.6% had 15 or fewer remaining teeth. Dentate patients who regularly brushed twice a day and flossed were few 14.3%, 2.4% respectively. Gingival bleeding was reported by about two thirds of dentate patients (67.5%). None of the patients were referred to a dentist or were attending regular dental care. The percentage of patients who were aware of oral cavity related infections and importance to oral hygiene following renal transplantation was very low (20.7% and 9.7% respectively). They have concluded that poor oral health, unsatisfactory daily oral hygiene habits and insufficient awareness of the importance of oral health are frequent among Turkish dialysis patients.

A study was done by Haugejorden et al., (2008) in order to assess inequality in dental status associated with educational level, gross personal and family income among Norwegian adults. They assessed that low gross personal and adjusted family income was associated with increased likelihood of having fewer than 20 natural teeth. Educational level was significantly associated with dental status in bivariate but not in multivariate
analyses, except once among males. The predictors of socio-economic inequality in
dental status accounted for a limited proportion of explained variance when controlling
for age, place of residence, perceived oral health compared with others, perceived
importance of oral health, dental attendance and smoking. They concluded that socio-
economic inequality in dental status persists among Norwegians aged 25-79 years but
absolute differences have decreased during the last 30 years.

A survey was conducted by Hullah et al., (2008) in order to assess the oral
hygiene habits; self reported oral health and factors associated with dental attendance
among pregnant women at a North London hospital, the majority of who are immigrants.
The majority reported good oral hygiene habits such as brushing their teeth twice a day
(73.7%) and using mouthwash (51%). However, their dental attendance was poor and the
average time since their last visit to a dentist was 1.8 +/- 1.61 years. Over one third of the
women questioned did not know about the availability of free dental care during
pregnancy and for 12 months after, 33% visited a dentist in pregnancy and half of them
needed and received treatment; 15% of mothers had more than one pregnancy and yet
were still unaware of free dental care provided during pregnancy and 12 months after
birth. Only 36% questioned women regularly visited a dentist. There appears no
difference in attitudes to dental care between immigrant and British born pregnant
women.

A study carried out by Lacerda et al., (2008) found that oral health status was
found to interfere in daily routine of 20.7% of participants and was more severe for
11.4%. Household crowding, low income neighborhoods, female gender and orofacial
pain in the previous six months were associated with higher interference in quality of life.
Another study was executed by Marques et al., (2008) in order to assess the association between oral health and hygiene practices and oral cancer in the metropolitan area of Sao Paulo, Southeastern Brazil. They found that the use of complete dental prosthesis was not associated with oral cancer but regular gum bleeding showed a strong association (OR 3.1, 95% CI 1.2-7.9). Those who never attended a dental visit were more likely to have oral cancer (OR 2.5, 95% CI 1.3-4.8). Daily mouthwash use showed a stronger association to pharynx (OR 4.7; 95% CI 1.8-12.5) than mouth cancer (OR 3.2, 95% CI 1.6-6.3). They concluded that gum bleeding, no dental care, and daily mouthwash use were factors associated with oral cancer regardless of tobacco and alcohol consumption.

Another study was performed by Okunseri et al., (2008) in order to assess the self-reported oral health perceptions and associated factors in an adult Somali population living in Minnesota, U.S.A. About 49% of subjects reported poor/fair oral health and 38% reported poor/fair general health. Seventy four percent rated their access to dental care as poor/fair and 83% reported that they did not have a regular source of dental care. Self-rated oral health was significantly associated with marital status (p<0.05), and self-rated general health (p<0.01). They have concluded that a substantial proportion of Somali adults rated their oral health and access to dental care as poor/fair.

A study was performed by Okunseri et al., (2008) in order to describe the Self Rated Oral Health (SROH) and use of dental services among Hmong adults in Milwaukee, USA. They found that 49% rated their oral health as poor/fair and 30% rated their general health as poor/fair, 39% reported that they did not have regular source of dental care, 46% rated their access dental care as poor/fair, 43% visited a dentist and 66%
visited a physician within the past 12 months. Bivariate analyses demonstrated that access to dental care, past dental visits, age and SRGH were significantly associated with SROH (P<0.05). Multivariate analyses demonstrated a strong association between access to dental care and good/excellent SROH. About half of adults rated their oral health and access to dental care as poor.

According to Sharda and Shetty (2008), the mean percentage score for oral health knowledge, attitude and behaviour were significantly higher in final year dental students compared to first year dental students (p < 0.001). The linear regression analysis showed a statistically significant linear relationship of attitude with the knowledge (p < 0.001) and behaviour with the attitude (p < 0.001) of the students. They have concluded that besides the positive changes revealed in oral health knowledge, attitude and behaviour, among the students from first to final year of dental studies, preventive behaviour among the students could still be improved.

Another survey was conducted by Tanwir et al., (2008) in an adult population in a deprived district of Karachi, Pakistan with reference to factors influencing oral health. They found that pan and betel nut chewing had a strong influence on the perceived oral health of the respondents. Pan chewers, 32% of the respondents had a greater risk for oral problems, odds ratio 3.63. While most of the respondents used a tooth brush for oral hygiene, a substantial proportion (27%) used their fingers. The oral hygiene method had no influence on the perceived oral health, nor did consumption of sweets and tea with sugar. Over 80% of the participants seldom or never visited a dentist. Cleaning frequency was significantly associated with oral health; those who cleaned their teeth at
least daily had fewer oral problems. Almost all participants considered that eating sweets, smoking and chewing pan and betel nuts endangered oral health.

Thomas et al., (2008) conducted a study on “oral and dental health care practices in pregnant women in Australia”. Of the 445 women enrolled in the survey, 388 (87%) completed the questionnaire. Most women demonstrated reasonable knowledge about dental health. There was a significant association between dental knowledge and practices with both education and socio-economic status. Women with less education and lower socio-economic status were more likely to be at higher risk of poor periodontal health compared with women with higher levels of education and higher socioeconomic status. Most women were knowledgeable about oral and dental health.

Another study by Zabos et al., (2008) described that of the 50 health conditions queried about, problems with teeth or gums were the chief complaint among participants (30%). Those more likely to report oral health problems than other participants had annual household income of less than $9000 (36%), were unemployed (34%), and lacked health insurance (34%). The privately insured were almost twice as likely to have seen a dentist for oral health problems (87%) than were the uninsured (48%).

They concluded that there is an urgent need to provide oral health services for adults in Harlem. Integrating oral health into comprehensive primary care is one promising mechanism.

A systematic study was executed by Al-Shammari et al., (2007) pointed out that 62% of the respondents reported brushing their teeth at least twice daily, while daily use of dental floss was uncommon (11.8%). Adequate tooth brushing habits were significantly associated with female gender, educational level, non-smoking status, and
history of recent preventive dental visits (p<0.001). The majority of subjects reported multiple oral health problems (64.7% with 2 or more and 41.8% with 3 or more). Factors associated with multiple oral health complaints included younger age, smoking, not having a recent preventive dental visit and brushing the teeth less than twice daily.

Another study was attempted by Al-Shammari et al., (2007) on “Barriers to seeking preventive dental care by Kuwaiti adults” revealed the following: Of the 1925 respondents, 620 (32.2%) had a dental visit within the previous six months; 504 (26.2%), between 6 and 12 months and 801 (41.6%), more than 12 months ago. The most common reason for the last dental visits were pain or a dental emergency, need for restorative treatment and an examination/prophylaxis. The strongest factors for not having preventive visits were not using a mouth rinse daily, flossing less than once a day, dental fear, belief that there is no need for visits unless pain was present, brushing the teeth less than twice a day, and believing that appointments are too far ahead. Also older respondents (>30 years), female gender and those having only high school education or less were less likely to visit a dentist for preventive reasons. More than half of the studied population reported not having made a preventive visit for more than one year.

Bower and Newton (2007) carried out a study on “oral health acculturation in Albanian-speakers in south London” . They found that participants attended the dentist more regularly and brushed their teeth more frequently in the U.K, particularly those from lower social class groups. However young people consumed more sweet foods and drinks than in Kosovo. The priority for oral health was higher in the U.K for most participants. Mothers of young children were more interested in prevention in the U.K, mainly as a result of receiving oral health information from health visitors and agencies.
However, oral health priorities generally remained treatment focused. Material and structural changes which impact on oral health behaviours may be overlooked. Improving oral health knowledge can be a crucial step in shifting oral health priorities from a treatment to a prevention focus. However, unhealthy choices may persist due to the impact of wider cultural norms.

Another study was attempted by Cohen et al., (2007) in Baltimore, U.S.A. They found that the focus group participants indicated that toothache pain affected their ability to perform normal activities, such as their job, housework, social activities, sleeping, talking and eating as well as making them depressed and affecting their social interactions. Numerous prescription and non-prescription medications as well as home remedies and self care strategies were used for pain relief, although these were generally of limited and uncertain benefit. While receiving care at a dental office was the most preferable option for care, most participants reported multiple barriers, including the cost of dental care that resulted in long delays in seeking dental care. The main reason for eventually seeking dental care was severity of the pain.

Another attempt was done by Doshi et al., (2007) to assess the oral hygiene knowledge and practices of university students in Mangalore, India. They concluded that statistically significant differences were found between the two groups (Engineering and Medical students) with respect to the knowledge of fluoridated toothpastes, frequency of toothbrush renewal, use of dental floss and a tongue cleaner (p<0.001). The groups were similar in all other practices including the utilization of dental services. There were no significant differences between the self-reported oral hygiene knowledge and practices
among medical and engineering university students, but the knowledge levels of the students were considerably lower than expected.

Krustrup and Petersen (2007) made a study on “Dental caries prevalence among adults in Denmark”. They found that significantly more untreated decay was found among men, in rural areas and in low income groups. A significantly higher score of filled surfaces were found among older adults and in the group with more education. They concluded that reducing social inequality in dental caries experience remains a challenge to oral health services in Denmark; strengthening community-oriented oral disease prevention and health promotion is needed to improve the oral health in the Danish adult population.

A systematic study was performed by Pau et al., (2007) on demographic and socio-economic correlates of dental pain among adults in U.K. Of the 4942 valid responses, 46.1% were men, the proportion of subjects in each 10 year band age group up to 65 years ranged from 10 to 23%, and 42.6% were manual workers. Dental pain was reported by 28%. After controlling for gender and age, manual workers were more likely to report dental pain (OR=1.21, 95%. CI=1.06-1.37), non-utilization of dental services (OR=1.43, 95%. CI=1.12-1.82), and perceived treatment need (OR=1.28, 95%. CI=1.03-1.60). They concluded that inequality by social class, age and gender exists in the experience of dental pain, access to dental services and perceived treatment need in the U.K adult population.

Smith et al., (2007) made a study on “Oral health in rural and remote Western Australia”. They found that advanced periodontal disease was present in 60.8% of all patients. Almost 88% of patients had experienced toothache in the previous 6 months.
Almost a third (31.4%) of people could not remember the last time they went to the dentist. Less than half of the people reported brushing their teeth daily (40.4%) with 37.9% cleaning occasionally. A total of 52.4% of patients identified themselves as a smoker of tobacco products. Past smokers accounted for 10.5% of the participants. The most common self reported reason for visiting the clinic was for hole in tooth/ fillings required (37.4%), followed by pain /urgent problem (24.8%).

Another attempt was made by Stahlnacke (2007) and concluded that there were social differences in self-perceived oral health, with those born outside Sweden, those living single, those with lower level of education, and those being blue collar worker perceiving worse oral health. Socio-economic factors affected dental care utilization as well. Health perception, both oral and general health, and dental anxiety also affected utilization. Increasing patient cost for care did not appreciably affect utilization. Almost no correlation was seen between socio economic factors and satisfaction with dental care.

A similar study was conducted by Turrell et al., (2007) in Brisbane, Australia. They found that respondents with low levels of education and those from a low income household reported poorer oral health for each outcome independent of neighborhood disadvantage. The socioeconomic characteristics of neighbourhoods are important for oral health over and above the socio economic characteristics of the people living in those neighbourhoods. Policies and interventions to improve population oral health should be directed at the social, physical and infrastructural characteristics of places as well as individuals.

Al-Shammari et al., (2006) made a study on “Dental patient awareness of smoking effects on oral health” and found that the prevalence of smoking was 29.3%.
Fewer smokers and non-smokers thought that oral health and smoking are related and that smoking affected oral cancer. They concluded that smoking dental patients are significantly less aware of the oral health effects of smoking than non-smokers.

Another attempt was performed by Barrieshi–Nusair et al., (2006) on dental health attitudes and behaviour among dental students in Jordan. They came to a conclusion that the percentage of students brushing their teeth twice daily or more often was 4 times higher amongst clinical students than amongst pre-clinical students. The number of items regarding use of dental floss and tooth paste, bad breath, colour and appearance of teeth and cigarette smoking was similar between preclinical and clinical students. With advancement in dental school, dental students’ oral health awareness and attitudes improved in some aspects.

Bou et al., (2006) carried out a study on oral health status of 1500 university students in France. They came to a conclusion that of the 1500 subjects, 27.6% smoke, while 43% eat sweets on a regular basis. The female students are more careful with their dental health (tooth brushing frequency) and mouth wash use are statistically significant (p<0.001).

Eli Schwarz and Edward (2006) performed a study on dental health knowledge and attitudes among the middle aged and the elderly in Hong Kong. Two populations aged 35-44 years and 65-74 years were selected for the study. In both age groups, increased level of education and regularity of dental visit were strongly associated with dental knowledge. Women, regular dental care users, and prevention oriented respondents had higher attitude scores. There was no correlation between knowledge and attitudes. Some improvement in knowledge seems to have taken place, especially on the
cause of caries with fewer 35-44 year old respondents claiming lack of knowledge of the causes of caries and gum disease than in a previous study.

Jamieson and Thomson (2006) found that edentulism was most prevalent among those from low socio-economic status households who were resident in high deprivation areas. Poor self rated oral health and 2+ years since the last dental visit were also most prevalent among these same individuals. In contrast, respondents from high SES households located in the least deprived areas had the lowest prevalence of edentulism, poor self reported oral health or 2+ years since their last dental visit. Those form the other household/area SES combinations occupied intermediate positions.

Kassim et al., (2006) conducted a study and found the following: Regarding the oral health knowledge, 43% did not know any causes of dental diseases while 36%, 17% and 12% knew that diet, dirt on teeth and bacteria were responsible causes, respectively. 50% did not know any preventive measures for dental diseases while the rest indicated abstention from the consumption of sugary foods; and only 0.8% mentioned the use of fluoridated toothpaste as a preventive measure for dental caries. They concluded that there is a low level of oral health awareness and moderately high level of dental caries experience in this community with women apparently carrying the biggest burden of dental caries.

According to Mumghamba et al., (2006) on oral health practices among young mothers in Tanzania, they found that tooth brushing practice was 99%; tongue brushing (95%), plastic tooth brush users (96%), chewing stick(1%), wooden toothpicks(76%), dental floss(<1%), and tooth paste (93%). The prevalence of plaque and gingival bleeding on probing was 100%, gum bleeding during tooth brushing 33%, calculus 99%
and tooth decay 55%. Self reported bad breath is a cause of concern among young mothers, and associated significant factors were gum bleeding on tooth brushing and deep periodontal pockets.

Tanwir et al., (2006) performed a study on perception of oral health among adults in Karachi, Pakistan. Their main findings were: over half of the participants (54%) perceived that they had oral problems: esthetic issues predominated (33%) but pain (17%), cavities (15%) and difficulty in chewing (8%) were also reported. Most participants (94%) have dentition of >or=20 teeth. There was a weak but significant negative correlation between age and number of teeth (r =-0.03, p < 0.001). Age and female gender were significantly associated with pain, bleeding gums and periodontitis. Pain was a more frequent complaint among poorly educated subjects than among the better educated. Diabetics comprised 17% of respondents were reported higher frequencies of dental problems, bleeding gums and calculus and fewer teeth. Smoking was reported by 30% of all subjects and was significantly associated with pain, bleeding gums and periodontitis.

Uetani et al., (2006) conducted a study and their major findings were: dental caries were highly prevalent among both the Co-HO minority and Kinh majority groups. The higher numbers of dental caries among children with primary teeth were associated with a higher frequency of consuming sweets. Most people (87%) aged 14 and over had periodontal problems.

Another attempt was made by Varenne et al., (2006) and their main findings were: The level of oral health knowledge, attitude and self-care were low; 57% of 35-44 years olds carried out tooth cleaning on a daily basis. Pain and discomfort from teeth
were common while dental visits were infrequent. Tooth cleaning was mostly performed by use of chew sticks. Use of tooth paste was rare; 18% of 35-44 year olds reported use of fluoride toothpaste. Significant differences were found in oral health knowledge, attitudes and practices according to location and gender. In 35-44 year olds gender (female), high education level, dental visit and occupation (government employee) were the significant factors of high dental caries experience.

Wamala et al., (2006) performed a study to analyse the effects of socio-economic disadvantage on access to dental care services and on oral health in Sweden. The main findings were: every instance of increasing levels of socio-economic disadvantage was associated with worsened oral health but, simultaneously, with decreased utilization of dental care services. People with severe socio-economic disparities were 7-9 times as likely to refrain from seeking the required dental treatment. These associations persisted even after controlling for living alone, education, occupational status and lifestyle factors. Lifestyle factors explained only 29% of the socio-economic differences in poor oral health among men and women, whereas lack of access to dental care services explained about 60%. These results call for urgent public health interventions to increase equitable access to dental care services.

Al-Omari and Hamasha (2005) conducted a study in order to determine the difference in oral health attitudes and behaviour between male and female dental students at Jordan University. The response rate was 83.7% with 48% males and 52% were females responding. Female students reported brushing their teeth more frequently than male students (p<.001). Approximately 47% of the male students brushed their teeth less than twice daily compared to 21% of the female students. Also, female students believed
in the necessity of using tooth paste during brushing more often than male students (p < 0.01). On the other hand, smoking was much more frequent among males than among females (31% vs. 4%) (p < .001). This survey shows male students visit the dentist only when they have dental pain. While this was more than their female peers, it was not statistically significant (p=0.056). In general, the present study showed dental students in Jordan had poor oral health.

Alwaeli and Al-Jundi (2005) made a study to evaluate the degree of periodontal health knowledge, and awareness, among pregnant women in Jordan. This study revealed that a minority of the pregnant women had knowledge or ability to identify dental plague (16.4%) and its harmful effects (22.5%), while most of them (88%) were that bleeding gums indicated the presence of periodontal disease. It also revealed that (71.6%) of the pregnant women knew the main cause of gum disease; however 56% of them did not believe that frequency of teeth brushing should be increased during pregnancy and only 5.1% believed there might be a relationship between gum diseases and premature labour. Knowledge and awareness for pregnant woman about their teeth and gingival condition is generally poor.

Harada et al., (2005) conducted a study to determine associations of lifestyle with dental health behaviours in a rural population in Japan. The study revealed that subjects in a younger group (18-39 years of age) and subjects who had never smoked brushed their teeth more frequently. Experience of social volunteer work and presence of systematic disease were correlated with the use of extra cleaning devices. Associations of female gender with frequency of tooth brushing and use of extra devices were weakly positive. The subjects who considered dietary combination carefully and those who lived
alone were predisposed to visit a dentist regularly. The results indicate that dental health
behaviour is associated with lifestyle as well as demographic factors.

Honkala and Al Ansari (2005) performed a study to describe self reported oral
health, oral hygiene habits and frequency of visits to a dentist among pregnant women in
Kuwait. They found that every fourth respondent was in her first pregnancy, while 36%
already had three or more children. Every fifth woman felt that her oral health was poor,
and one-third of the women believed that they had periodontal problems currently.
About two-thirds of the women were brushing more than once a day and almost all (94%)
at least once a day. Over the previous 6 months, 40% had experienced dental pain. Half
of the women had visited a dentist during pregnancy, mostly for dental pain. Most of the
women had received no instructions concerning oral health care during their pregnancy.
They concluded that a large proportion of the pregnant women in their study had oral
health problems; however, half of the women had not seen a dentist during their
pregnancy.

A similar study was carried out by Liu et al., (2005) to investigate the oral health
knowledge, attitudes and behaviour of adults in Deyang, China. The major findings
were: More than half of the surveyed adults claimed “having pain of mouth during the
last one year”. More urban adults (61.3%) used fluoridate toothpaste than suburban and
rural adults (6.9%, 16.8%). 61% and 71.5% of rural and suburban adults had never seen a
dentist, compared with 32% of urban adults. Logistic regression analysis showed that
urban adults having pain in mouth during the last year were more likely to visit a dentist
in the last two years. They concluded that although the oral health attitude is good
among people in Deyang, the knowledge is poor. Dental service utilization was not enough and the situation was also worse for rural adults.

Another attempt was made by Okunseri et al., (2005) on self-reported toothache experience in an adult population in Benin City, Nigeria. The main findings were: The proportion reporting toothache experience in the previous 12 months was 34%; painful/bleeding gums 28% and oral ulcers/painful spots 14%. Univariate analysis showed that toothache experience was associated with time since last dental visit (p<0.001), age (p<0.001), gender (p<0.001), and education (p<0.001). Fewer males than females reported toothache (25% vs. 42%, OR 1.65) but more males reported bleeding gums (37% vs. 19%, OR= 0.34). They concluded that toothache experience was the most prevalent oral health problem reported by adults and were associated with age, gender and last dental visits.

Tubaishat et al., (2005) performed a study aimed at determining the perceived relationship among miswak and tooth brush usage on oral health beliefs and behaviours of Jordanian adults. They concluded that overall, the level of oral health knowledge was low; of 71 people who attempted to define dental plaque, only 26% knew the meaning of dental plaque. While 12% have never been to a dentist, and 12% visit the dentist on a regular basis, the majority (63.2%) of the respondents reported that they visit the dentist only when they have pain. The majority (72%) uses the tooth brush, 20.5% use tooth brush plus miswak and only 3% use miswak alone. Toothbrush users believe that using the tooth brush plus miswak is most effectively in reducing mouth debris (chi^2=32.069, d.f=16, p=.01); and level of education is significantly associated with the type of oral cleaning device used (chi^2=25.817, d.f =12, p=0.05). About 19% of the study participants
use dental floss, 60.9% use mouth rinses and 8.3% use inter-dental brushes. Educated people tended to use toothbrushes and toothbrush plus miswak. In general, the oral health awareness level among Jordanian adults is poor and needs to be improved.

Zhu et al., (2005) performed a study to describe oral health knowledge, attitudes and behaviour of adults in China. The study revealed that 32% of the 35-44 year olds and 23% of the 65-74 years olds brushed at least twice a day but only 5% used fluoridated toothpaste; 30% and 17% respectively performed "Love–Teeth-day" recommended methods of tooth brushing. A dental visit within the previous 12 months was reported by 25% of all participants and 6% had a dental check-up during the past two years. Nearly 15% of the subjects would visit a dentist if they experienced bleeding from gums; about 60% of the subjects paid no attention to signs of caries if there was no pain. Two thirds of the urban residents and one fifth of the rural participants had economic support for their dental treatment from a third party, either totally or partially. Significant variations in oral health practices were found according to urbanisation and province. At age 35-44 years 43% of participants had daily consumption of sweets against 28% at age 65-74 years. Dental caries experience was affected by urbanisation, gender, frequency, time spent on and method of tooth brushing. Knowledge of causes and prevention of dental diseases was low with somewhat negative attitudes to prevention observed.

Another attempt was carried out by Al-Otaibi and Angmar-Mansson (2004) in order to analyze prevailing oral hygiene practices and oral health awareness among urban Saudi Arabians. The study indicated that for the majority (>88%) oral hygiene routines were introduced very late, after the age of 7 yr. Habits were strongly correlated to the level of education (p<.001); subjects with less education favoured the miswak. Among
the better educated, tooth brushing started earlier ($p<.001$), females used toothbrush more often than males ($p<.001$), and miswak use by women was less frequent than by men ($p<.001$). Despite the availability of free dental care at the public health centers, 89% of the participants at the military centre sought only emergency care, in contrast to 54% at the university centre. There are pronounced variations in oral hygiene habits, related mainly to age and educational levels.

A1-Otaibi (2004) did a study on oral hygiene practices among urban Saudi Arabians. This study concluded that oral hygiene practice is introduced very late, is strongly correlated to educational level, and that more women prefer tooth brushing to miswak use. It was further concluded that miswak use was at least as effective as tooth brushing for reducing plague and gingivitis, and that the antimicrobial effect of Salvadora Persica is beneficial for prevention/treatment of periodontal disease. There is clearly a need for further oral health education in Saudi Arabia.

Amjad Wyne et al., (2004) performed a study to determine the oral health knowledge, attitude and practices of the parents of children attending a clinic in Riyadh. The study showed that almost all (98.6%) the parents thought that good dental health was important for optimal general health and that routine check-up or dental visits help in maintaining good dental health. While it six in every ten (60.3%) parents thought that teeth should be cleaned three times daily, only four in ten (41.1%) parents actually brushed thrice daily. Majority of the parents understand the main causes of dental caries such as poor oral hygiene (93.2%) and high sugar intake (84.9%), but more than one fourth (28.8%) did not think the frequent intake of soft drinks as a caries risk factor. A majority (82.2%) of parents claimed that they observed their children’s diet (82.2%) and
dental health (78.1%). About one-fourth (24%) of the parents responded that they did not spend time with their children about how to maintain good dental health. It can be concluded that the parent’s knowledge about oral health is generally satisfactory with some expectations and their attitude towards oral health is positive. But, there are shortcomings in the area of preventive practices.

Another study was instituted by Petelo et al., (2004) in order to determine levels of self reported oral health, dental attendance patterns and barriers to seeking dental care among a Pacific community in New Zealand. The study indicated that over half the respondents had not attended a dentist within the previous two years and more than three-quarters had last attended a dentist because of pain. Most respondents had paid for their last treatment themselves, and over half had received an extraction because of infection. Those who had not received education beyond secondary school were more likely to have used a public dental service than those who had achieved higher education levels. Males were more likely to have had a tooth removed due to infection than females; and Cook Island, Niuean and other Pacific groups were more likely to have had a tooth removed than Samoans. Tooth loss was a common occurrence among this population.

Shah and Sundaram (2004) attempted to evaluate the dental caries experience and restorative treatment needs of an elderly Indian population and to study the impact of socio-demographic variables, oral hygiene practices, oral habits and dietary practices on them. They indicated that urban-rural differences in caries experience were statistically significant. Multivariate regression analysis showed that dental caries was associated with literacy level, oral hygiene practices, oral health perception and diet. They concluded that dental caries prevalence was high amongst the studied elderly population.
and significant differences were observed in those living in a rural compared with an urban setting. Only a small percentage of elderly had evidence of previous restorative treatment whereas their unmet treatment need was significant.

Almas et al., (2003) performed a study to find out the knowledge and practices of oral hygiene methods among primary and secondary school teachers in Riyadh, Saudi Arabia. The study revealed the following: Almost 86% male and 90% of female teachers felt that dental caries is due to the wrong method of tooth brushing, while sugar and sugary drinks were considered the main factor by 90% of male and 98% of female teachers. 75% of male and 72% of female teachers considered irregular tooth brushing cause of gums disease with 32% of male and 39% of female teachers not knowing details with regards to microbial relationship of gum disease. Tooth brushing preference was common among 45% male and 49% female teachers due to perceived effect of better cleaning, while almost an equal percentage of male and females (62%) used miswak due to Sunnah. 33.5% of female teachers brushed 3 times a day as compared to 19% male teachers. Male teachers preferred horizontal tooth brushing (40%) while female teachers preferred circular tooth brushing (45%). Miswak was more commonly used by male teachers as compared to female teachers. 32% of females and 28% of male teachers were regular attendees to the dentist. Males were more satisfied by their oral health as compared to female teachers and 56% of male and 63% of female teachers visited dentist only on having pain (toothache). It was concluded that there is a need to enhance their knowledge regarding oral health and disease.

Al-Otaibi et al., (2003) conducted a study to analyze prevailing oral hygiene practices among urban Saudi Arabians. It was found that 73% used a toothbrush daily,
while a miswak was used daily by 65%. Significant differences were found between genders and age groups, and between the centers. Regular miswak use was more prevalent among men (p<0.01), while women used toothbrush more than miswak (p<0.05). Regular toothbrush use was more prevalent in the youngest age groups (p<0.001). They concluded that there are large differences in current oral hygiene habits among Saudi Arabians, and that these are related mainly to age and socio-economic level, and to a lesser extent gender.

A similar study was conducted by Amarasena et al., (2003) in order to explore the socio-demographic factors associated with tooth loss in rural inhabitants of Sri Lanka. The study revealed the following: The mean number of tooth loss in the sample was 5.17+/-5.43. Tooth loss increased significantly with age. Sinhalese had significantly fewer lost teeth (5.05 +/-5.38) compared to Tamils (6.54 +/-6.18) and Muslims (6.02 +/-5.21) whereas education, income, oral hygiene practices and tobacco use were significantly associated with tooth loss in the bivariate analysis. A forward stepwise multiple regression analysis revealed that age, Muslim ethnicity and quantified tobacco use were positively associated with tooth loss while better socio-economic conditions and good oral hygiene practices were negatively linked with tooth mortality independent of other factors. Age, Muslim ethnicity, quantified tobacco use, income, education, brushing frequency and substance used for cleaning had significantly affected tooth loss. Quantified tobacco use and oral hygiene may be regarded as modifiable socio-demographic risk indicators associated with tooth mortality in Sri Lankans.

Another study was conducted by Buhlin et al., (2003) to investigate the oral care habits and the ability of the participants to afford dental care in an adult Swedish
population. The results indicated that 16% had experienced dental problems without seeking help and more than 10% reported problems with chewing. In the group as a whole, 31.5% had sought no dental treatment, partly for financial reasons. When using a logistic regression model, as regards bleeding gums as a risk indicator of cardiovascular disease (CVD), correcting for diabetes, education, gender, age and tobacco use, the estimated odds ratio was 1.70 (p=0.05). It also revealed that a relationship between the presence of bleeding gums and CVD, especially amongst the oldest participants.

A study was conducted by Christensen et al., (2003) in order to assess the present level of oral hygiene practices in the Danish adult population. The study revealed the following. Tooth brushing twice-a-day was reported by 68% of the dentates while 32% brushed their teeth once-a-day or less frequent. Daily use of toothpicks was reported by 28% while daily use of dental floss was reported by 11%. Oral hygiene habits were more frequent amongst women. Tooth brushing twice-a-day was related to regular dental visits, dental care during school years, and a high level of education. Daily use of toothpicks was more common among females and older persons. Regular dental visits, having 20 or more teeth in situ, and regular dental service through school years were predictors for daily use of toothpicks. Amongst denture wearers, one-third cleaned their dentures twice-a-day. Frequency of denture cleaning was significantly associated with gender, age, number of teeth left and educational level.

Hobdell et al., (2003) carried out a study to determine the association between oral diseases and socio-economic status in Houston, U.S.A. The study indicated the following: There is a discernable association between the three oral diseases and the variables selected, which varies in strength, being strongest for chronic destructive
periodontitis and weakest for oral cancer. Dental caries lies in between. The degree to which variables account for differences in the three oral diseases between the countries studied in striking, being insignificant for oral cancer incidence, modest for oral cancer mortality, stronger for dental caries and strongest for destructive periodontal disease. Removing variables with strong co-linearity with the Human Development Index has little effect on the regression coefficients.

King (2003) performed a study on “Tooth brushing and utilization of dental service in Fiji”. The study concluded that: 31% of the respondents indicated that they learnt to care for their teeth from dental professional. Of the individuals who brushed their teeth twice a day, 41% visited the dentist within the last 12 months. Majority of the individuals (65%) who brushed their teeth twice or more daily indicated that they needed dental treatment. Individuals who visited the dentist within the last 12 months reported having a tooth extracted (53%), check-up (29%), filling (8.9%), polishing of teeth (3.7%), gum problem (3.2%) and false teeth (1.8%). Individuals who brushed twice daily did not visit the dentist within the last 12 months because nothing was wrong (63.2%), too busy (9%) and afraid of dentists (7%).

Another study was performed by Ogawa et al., (2003) to determine the dental caries prevalence among the Myanmar population. The majors findings were: the mean number of decayed teeth (DT) in rural areas was higher than that in urban areas, while the mean number of filled teeth (FT) in rural areas was lower than that in urban areas. Mean knowledge and attitude scores for correct answers were also significantly higher for the urban than the rural subjects. There were statistically significant correlations between the correct/incorrect responses to knowledge and attitude questionnaires on oral health and
the mean number of DMFT (Decayed, Missed and Filled Teeth). Knowledge, Attitude any Practice (KAP) pertaining to oral health of Myanmar population, especially those of rural subjects, might not be satisfactory and related to threaten their dental caries status.

Another study was done by Patton et al., (2003) to investigate dental care among HIV/AIDS patients in North Carolina, USA. The important findings of the study were the following: Compared to whites, blacks were significantly more likely to be female, older, less educated, to have lower income, and have acquired HIV by heterosexual sex or injecting drug use. Although two-thirds of patients reported good oral health, blacks were significantly more likely to have loose teeth, needed extractions and be episodic dental care utilizers. Primary barriers to dental care were cost (30%), fear (19%), and low motivation (13%). 65% of patients had unmet dental needs in the last three years. Race, cost, fear and immune competence were significantly associated with unmet dental need in a multivariable model.

Vazquez and Swan (2003) did a study on access to care and attitudes toward oral health among the Hispanic population in Wichita, USA. They found that older respondents had greater consistency in oral health care, were more likely to have a regular place they received their care, and more recent visits for care. Education beyond high school predicted more dental visits, fewer months since the last oral health examination, and greater frequency of oral health care. Office workers showed more recent and more oral health care visits. Those with greater education perceived their oral health as better, recognized greater oral health needs, and were less likely to delay seeking care. Insured participants averaged fewer months since their last dental visit.
Aleksejulniene et al., (2002) did a study on "Dental health patterns in young adults" in Lithuania, Norway. They found that experience related to caries and treatment differed with regard to residency and between genders. Analysis of self-reported data elucidated different aspects of psychosocial and socio-economic status and a variety of lifestyle factors. Different patterns of dental health were revealed for men and women and for urban and rural participants. It can be concluded that factors influencing the dental status of Lithuanians are not only multiple, they seem also to influence dental health in complex ways.

Alkhatib et al., (2002) instituted a study on oral health problems among young Syrian adult population and found the following: The prevalence of oral health problems was high, with 96% (353) of respondents claiming that they experienced one or more problems in the previous year. Two thirds of participants 65% (239) claimed they had dental pain in the previous year. The analysis revealed that dental pain experience was significantly associated with age and gender. Socio-demographic variations in experience of dental pain were apparent, with young men of lower education having the greatest odds of dental pain experience in the previous year.

Arnrup et al., (2002) carried out a study on “Attitudes to dental care among parents in Sweden”. The study group parents had significantly lower socio-economic status and a higher level of dental fear as compared to parents of ordinary child patients. They found indications of a poorer dental knowledge and a differing responsibility taking profile among study group parents. Their children also had sweets more often. As compared to parents of younger children, the older study group parents had lower socio-
economic status and showed a lower responsibility taking related to the child's treatment refusal.

Ide et al., (2002) made a study to examine the relationship between intake of sweets and oral health status in the adult population, in Japan. The authors found that among males, subjects who took sweet drinks almost every day, compared to subjects who hardly took, had higher risk of missing teeth, filled teeth and gum bleeding. Dose response relationships were also observed between intakes of sweet drinks and these variables. No significant association was recognized between intake of candies of chewing gum and oral health status. The results indicated that intake of sweet drinks is a determinant of oral health status, independent of dental health behaviour, particularly among males.

Another attempt was carried out by Karikoski et al., (2002) on Oral self-care among adults with diabetes in Finland. The major findings were as follows: Self-reported twice-a-day brushing among dentate participants was significantly more common among women and the highly educated, but was less common compared with earlier studies among Finnish adults. A quarter of those surveyed reported never cleaning interdental surfaces, with the number of daily cleaners being nearly equal (27%). Age 40 years or over and recent treatment by a private dentist was significant predictors for daily interdental cleaning. The proportion of those who had attended a dental appointment within the last year was 63%, and the main reason for the last dental visit was on emergency among almost one fifth of those surveyed. They suggested that a need exists for further promotion of oral self-care among adults with diabetes.
Lukes and Miller (2002) carried out a study on “Oral health issues among migrant farm-workers” in Illinois, USA. Utilization results showed that 51% of those surveyed neither had not sought oral health care in the previous year, citing absence of pain or discomfort as the primary reason. Forty-one percent reported seeking oral health care on a yearly basis, while 42% only sought care when in pain. Primary services received were examinations, prophylaxes, and restorations. Having received brushing instructions was reported by 58%, while 45% had received instructions on flossing. Most respondents reported regular brushing habits, but only 11% used floss daily, 38% occasionally, and 52% never used it at all. Only 7% reported smoking. Meanwhile, bleeding gingiva was reported by 50%, swollen or tender gingiva by 37% and tooth loss by 49%. The authors concluded that the majority of migrant farm workers reported access to care behaviours, and having never or episodically received dental services.

Mwangosi and Nyandindi (2002) performed a study to assess the oral health related knowledge, behaviours and self-assessed status of primary school teachers in Rungwe, Tanzania. They found the following: School teachers were generally well informed and had moderate attitudes and behaviours to oral health related issues. However, a few but important deficiencies in this regard have been identified on which recommendations are presented. A substantial proportion of teachers reported having dental problems. However, the teachers had positive attitudes towards oral health education to pupils as part of a teaching curriculum. A professional support is called upon for teacher from the oral health personnel in terms of oral health education training at teachers’ colleges, to prepare the teacher trainees for their future task. They suggested
that in-service teachers need to be motivated to improve their awareness on sound oral health information, attitudes and behaviours.

Another study was made by Polychronopoulou et al., (2002) to determine the oral health attitudes, behaviour of Greek dental students. The major findings were the following: A significant increase per year of study was observed in the number of students reporting careful brushing of the teeth and being able to clean their teeth well without the use of toothpaste. Each year of education significantly increased the probability of disagreement with statements such as "I think my teeth are getting worse despite my daily brushing"; [OR: 1.5 (1.2 – 1.9)]. "It is impossible to prevent gum disease with tooth-brushing alone" [OR: 1.3 (1.1 – 1.5)] and "I put off going to the dentist until I have a tooth ache” [OR: 1.3 (1.2 – 1.6)]. All summary questionnaire scores increased significantly in the fourth and fifth years of dental studies.

Another systematic study was performed by Sofola et al., (2002) to assess the knowledge, attitude and practices of primary school teachers in Lagos State, Nigeria. The results revealed that majority of them have a poor attitude to oral health issues. The few of them who have attended a dental clinic mostly had extractions done. It was also found that there is a need for improved knowledge of oral health disease and their prevention among the teachers for an effective school based oral health education programme. The study suggests ways in which this could be achieved.

Another systematic study was performed by Vargas et al., (2002) on oral health status of rural adults in the United States. The authors found that adults living in rural areas were more likely to report having unmet dental care needs and were less likely to have had a dental visit in the past year compared with adults living in urban areas. The
prevalence of edentulism among rural adults was 16.3 percent, almost twice that of urban adults. Caries experience also was more likely to be greater among adults residing in rural areas. They concluded that oral health disparities exist among U.S. adults living in rural and urban areas.

Cruz et al., (2001) conducted a study to compare the perception of oral health among subgroups of Asian-American residents of New York City, USA. When data were analyzed in multivariate context, only ethnicity and income were significant predictors of perceived oral health, after adjusting for DMFT. The within-group multivariate analysis of the three ethnic subgroups’ results were as follows: Among the Chinese there were no significant predictors, only income was strongly suggestive; among the Indians, number of missing teeth and number of years in the USA were significant predictors; and within the Pakistani group, DMFT was the only significant predictor. Predictors associated with the perception of oral health are different for different ethnic group.

Another study was made by Hjern et al., (2001) to describe oral health and use of dental care in relation to socio-economic determinants in Sweden. They found that low education level, having no cash margin and being born outside of Sweden was associated with higher odds of problems with chewing, wearing a prosthesis and not having been treated by a dentist during the 24 months preceding the interview. The socio-economic differences in dental treatment and problems with chewing were greater in the age group 45-64 years compared to 25-44 years old. The prevalence of problems with chewing increased from 7.1% in the 1988-89 survey to 9.1% in the 1996-97 survey. The socio-
economic distribution of oral health and use of dental care in the adult population was similar in the two surveys.

Another attempt was made by Lin et al., (2001) to assess oral health knowledge, attitudes, and practices of Chinese adults. The analysis revealed that almost all of the middle-aged and more than 90% of the dentate elderly surveyed claimed that they brushed their teeth every day and used toothpaste during tooth brushing, but awareness about fluoride content was lacking. The respondents showed poor oral health knowledge but positive attitude towards oral health, providing a basis for more community-based oral health education programmes.

Naidoo et al., (2001) carried out a study on perceptions of oral health in South Africa. The study revealed that a high proportion (36%) of people had experienced oral health problems. Teeth problems were most commonly reported in the higher age-groups, non-urban areas, Eastern Cape, Northern Cape and Free State, people with little education and those classified as non-urban Africans. Significant differences were found in regard to periodontal disease, tooth loss, knowledge of fluoride between groups according to age, geographic location, race and level of education. 62% of the respondents reported that they had lost some of their natural teeth and in some communities almost a third of the respondents were edentulous. The high prevalence of hepatitis and HIV/AIDS infection poses a higher risk to oral health personnel and the public.

Rimondini et al., (2001) carried out a study to assess the oral hygiene attitude in Italian university students. They found that all students reported using toothpaste and most of them (92.1%) brushed their teeth at least twice a day using artificial, medium,
stiffness bristles. The toothbrush was generally (81.6%) replaced within 3 months. Few subjects (14.9%) said they used dental floss daily or utilized other devices. A majority of subjects (59.9%) had a dental examination within the year previous to the interview. Only 33.6% of the sample showed consistent frequency and modalities of oral hygiene habits. Since the sample was characterized by a young, urbanized, homogeneous group with a high educational level and frequently from an upper middle class social status, the analysis probably gives a supra-estimation of the positive behaviour.

Tiller et al., (2001) performed a study on oral health status and dental service use of adults with learning disabilities in Sheffield, UK. They found that people living in residential care were significantly older (43.2 years) than those based in the community (36.3 years) (p<0.05). Adults living in the community had significantly more untreated decay and poorer oral hygiene than their counterparts in residential care. Adults in residential care had significantly more missing teeth than those in community care. Subjects living in the community were significantly less likely to have a dentist and to use community dental services than their residential counterparts; they were more likely to attend only when having trouble.

Another study was carried out by Astrom et al., (2000) to assess oral health knowledge, beliefs and self reported behaviour among teacher trainees in Uganda and Tanzania. The study indicated that Tanzanian students had less experience with oral impairments, were more resolutely prepared to teach about the importance of personal habits for oral health maintenance, and had higher levels of oral health knowledge than Ugandan students. Ugandan students endorsed frequent consumption of sugar products more often than their Tanzanian counterparts but they were more diligent in visiting
dentists. Most of the Tanzanian (97.4%) and Ugandan (95.6%) students reported daily tooth brushing. In both countries, beliefs about the importance of preventive behaviours of oral health were closely related to the frequency with which such habits occurred. This cross-cultural consistency highlights the importance of cognitive factors.

Another study was performed by Madden et al., (2000) to study about oral health status and access to care in a rural area of Andhra Pradesh, India. They found that there was a high prevalence of chronic inflammatory periodontal disease in this population, and most of this was untreated. In view of the difficulties in access to health care, it would be prudent to offer good preventive oral health care within the rural community.

Petersen et al., (2000) performed a study on oral health behaviour and attitudes of adults in Lithuania. The study indicated that nearly all persons of ages 35-44 had natural teeth, whereas 14% of 65-74 year olds were edentulous. Among the dentate persons, 45% of the young adults against 36% of the elderly claimed having poor teeth, and 66% and 55%, respectively, had experience of pain from teeth or mouth during the past year. At ages 35-44, 33% of participants reported tooth brushing at least twice a day and this was the case for 21% of 65-74 year olds. Dental visits made within the past year were indicated by 60% of young adults and 43% of the elderly; 83% of all participants reported that their last visit to the dentist was due to acute oral symptoms. In general, the participants had positive dental knowledge and attitudes; however, 56% were unaware of any effect of fluoride. The bivariate analyses showed that perceived oral health status and oral self-care practices were related to use of dental services. The multivariate analyses of dental visiting habits revealed the effects of gender, urbanization, presence of natural teeth, and experience of dental problems, attitudes to dental care and dentists, and
education. It concluded that preventive dental services should be introduced and the establishment of community-based oral health promotion programmes should be urgently needed for Lithuania.

Stenberg et al., (2000) performed a study on “Attitudes to dental health and care among 20 to 25 years old” in Sweden. The study revealed that a high proportion of the respondents considered themselves to have a high need for dental care. They had a strong conception of being able to influence their own dental health. Most responds had adopted good oral hygiene habits but dental floss was rarely used. The majority of subjects indicated that they attended dental examinations on an annual basis. It stressed that there is a need for further investigation into patient’s attitudes to dental health and dental care.

Unfer and Saliba (2000) attempted a study to evaluate the popular knowledge and everyday practices in oral health of public services’ users in Brazil. It was verified the predominance of the age group between 21 to 40 years old and females. The socio economic pattern is characterized by low schooling and family income. The search for oral diseases control are due to individual awareness of the need of oral hygiene and dental care; fluoride in toothpaste and drinking water and its benefits were not known by the population. They concluded that there is a need to promote the collective awareness in health promotion in every level of the society.

Kawamura and Iwamoto (1999) made a study on present status of dental health knowledge attitudes/behavior and perceived oral health of Japanese employees. The subjects comprised 77,845 employees, 76% of whom reported delaying a dental visit until they had toothache, with about 60% delaying even when they discovered decayed
teeth. The majority did not regard decayed teeth as a disease and only a minority reported regular dental visits. About three quarters reported bleeding gums on brushing, although more than half had never been taught professionally how to clean their teeth and less than 5% flossed daily. More than half believed that false teeth were inevitable in old age, and that their teeth were getting worse despite daily brushing. About 70% of the employees thought that it was impossible to prevent gum disease with tooth brushing alone, and nearly half believed toothpaste with fluoride was effective in preventing periodontal disease. Reorientation of oral health care in Japan, therefore, is urgently needed and dental services have to be provided for the implementation of systematic oral health promotion for employees in the workplace.

Kwan and Williams (1999) conducted a study to explore oral health beliefs, knowledge and behavior among a sample of Chinese people, in the United Kingdom. The study indicated that regardless of gender and age, the majority of respondents believed that it was natural for people to lose all their teeth in old age. Less than half were convinced that they would be able to keep their own teeth for life. The majority of the sample considered that they were susceptible to dental diseases; the consequences were thought to be serious. Approximately half presumed that dental diseases were preventable although the aetiology of dental caries, periodontal disease and tooth loss was poorly understood. While 94% claimed to brush their teeth as part of routine dental care, dental visiting and dietary restriction of sugar intake were reported only in 61% and 30% of the sample respectively. A low level of dental awareness was found among the UK Chinese.

Murano et al., (1999) carried out a study to investigate the oral health status and behaviour of the adult population in the workplace in Japan. It revealed that overall, 48%
needed treatment for dental caries, 44% needed calculus removal, and 23% needed treatment for periodontal disease. Although there were no oral health complaints, 20% had early caries, 40% had dental calculus, and 19% had periodontitis. Compared to males, more females brushed their teeth, had home dentists (44%) and received more regular dental health check-ups at least once a year (48%). There was no relationship between oral health status and regular check-ups in both males and females. The results revealed that receiving regular dental check-ups from home dentists was not popular in Japan. Further, the role of home dentists is not preventive oriented. It was concluded that it is necessary to provide regular oral health examination and health promotion programmes for adult population at the workplace in Japan.

Petersen and Mzee (1998) carried out a study to analyze oral health profile of school children, mothers and school teachers in Zanzibar. They found that the prevalence of caries experience was higher in urban than in rural areas. Daily tooth cleaning was reported for 59% of the children and 67% of the mothers. The use of traditional Miswak was frequent in rural areas whereas toothbrushes were common in urban areas. The level of knowledge was similar for mothers and teachers. Training in oral health topics is needed for school teachers to provide for school-based health education of children.

Another study was made by Abegg (1997) to analyse oral hygiene habits among Brazilian adults in an urban area of Southern Brazil. It was found that daily tooth brushing was frequent. The median and mode were three, and it was associated with sex and socio-economic status. The majority of the sample population (67.5%), reported using dental floss and its use was associated with sex and socio-economic status. The use of toothpicks was frequent: 54.6% of the study group used them, and their use was also
associated with sex, age and social class. The majority of the sample population had a moderate level of dental plaque (62.6). The level of dental plaque was associated with social class. A quarter of the subjects did not have teeth with gums bleeding after probing. Bleeding gums were associated with age and social class.

Ahlberg et al., (1996) conducted a study on “Dental knowledge, attitudes towards oral health care among male industrial workers” in Finland. The major findings were the following: In the study group, 60% of the subjects had their last dental visit within a year but 91% of the subsidized workers compared to 79% of the controls had visited a dentist in the past two years (p<.001). The subjects had similar attitudes towards the importance of regular dental care and its implications for dental and general health. Subsidization explained the disparity in the current dental visiting pattern between the groups better than the possibility of using working hours for dental visits. The results demonstrate a positive impact of subsidization on the utilization of dental services.

Hede (1995) performed a study to describe dental health behaviour and self-reported oral health problems among hospitalized psychiatric patients in Denmark. Two hundred and forty dentate patients were interviewed with regard to participation in school dental care, dental visiting habits, and self-assessment of oral health, dental anxiety and oral hygiene habits. Dental visiting habits were associated with gender, psychiatric diagnosis, duration of mental disorder, and fear of dental care. Moreover, tooth brushing habits varied with gender, status as inpatient or day-hospital patient, number of admissions, and psychiatric diagnosis. Constant regular dental visits were observed among 31% of the participants, whereas regular tooth brushing was reported by 55%. Compared with reference figures of the general population, these figures reflect relatively
poorer dental health behaviour among the study participants. The study underlines the
need for specific preventive dental programs, which aim at improving the poor dental
health behavior among psychiatric patients.

Vonhagen et al., (1994) carried out a study to assess the oral hygiene practices
and dental knowledge by means of a questionnaire, in a group of 239 adults in
Mozambique. Despite the relatively low educational status of the sample, the level of
dental knowledge appeared satisfactory. However, there still exists a need for increasing
the awareness of good oral hygiene in this population.

Another study was conducted by Ronis et al., (1993) on “Tooth brushing,
flossing, and preventive dental visits by Detroit-area residents in relation to demographic
and socioeconomic factors” in USA. It revealed that the three preventive behaviors like
brushing, flossing and preventive dental visits were positively associated with socio-
economic status. Females were more likely than males to perform each of the behaviours
at the recommended frequency. The behaviors were only weakly associated with age.
Whites were more likely than non-whites to make regular dental visits, but frequency of
brushing and flossing did not very substantially across racial groups. The impact of race
on frequency of dental visits was found reduced when socio-economic status was
statistically controlled. Findings suggest that socio-economic status, race and sex remain
important considerations when planning dental health education or other interventions.

Esa et al., (1992) made a survey on oral hygiene practices among Malaysian
adults. The survey revealed the following: The majority (89.7%) of the subjects reported
that they brushed their teeth, 68% used toothpaste containing fluoride, but only 8.4%
flossed their teeth. Generally the younger group had better oral hygiene habits. The
higher the socioeconomic status of the adults, the better their tooth cleaning practices. Awareness concerning dental floss was low regardless of all the socio-demographic variables. It was concluded that there is a need to improve the dental health practices of adults in Malaysia.

Keogh and Linden (1991) performed a study to investigate the knowledge, attitudes and behaviour related to dental health of adults living in two neighbouring areas in Belfast, Northern Ireland. The study revealed that those in the higher socioeconomic status groups had clearer knowledge, more positive attitudes and more appropriate behavior related to dental health than those in lower socio-economic status groups. The differences between the residents of the two areas were less obvious than those noted between the different socio-economic status groups. It was concluded that the results revealed misconceptions amongst adults in Northern Ireland regarding the causes of dental disease and how it might be prevented both in them and in their children.

Tewari et al., (1991) made a survey to evaluate the existing status of knowledge, practice and attitudes towards oral health of rural communities of Haryana, India. It revealed that use of datun was more prevalent (56% in adult community and 49% students) than tooth brush (35% adult community and 34% students). 37% of the total community had the knowledge of brush being the best oral hygiene measure .25% of the community using brush were brushing only once/day. The knowledge of the community regarding the role of fluorides in prevention of dental caries was completely lacking: 1.8% of the community was using fluoride dentifrice. 35-45 percent of the communities were practicing sweet foods/drinks etc. four times a day. The Snyder test showed a positive relation with frequency of sugar intake.
Kotsanos and Sakellari (1988) performed a study on “Dental health practices of 506 Greek adults attending a dental clinic”. The study revealed the following: It appears that 49% of men and 27% of women do not brush their teeth daily (7% of men never do), while age, sex and education are significant parameters of most dental practices examined. Only 24% have been shown brushing technique by a dentist, whilst toothbrush selection is mainly based on advertisement or non-professional advice. Although about 84% of the dentifrices sold in Thessaloniki contain fluoride, only 20% of this sample was aware of its usefulness. The results call for urging the public to have higher dental education and motivation to practicing oral hygiene procedures.

SECTION: II

This section provides studies related to willingness to pay of the patients for various dental treatments.

Leung and McGrath (2010) carried out a study on patient preference on willing to pay (WTP) for implant therapy. The study revealed that ninety-four percent and 84% of the subjects chose implant treatment to replace missing anterior and posterior teeth, respectively. The mean WTP amounts for anterior and posterior tooth replacement were HK$11,000/HK$10,000 (p>0.05). Higher WTP amounts were obtained from females, subjects without missing teeth or restorative need, and had attained higher level of education (p<0.05). Gender (p<0.05) level of education (p=0.042), and the presence of missing teeth (p=0.001) were independent predictors of WTP.

A study was carried out by Chuck et al., (2009) to identify chronic pain and patients’ preferences for levels of improvement in pain-related morbidity (PRM) by
measuring their willingness to pay (WTP) for reducing their pain intensity and pain-related disability. They found that the WTP to completely minimize PRM was $1428 per month. Reduction in pain intensity was valued more highly than functional improvement. For every dollar, an individual was WTP to improve his/her disability to the lowest severity (mild), he/she was WTP approximately $2 to reduce pain intensity to moderate and $3 to reduce pain intensity to mild. The potential return on investments in terms of health improvement gained was $3318 per patient visit per year. The morbidity associated with chronic pain is worth approximately $1428 for every month in the chronic pain health state. From the patient’s perspective, treatment and management strategies that focus on reducing pain intensity would have the greatest impact on improving health-related quality of life. Valuing health improvement in monetary terms allows for direct monetary comparisons between the costs of chronic pain interventions and their associated health returns.

Esfandiari et al., (2009) made a study which was designed (i) to measure the preferences of edentulous patients for mandibular two-implant overdentures using Willingness-To-Pay (WTP) and Willingness-To-Accept (WTA), (ii) to assess the effect of long-term financing on WTP and (iii) to assess the desired role of health care plans in financing dental prostheses. Forty-six per cent (6/13) of the CD wearers and 70% (16/23) of the IOD wearers were willing to pay three times more than the current cost of conventional dentures for implant prostheses. These percentages were increased to 77% (CD) and 96% (IOD) if participants could pay for implant overdentures in monthly installments. Eighty-six per cent (31/36) of all participants in both groups (21/23 IOD; 10/13 CD) thought that the government should cover at least some of the cost of implant
overdentures. This study revealed that, the majority of elderly edentate individuals who have not experienced mandibular two-implant overdenture therapy are willing to pay the cost, particularly when payment can be made in monthly installments.

An analysis conducted by Iskedjian et al., (2009) on willingness to pay for a treatment for pain in multiple sclerosis. Multiple sclerosis (MS) is a chronic neurological disease that affects 240 per 1, 00,000 Canadians. Of these patients, 10-80% (average 70%) experience pain. Sativex is a cannabis-based drug recently approved for neuropathic pain. The study revealed the following: Mean (SD) age of participants was 39 (13) years, with a female: male distribution of 56:44. The decision board was presented in both English (85%) and French (15%). Of 500 interviewees, 253 (50.6%) chose the ‘pills and oral spray’. Mean monthly WTP for the insurance premium for those who chose the ‘pills and oral spray’ was Can dollars 8 (SD+/15, median 4, range 0-200). Assuming that 51% of the general populations are willing to pay additional premiums as reported in this study, the premiums collected would cover the cost of Sativex for all Canadian MS patients experiencing pain, with a surplus.

Another study was performed by Shiroiwa et al., (2009) on International survey on willingness-to-pay (WTP) for one additional QALY gained. They measured willingness-to-pay (WTP) for one additional quality-adjusted life year gained to determine the threshold of the incremental cost-effectiveness ratio. This study used the web data to compare WTP for the additional year of survival in a perfect status of health in Japan, the Republic of Korea (ROK), Taiwan, Australia, the UK, and the US. The research utilized a double-bound dichotomous choice and analysis by the nonparametric Turnbull method. WTP values were JPY five million (Japan), KWN 68 million (ROK),
The discount rates of outcome were estimated at 6.8% (Japan), 3.7% (ROK), 1.6% (Taiwan), 2.8% (UK), 1.9% (Australia) and 3.2% (US). Based on the current study, they suggest new classification of cost-effectiveness plan and methodology for decision making.

Another study was performed by Debora et al., (2007) to test the feasibility and validity of a willingness to pay (WTP) tool in a dental setting. The study revealed the following: The majority (92.6%) felt the questionnaire was an accurate representation of treatments and outcomes, establishing face and content validity. In terms of construct validity, four hypotheses were tested: (1) manipulation of the outcomes of the preferred treatment led to a predictable shift in preferences for 38 subjects (92.7%); (2) although periodontal patients were not more likely to choose periodontal surgery than non-patients (p=.14), those with a history of surgery were more likely to choose surgery again (p=.06); (3) WTP was positively related to income level (p=.05); and (4) subjects were willing to pay more for coverage for themselves than for others. Periodontal surgery was the preferred treatment for moderate to advanced periodontal disease and was more strongly preferred than other choices (i.e., a higher WTP) for all income groups. The interclass correlation coefficient for treatment preferences was 0.95 (p<0.001). This pilot study supports some of the criteria concerning validity of the WTP questionnaire to measure preferences for alternative periodontal therapies.

Dror et al., (2007) carried out a study on willingness to pay for health insurance among rural and poor persons. This study, conducted in India in 2005, provides evidence on Willingness to Pay (WTP), gathered through a unidirectional (descending) bidding
game among 3024 households (HH) in seven locations where micro health insurance units are in operation. Insured persons reported slightly higher WTP values than uninsured. About two-thirds of the sample agreed to pay at least 1%; about half the sample was willing to pay at least 1.35%; 30% was willing to pay about 2.0% of annual HH income as health insurance premium. Nominal WTP correlates positively with income but relative WTP (expressed as percent of HH income) correlates negatively. The correlation between WTP and education is secondary to that of WTP with HH income. Household composition did not affect WTP. However, HHs that experienced a high-cost health event and male respondents reported slightly higher WTP. The observed nominal levels of WTP are higher than has been estimated hitherto.

Another study was carried out by Oscarson et al., (2007) to explore adolescents with high and no caries experience and their preferences for caries preventive dental care. Their willingness-to-pay (WTP) for preventive dental care was elicited using the contingent valuation method (CVM) within a cost-benefit approach. The data were used to: (a) compare WTP between study groups, and to (b) calculate net social benefit (NSB) in cost-benefit analysis (CBA). The result showed a mean yearly WTP for the high and low-risk group of 1405 SEK and 1087 SEK (7.70 SEK=US$ 1; July 2005), respectively. Two variables were associated with the differences between the groups: caries risk (i.e. group designation) and housing. Using these WTP values, the CBA showed positive NSB values for both study groups. Through use of the CVM, 19-year olds’ WTP for caries preventive measure was elicited. An NSB>0 was found, which means that benefits exceeded the costs for prevention. Despite the small sample size and restriction to one
Swedish county, the results indicate that the methods used in this study are suitable for further testing and analyses.

Another study was made by Yasunga et al., (2006) in Japan. The objective of this survey was to measure WTP for the treatment of typical acute illness and to analyze the factors affecting WTP. The study revealed the following: Mean WTP was $29.9 for CC, $2,233 for RD, and $8,976 for MI. WTP for RD and MI was lower in the low-income group. While WTP for CC did not vary with income, WTP was higher in groups whose current subjective fitness levels were low. Based on the results of this study, it is deemed necessary to enhance safety nets for low-income earners in regards to serious illnesses that incur high medical expenses. Further, it is recommended that the rate of co-payments be set relatively high with respect to mild illnesses for which alternative services are available.

Chan Kit Ying et al., (2005) performed a study to determine patients’ willingness to pay (WTP) for anterior and posterior root canal treatment, and to investigate factors associated with WTP. Of the 267 patients recruited, 257 completed the interview (96%) and 70% of them (177/257) found the task easy to understand. The mean WTP value for an anterior tooth root canal treatment was KH$ 2618 (SD 2127), the median value HK$ 2000 (I.Q.R. HK$ 2974 (SD 1978), the median value was KHS 2500 (I.Q.R. HK$ 1900, HK$ 3950). WTP for anterior and posterior RCT was highly correlated (r=0.75, p<0.001). WTP for both anterior and posterior root canal treatment was associated with socio-demographic factors: age (p<0.05) and educational attainment (p<0.05). With respect to oral health factors, self-reported number of teeth was associated with WTP for both anterior and posterior root canal treatment (p<0.05). The values obtain differed
somewhat from average prices of root canal therapy in general practice. Socio-demographic factors age and educational attainment were associated with WTP values. In addition, self-reported number of teeth possessed was associated with WTP values.

Another study was performed by King et al., (2005) to study the willingness to pay for a quality-adjusted life year. The study revealed that the Mean WTP/QALY ratios ranged from 12,500 to 32,200 US dollars (2003 US dollars). All values were below most published cost-effectiveness ratio thresholds, below the ratio from a prototypic medical treatment covered by Medicare (i.e., renal dialysis), and below ratios from the value-of-life literature. The WTP/QALY ratios were similar to those calculated from published preference data for patients with dento-facial deformities, asthma, or dermatologic disorders. WTP/QALY ratios calculated using preference data collected from diverse populations are lower than most proposed thresholds for determining what is “cost-effective”.

Marra et al., (2005) performed a study to elicit treatment location preferences and willingness to pay (WTP) from patients referred to an outpatient parenteral antibiotic therapy (OPAT) program. The majority of participants were males, married, in their sixth decade of life and had a secondary school education or greater. The majority of participants were retired or they were employed with annual household income less than 60,000 dollars. Osteomyelitis was the most common type of infection for which parenteral therapy was required. Of those 87 patients who indicated a preference, 77 (89%) patients preferred treatment at home, 10 (11%) patients preferred treatment in hospitals. Seventy-one (82%) of these patients provided interpretable WTP responses. Of these 71 patients, 64 preferred treatment at home with a median WTP of 490 dollars
CDN (mean 949 dollars, range 20 to 6250 dollars) and 7 preferred treatment in the hospitals with a median WTP of 500 dollars CDN (mean 1123 dollars, range 10-3000 dollars). Tests for differences in means and medians revealed no differences between WTP values between the treatment locations. The total WTP for the seven patients who preferred hospital treatment was 7,859 dollars versus 60,712 dollars for the 64 patients who preferred home treatment. Income and treatment location preference were independent predictors of WTP.

Birch et al., (2004) attempted a study on willingness to pay for dentin regeneration in a sample of dentate adults. They found the following: At a success rate of 95%, the mean WTP for dentin regeneration was $262.70 (non insured) and $11.00 per month (insured subjects). For success rate of 75%, the corresponding values were $210.90 and $9.20 per month. Multivariate analyses were used to identify any significant relationships between WTP and a range of variables covering socio-demographic, socio-economic, dental experience and oral health status variables. The findings indicate that individuals’ valuations of treatments involve substantial unexplained variation. About half of the noninsured subjects would pay for dentin regeneration if it cost $200 per tooth. The data on the WTP for dentin regeneration indicate that a substantial percentage of adults will pay for this new technology.

Halvorsen and Willumsen (2004) performed a study on willingness to pay for dental fear treatment. The programme consisted of three different dental fear treatments: Cognitive therapy, applied relaxation and nitrous oxide sedation, in addition to dental treatment. They found that the social desirability of the treatment was very sensitive to uncertainty. While only 24% of the patients were willing to pay the actual cost of the
treatment before attending, 71% were willing to pay afterwards. This implies that many patients who would benefit from the treatment ex post are not willing to pay the cost of the treatment ex ante, and will thus not receive any treatment unless it is subsidized.

Smith and Cunningham (2004) carried out a study to establish factors that influence willingness-to-pay (WTP) for orthognathic treatment and to compare WTP values, from both members of the general public and orthognathic patients. The results showed that there was a significant difference between the mean WTP values for the public and patient groups. Patients were prepared to pay 2750 more than members of the general public. In addition, a significant relationship was found between WTP and incisor relationship in the patient group, with Class II division 1 patient prepared to pay 3130 more than those with Class III malocclusions. Ability to pay did not significantly affect WTP. The mean total costs estimated for orthognathic treatment were lower than the mean patient WTP value and similar to the mean WTP value for the public group. In terms of cost-benefit, it appears that orthognathic treatment provides ‘good value for money’. This study also showed that both patient and the general public were prepared to place a monetary value on the correction of dentofacial deformity and that this form of economic evaluation is a useful tool in monitoring health care in the UK.

A study was carried out by Tamaki et al., (2004) to investigate the relationship between demographic characteristics and willingness of patients to pay for regular dental check-ups in Japan. Five thousand one hundred thirty-two questionnaires were collected (response rate 56.8%). The 3 groups most likely to have regular dental check-ups were found to be the under 20s, 50 to 59 year olds and civil servants. Of these groups, civil servants were found to be the most likely of all to have regular check-ups. More females
than males were represented in the sample. More than 60% of the patients responded that they would be willing to pay for regular check-ups if the cost were less than 2,000 yen. However, no statistically significant differences were observed in relation to household income. The results suggested that participation in regular dental check-ups might be related to gender and age, but not to household income.

Dong et al., (2003) performed a study to assess the willingness-to-pay (WTP) for a proposed community-based health insurance (CBI) scheme in order to provide information about the relationship between the premium that is required to cover the costs of the scheme and expected insurance enrollment levels. In addition, factors that influence WTP were to be identified. Interviews were conducted with 2414 individuals and 705 household heads. The take-it-or-leave-it (TIOLI) and the bidding game were used to elicit WTP. The average individual was willing to pay 2384 (elicited by the TIOLI) or 3191 (elicited by the bidding game) CFA (3.17 US dollars or 4.25 US dollars) to join CBI for him/herself. The head of household agreed to pay from 6448 (elicited by the TIOLI) or 9769 (elicited by the bidding game) CFA (8.6 US dollars or 13.03 US dollars) to join the health insurance scheme for his/her household. These results were influenced by household and individual ability-to-pay, household and individual characteristics, such as age, sex and education. The two methods yielded similar patterns of estimated WTP, in that higher WTP was obtained for higher income level, higher previous medical expenditure, higher education, younger people and males. A starting point bias was found in the case of the bidding game.

Another study was conducted by Matthews et al., (2002) to measure preferences and Willingness to pay (WTP) for a novel anesthetic (dental gel) versus existing
anesthetic options for periodontal maintenance visits. The study revealed that the overwhelming majority of patients chose dental gel over injectable local anesthetic or no anesthetic as their first anesthetic preference (general 81.0%; recall: 82.5%). The median WTP for dental gel was 20.00 Canadian dollars per visit for the general population and 10.00 Canadian dollars for the recall population. The majority of participants were willing to pay an insurance premium for dental gel, even if they did not personally prefer dental gel (general 72.4%; recall 73.2%). In this study population an alternative to traditional injectable local anesthetic (i.e. dental gel) was overwhelmingly preferred by both general population participants and recall patients for maintenance and cleaning procedures. Most participants were willing to pay to have dental gel available, either for themselves or for others.

Thomas et al., (2000) performed a study on willingness to pay and found the following: Those who smoked were less likely to return the questionnaire, whilst those who drank alcohol were more likely to return it. The majority of respondents answered both WTP and WTW (willingness to wait) questions. The proportions responding to the WTW and WTP questions were 93.2% and 81.5% for the two questions, respectively (95% confidence interval of difference = 9.4% to 13.9%). The only result which was statistically significant at the 1% level showed that, relative to those who answered the WTW but not the WTP question, those who answered both were more likely to be older when they left full-time education. A weaker statistical association (at the 5% level) revealed that those who were older when leaving full-time education were more likely to answer a WTP question than not.
Asenso-Okyere et al., (1997) made a study to assess the willingness of households in the informal sector of Ghana to join and pay premiums for a proposed National Health Insurance scheme. The study revealed that there was a high degree of acceptance of health insurance in all the communities surveyed. Over 90% of the respondents agreed to participate in the scheme and up to 63.6% of the respondents were willing to pay a premium of 5000 cents or $3.03 a month for a household of five persons. Using an ordered Probit model, the level of premiums households willing to pay were found to be influenced by dependency ratio, income or whether a household has difficulty in paying for health care or not, sex, health care expenditures and education. As income increases, or the proportion of unemployed household members drops, people are willing to pay higher premiums for health insurance.

**SECTION: III**

This section presents a review of the past studies of various authors on cost effectiveness of dental treatments.

Bouchard et al., (2009) carried out a study to assess the cost-effectiveness of dental implant first-line strategy vs. fixed partial denture strategy in patients suffering from one single missing tooth. The model used a simulation decision framework over a 20-year period. Potential treatment switches can occur every five years. Transition probabilities come from literature, epidemiological reports or expert opinions. They have been programmed using specific distribution ranges to simulate the patients’ and practice variability, and to take into account parameter uncertainty. Direct medical costs have been assessed according to the cost survey. Probabilistic sensitivity analyses were
conducted using 5000 Monte-Carlo simulations, generating confidence intervals of model outcomes. They found that mean cost-effectiveness of the bridge strategy is higher than the implant strategy. Implant as the first-line strategy appears to be the ‘dominant’ strategy, considering the lower overall costs and the higher success rate.

Farrell and Tucker (2009) conducted a study on safe, efficient, and cost-effective orthognathic surgery in the outpatient setting. They found the following: First, the oral and maxillofacial surgery profession must reinforce the importance and value of orthognathic surgery to insurance providers, patients, and referring clinicians, as well as to surgeons within our own specialty. Alternative methods for providing high-quality surgical services at a reasonable cost must be explored including providing of options for cost-effective outpatient surgical care, making better arrangements for financial assistance, and exploring options to obtain coverage from third-party providers. Outpatient surgery in facilities that can substantially reduce cost can be an effective way of providing quality treatment that is affordable to patients. Efficient, safe and effective outpatient orthognathic surgery will help patients benefit from this valuable service.

A systematic study was performed by Pennington et al., (2009) to evaluate the cost-effectiveness of root canal treatment for a maxillary incisor tooth with a pulp infection, in comparison with extraction and replacement with a bridge, denture or implant supported restoration. The study revealed that root canal treatment extended the life of the tooth at an additional cost of pound 5-8 per year of tooth life. Provision of orthograde re-treatment, if the root canal treatment fails returns further extension of the expected life of the tooth at a cost of pound 12-15 per year. Surgical re-treatment is not cost-effective; it is cheaper, per year, to extend the life of the crown by replacement with
a single implant restoration if orthograde endodontic treatment fails. Modelling the available clinical and cost data indicates that, root canal treatment is highly cost-effective as a first line intervention. Orthograde re-treatment is also cost-effective, if a root treatment subsequently fails, but surgical re-treatment is not. Implants may have a role as a third line intervention if re-treatment fails.

Gaunt et al., (2008) performed a study systematically to evaluate the evidence for effectiveness of supportive periodontal care (SPC) provided in specialist care and general practice for patients with chronic periodontitis; to construct a model for the cost effectiveness of SPC. The study indicated the following: Deltas CAL for patients undergoing “specialist” SPC were 0.1mm (2 years), 0.2mm (6 years) and -0.01mm (3 years) respectively. In generalist care the Deltas CAL during SPC was -2.2, -1.8 and -2.8mm. Differences between specialist and generalist SPC were an extra 20.59 tooth years and 3.95 mm attachment loss for generalist SPC. Incremental cost-effectiveness ratios were an extra 288 Euros for one tooth year or an extra 1503 Euros/1mm reduction in loss of attachment for SPC delivered in specialist care. SPC delivered in specialist as compared with general practice will result in greater stability of clinical attachment but this will be achieved at relatively greater cost.

Kolker et al., (2006) instituted a study to determine the differences in costs and effectiveness of large amalgams and crowns over 5 and 10 years when catastrophic subsequent treatment (root canal therapy or extraction) was the outcome. They found that teeth with crowns had higher effectiveness values at a much higher cost than teeth restored with large amalgams. The cost of an additional year free of catastrophic treatment for crowns was 1088.41 dollars at five years and 500.10 dollars at 10 years.
Teeth in women had more favourable cost-effectiveness ratio than those in men, and teeth in the maxillary arch had more favorable cost-effectiveness ratio than teeth in the mandibular arch. Neither the large amalgam nor crown restoration had both the lowest cost and the highest effectiveness. The higher incremental cost-effectiveness ratio for crowns should be considered when making treatment decisions between large amalgam and crown restorations.

Kowash et al., (2006) conducted a study to evaluate the benefit-cost (B/C) and cost-effectiveness (C/E) of a long-term dental health education program to prevent early childhood caries (ECC) through home visits. The data collected over a three year period in a dental health education programme (DHE), previously reported for infants aged 8 months at start were analysed for B/C and C/E. Dental caries indices (BASCD) for dmft and dmfs were used. Costs were based on British National Health Service (UK) fees for treating children by general dental practitioners and salaries for community dental officers in the Community Dental Services in the UK. Comparisons were made for B/C and C/E with results from a clinical trial of a slow releasing fluoride device (SRFD), community water fluoridation (CWF) and a school based fissure sealant program (FSP) using the hypothetical community of Niessen and Douglass, [1984]. The cavities, as ECC, saved over the three year period indicated a B/C ratio for the DHE of 5.21 compared with SRFD of 4.17; CWF of 1.15 and FSP of 0.42. The C/E results were 1.92, 2.40, 8.66 and 23.74 respectively. A dental health education programme of home visits with mothers of young infants to prevent early childhood caries and starting at 8 months of age gave better benefit-costs and cost effectiveness ratio than other preventive programmes.
Van der Wijk et al., (2006) attempted a study on cost-effectiveness of dental implants. In this study the cost-effectiveness of dental implants (rootform and transmandibular) is compared with making complete dentures combined with vestibuloplasty and just a set of new dentures. The cost components of labour and technique are analysed at the individual patient level. Effectiveness was measured using a ratio scale. Several assumptions for the long run effectiveness of the treatment options are necessary due to lack of information about this in the literature. Assumptions were made regarding: survival rate, life span of dental implants and complete dentures, costs of aftercare and development of oral health in the long run. The main conclusion is that overdentures on rootform implants are superior to complete dentures combined with pre-prosthetic surgery or overdentures on a transmandibular implant. The choice between treatment with rootform implants or just a new set of dentures is a more difficult matter.

Another study was performed by Zitzmann et al., (2006) to assess whether implant treatment in the mandible represents value for the money spent. Twenty patients were included in each treatment group and were followed up for three years. Health outcomes were expressed in Quality-adjusted Prosthesis Years, and dental health care costs and time costs were recorded in year 2000 Swiss Francs (CHF 100 = US dollars 61). The cost per Quality-adjusted Prosthesis Year gained for implant treatment was CHF 9100 (2 implants) and CHF 19,800 (4 implants) over 3 years. Over a ten-year period, these threshold ratios were reduced to CHF 3800 (2 implants) and CHF 7100 (4 implants) per Quality-adjusted Prosthesis Year gained.

Heydecke et al., (2005) conducted a study on cost-effectiveness of mandibular two-implant overdentures and conventional dentures in the edentulous elderly. The cost
and effectiveness of mandibular conventional dentures (CD, n=30) and two implant overdentures (IOD, n=30) were compared in elderly subjects. Effectiveness (Oral Health Impact Profile, OHIP-20) and cost were measured up to one year post-treatment. Using an average life expectancy of 17.9 years, the equalized annual costs (in Canadian dollars) were dollar 399 for CD and dollar 625 for IOD (p<0.001), and the equalized annual values for the outcome (OHIP-20) were 47.0 for CD and 31.3 for IOD treatment (p<0.05). These values translate into a yearly additional cost for IOD treatment of dollar 14.41 per OHIP-20 point. These results are key to the implementation of programmes to provide this form of therapy for edentulous adults.

Richmond et al., (2005) attempted a study to determine the relative effectiveness and cost-effectiveness of orthodontic treatment per case in one “fee for item” and two different types of salaried orthodontic clinics. The study showed that complete records of outcome were available for 1,087 patients, but only 789 had complete data on costing. Three of the four cost-effectiveness models indicated similar rankings for the 18 clinicians. The most cost-effective service was provided by clinicians working in community clinics, followed by clinicians working in hospitals, then self-employed clinicians. The preferred cost-effective model takes into consideration the initial need and successful outcome of orthodontic treatment. Cost-effectiveness models have been developed to quantify the performance of individual clinicians working in self-employed and salaried clinics. Costs and effectiveness of the clinicians in each clinical setting shows considerable variation.

Zitzmann et al., (2005) performed a study to investigate a method of analyzing cost-effectiveness in dentistry. In a self-selected trial, 20 patients each were treated with
implant-retained overdentures (two implants, IRET), implant-supported overdentures (four implants, ISUP) or CDs (control group) in the edentulous mandible. A cost-effectiveness analysis was performed from the patient’s perspective, with a time horizon of 6 months. Direct health-care costs were calculated in Swiss Francs (in 2000), and effects were defined as improvements in perceived chewing ability compared with the baseline value before treatment (measured on a VAS). Point estimates for mean incremental cost-effectiveness ratios were complemented with cost-effectiveness acceptability curves to account for uncertainties associated with costs and effects. Mean incremental costs were CHF 4,329 (IRET-CD), CHF 13,360 (ISUP-CD), and CHF 9,301 (ISUP-IRET); these cost differences were all statistically significant. The mean incremental effects at 6 months were 19% (IRET-CD), 23% (ISUP-CD), and 4% (SUP-IRET). Incremental cost-effectiveness ratios were CHF 228 (IRET-CD), CHF 581 (ISUP-CD), and CHF 2,258 (IRET-ISUP) per percentage increase in chewing ability. From an economic point of view, IRETs were more attractive than ISUPs. The latter were associated with a statistically significant improvement in perceived chewing ability compared to CDs, but at substantially higher costs.

Kelly and Smales (2004) carried out a study to determine the relative cost-effectiveness of alternative methods for restoring large tooth substance loss in adults. Long-term survival estimates and discounted costs for 245 large indirect restorations were used to calculate their incremental cost-effectiveness over 15 years when compared with direct placement Class II cusp-overlay amalgams and Class IV multisurface resin composites, placed in 100 patients from three private dental practices. The direct placement restorations were more cost-effective than the indirect restorations at all time
intervals over the 15-year study period. The full gold crown and the ceramometal crown were the most cost-effective indirect posterior and anterior restorations respectively. The cast gold onlay and the porcelain jacket crown were the least cost-effective indirect posterior and anterior restorations respectively. When clinically practicable, large direct placement restorations should be placed initially in preference to indirect restorations.

Another study was performed by Takanashi et al., (2004) to compare the cost of mandibular two-implant overdenture treatment to that of conventional denture treatment in an academic teaching hospital. Sixty edentulous patients participated in a randomized clinical trial. All patients received a new maxillary complete denture either a mandibular conventional denture or an implant overdenture on two unsplinted implants. Resource-based micro costing of direct and indirect costs (e.g. expenses and time cost to patients) of all scheduled and unscheduled visits was conducted through 1 year following delivery of the prostheses. Mean direct costs (1999 CD dollars) for scheduled visits in the implant and conventional groups were 2,332 dollars and 814 dollars, respectively, and mean indirect costs were 1,150 dollars and 810 dollars, respectively. Differences between the two groups were significant. Twenty-six patients in each group had unscheduled visits during the study at a median direct cost for the overdentures of 85 dollars and 64 dollars for the conventional dentures. Median indirect costs for unscheduled visits were 163 dollars and 202 dollars, respectively. These differences were not significant. Mean total costs of the overdentures were 4,245 dollars and 2,316 dollars for the conventional dentures, and the between-group difference was significant. The direct cost of mandibular two-implant overdenture treatment was 2.4 times higher than that of conventional denture treatment. When indirect costs were added, the implant-to-
conventional total cost ratio estimate was 1.8. These cost data can now be combined with estimates of the efficacy of the two types of prosthesis so practitioners and patients can make informed decisions about these prosthodontic treatment concepts.

Oscarson et al., (2003) made a cost-effectiveness analysis (CEA) study performed from a societal perspective is to compare costs and consequences of caries preventive programs in a caries high-risk population. By ‘costs’ is meant both treatment costs and costs contributed by the patient and the patient’s family. Costs contributed by patients and their families consist of out-of-pocket expenses, transportation costs, and time. Conclusions made are that it is important to consider the perspective from which a study is carried out. Costs contributed by the patient and the patient’s family have a high impact on total costs for children and younger adolescents but decrease with time as the adolescents get older. The present study shows an incremental cost-effectiveness of 2043 SEK (8.54 SEK=1 US Dollar, December 1999) per averted decayed enamel and dentine missing and filled surface (DeMFS), of which treatment costs represent 1337 SEK using the unit cost for a nurse. This means a yearly cost of approximately 334 SEK.

Another study was performed by Higashi et al., (2002) to determine the clinical scenario required to produce cost-effective results with the use of IL-1 testing to identify high-risk patients. A disease simulation model was developed using decision-analytic techniques and a 30 year time frame. Using different modeling scenarios, the genetic test produced results ranging from cost savings of $830,140 and 52.8 fewer cases of severe periodontitis to increased cost of $300,430 and 3.6 additional cases of severe periodontitis (per 1,000 patients). Three parameters in the analysis were highly influential: 1) The compliance rate for maintenance therapy in test positive versus non-
tested patients; 2) The effectiveness of non-surgical therapy; and 3) The relative risk of
disease progression for test positive patients. The model produced a wide range of
outcomes reflecting our incomplete understanding of the biology, optimal treatment, and
genetic susceptibility of periodontal diseases. However, the model demonstrates that
three clinical parameters are highly influential in determining if IL-1 testing can be
implemented in a primary care setting on a cost-effective manner.

Edwards et al., (1999) carried out a study to identify the least costly, most
effective and most cost-effective management strategy for asymptomatic, disease free
mandibular third molars. 100 patients attending the oral surgery clinics, University of
Wales Dental Hospital rated the effect of each outcome on their own life. The cost and
effectiveness data for each outcome were entered into the decision tree and the analyses
were conducted by ‘folding back’ the decision tree based on the probabilities. The main
findings were: Mandibular third molar retention was less costly (170 Pounds), more
effective (69.5 effectiveness units on a 100 point scale) and more cost-effective (2.43
Pounds per unit of effectiveness) than removal (226 Pounds, 63.3 and 3.57 Pounds
respectively). These findings were sensitive to changes in the probability of periodontal
disease and caries. Mandibular third molar retention is less costly to the NHS, more
effective for the patient and most cost-effective to both parties than removal. However,
on the likelihood of developing periodontitis, periodontal disease and caries increase
substantially then removal becomes the more cost-effective strategy.

Lewis (1998) conducted a study on cost-effectiveness considerations optimized
therapy for the edentulous predicament. The findings of current research will enhance
increased economic analysis in prosthodontics, which, in turn, may help both dentists’
and patients’ decision-making. Even implant supported prostheses that are clinically effective have yet to be proven societal effective because they are inaccessible economically to some who need them. Long-term, multidimensional comparative economic analyses of overdenture and conventional denture use may lead to the expansion of implant-supported dentures to selected patients who, to date; have not had access to this treatment modality.

Schwarz (1998) performed a study on “Is caries prevention cost-effective? Does anybody care?” The aim of this study is to review current issues concerning the cost-effectiveness of caries prevention. Several decades after considerable improvements in the oral disease situation were documented in Scandinavia, doubts are still expressed about whether preventive measures are cost-effective. An analytic model is suggested to explore the relationship between the dental profession, which provides the prevention, the research and development activities, which provide the material and data basis for prevention, and political/societal responses to the professional input. The four elements considered were the definition of prevention, the practical perception of effective prevention, the appropriateness of traditional cost-effectiveness analysis, and the time factor with regard to when a preventive effect should be evaluated. The main arguments of the discussion are that caries prevention is not uniformly defined by the profession, that dental research is casting doubt on the effectiveness of traditionally accepted preventive measures that political pressures on health care are motivated by economic pressures, but that traditional cost benefit/effectiveness analyses have not been able to help the decision-makers to choose wisely. Often the time perspective for the real effects of prevention lies beyond the interests of decision-makers. Although caries prevention
may be viewed as an investment in health by the profession, this contention may not be acceptable to a society with very short-term perspectives.

Creugers and Kayser (1992) made a study to compare cost-effectiveness of dental treatments. The cost-effectiveness of dental restoration depends primarily on the durability and the cost of the restoration. In this report a method is described to compare the cost-effectiveness using the durability data of adhesive bridges and conventional bridges. The study shows that, for the situation in the Netherlands, the breakeven point for equal cost-effectiveness compared to conventional bridges is achieved when the 50% survival for adhesive bridges is approximately 6.5 years. Clinical data indicate a higher cost-effectiveness for anterior adhesive bridges. The method described in this report is considered to be useful for comparing cost-effectiveness of dental restorations in different situations.

Mileman and Kievit (1992) carried out a related study and found the following: By adding information concerning the direct costs of examining and treating patients over a 10-year period to the analysis and varying the likely prevalence of periapical lesions in a three-way sensitivity analysis, the following results were arrived at: (1) if the disease prevalence in teenage patients is < 5%, it is economically justifiable to make a visual inspection only and then to proceed with simple restorative treatment; (2) if there is evidence from the clinical examination or patient history that the prevalence of pulp necrosis is between 5% and 50% then, in our case, radiographs were the most appropriate single diagnostic test.

Maryniuk et al., (1988) performed a study to compare cost-effectiveness of large amalgams vs. crowns. According to the analyses, the optimum treatment decision is to
attempt to replace failed first amalgam with another amalgam, instead of with a crown. When this amalgam restoration fails, then the subsequent replacement may be with a crown. Potential lifetime cost savings were between 11% and 24% if the first replacement was an amalgam. This study concludes that the technique of decision analysis provides the dental community with an effective evaluation tool for the study of clinical decision making, taking into account all levels of clinical uncertainty.