

Oral Health and Wellbeing: A Study of Tooth Decay, Periodontal Disease and Tooth Loss in England, Wales and Northern Ireland

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Abstracts

Objectives: this study investigated the differences between England, Wales and Northern Ireland in terms of tooth decay (TD), periodontal disease (PD) and tooth loss (TL). Additionally, it clarified oral health and wellbeing in relation to these including gender and age.

Materials & Methods: Data from the 2009 Adult Dental Health Survey (ADHS) from the National Health Service (NHS) and the 2013 Children’s Dental Health Survey (CDHS) from the NHS were used. Additionally, afterwards, mainly TD, PD and TL data were selected from ADHS and CDHS.

Results: the majority of children, according to the data collected from England, Wales and Northern Ireland, suffered from TD, while adults suffered from PD and the elderly underwent TL. Children’s dental check-up rate of three countries on average was more than approximately 90% of children. Moreover, rates of plaque and calculus, were roughly higher in males than females. Furthermore, TD and PD rates increase gradually from younger to elderly people.

Conclusion: British dental institution or NHS seems to be effective because children’s dental fee is free. A British family is more likely to take their children to NHS dentists.

Additionally, males are less likely to practice a suitable or a regular tooth brushing because they might be extremely busy, so that they would not be able to observe their oral hygiene strictly. They also might consume meal textures like soft or sticky foods.

In addition, with the advanced age, tooth and periodontal tissue deteriorates.

TD and PD can predict the presence of systemic diseases because of severe TD, PD and TL which is ordinarily an ageing characteristic. Systemic diseases can have a serious impact on oral health and holistic dental treatment is needed, likewise poor oral health can affect general health as well as wellbeing including hedonic and eudaimonic wellbeing.

Keywords: Oral Health; Tooth Decay; Periodontal Loss, Wellbeing; England

Abbreviations

TD: Tooth Decay; PD: Periodontal Disease; TL: Tooth Loss; NHS: National Health Service; CDHS: Children’s Dental Health Survey; ADHS: Adult Dental Health Survey; ADA: American Dental Association; BDA: British Dental Association

Introduction

Though dental researches relating to diagnosis and treatment have considerably progressed and there is a great amount of research as well as articles on dentistry, the articles relevant to oral health and wellbeing are less likely to be discovered. Additionally, there is scarce dental literature linked to wellbeing including hedonic wellbeing (goal achievement or a moral life) and eudaimonic wellbeing (avoidance of pain or pleasure fulfilment) (Ryan, RM. & Deci, EL, 2001) [1] in dentistry (Motegi, N. Watter, C et al, 2020) [2]. Specifically, regarding dental diseases, pain and irritable feelings in a person affect hedonic wellbeing, while, serious pain affects not only hedonic wellbeing but also eudaimonic wellbeing due to malnutrition, insomnia, growth and development (Motegi, N. Watter, C et al, 2020) [2].

Moreover, oral health has a significant impact on wellbeing. Specifically, if children feel pain when they suffer from tooth decay (TD), they cannot concentrate on their studies or sleep well therefore, their health suffers. Some children might have a lack of appetite because of oral health problems. As a result, this might have an effect on their general growth and wellbeing (Banihani, A. et al., 2017) ‘The impact of dental caries and its treatment by conventional or biological approaches on the oral health-related quality of life of children and carers’, *International Journal of Paediatric Dentistry*, 2(2), pp. 266-276. doi: 10.1111/īpd.12350.) [3].

Furthermore, periodontal disease (PD) can be seen such as bleeding, acute or chronic gingivitis, persistent halitosis or unsavory taste in the mouth. Patients with more progressive PD have tooth loss (TL) (Chávez E.M. & Hendre, A., 2017) ‘Clinical Care for an Aging Population’, *Compendium of Continuing Education in Dentistry*, 38(9), pp. 595-602) [4].

Additionally, the elderly who suffer from TL could become malnourished and stressful because of their malocclusion. Consequently, people with TL can have serious health and wellbeing problems (Gil-Montoya et al, 2015) [5].

PD might have an impact on diabetes, making blood sugar control more difficult. On the other hand, people with diabetes could develop a serious PD and are likely to have higher blood sugar levels than those with normal gingiva. Since PD seems to cause systemic diseases such as diabetes, holistic treatment is needed (NIH, 2000) ‘6 chapter Effects on Well-being and quality of life’, *Oral Health in America: A Report of the Surgeon General*, pp. 133-152.) [6].

Another inevitable problem is anxiety for visiting a dentist including dental phobia to treat TD, PD and TL. These problems might lead to deterioration of oral health. Most of them are caused by negative psychological and emotional experiences. Accordingly, it is essential to ameliorate and prevent adverse psychological reactions in patients. In consequence, dentists’ principle concern is required. (Heilmann, A. et al., 2015) ‘Oral Health Over the Life Course’ *A Life Course Perspective on Health Trajectories and Transitions*, Chapter 3, Springer, pp. 39-58.) [7].

Thus, this essay will highlight the significant relevance of oral health including TD, PD, TL, systemic diseases, the psychological and emotional symptom. The relation to wellbeing comprising hedonic and eudaimonic wellbeing with oral health will also be discussed in this paper.

Materials and Methods

The NHS online data used was: a) The 2013 Children’s Dental Health Survey (CDHS) (NHS, 2015a) [8] and b) The 2009 Adult Dental Health Survey (ADHS) (NHS, 2011) [9].

c) The 2013 CDHS (NHS, published in 2015).

The subjects were 5, 8, 12 and 15 year olds school boys and girls in England, Wales and Northern Ireland. A total of 13,600 children were sampled in participating schools.

d) The 2009 ADHS (NHS, published in 2011) [9].

The survey was carried out by a team of dental experts from the Universities of Birmingham, Cardiff, Dundee, Newcastle and University College London in England, Wales and Northern Ireland. Age of adult group includes 16-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84 and 85 and over with a total of 13,400 addresses.

The authors selected the information data of CDHS which took place in 2013 as well as ADHS which took place in 2009. The author could find out valid and appropriate cases and studies by taking into consideration the results of the comparison among the three countries selected. In detail, the CDHS data selected has a deep association with TD, PD and TL, A. Tooth decay (TD), B. Periodontal disease (PD), C. Tooth brushing, D. NHS dental visits, E. Dental anxiety, F. Sugary drinks in CDHS (2013). While the selective ADHS consisted of A. TD, B. PD, C. Tooth brushing, D. NHS dental visits, E. Dental anxiety, F. Sugary drinks, G. Smoking were examined.

Results

Selective CDHS 2013

Tooth Decay (TD)

A) Moderate TD: At the age of 8, children in Wales and Northern Ireland (43% and 31%) were more likely to have moderate TD in their adult teeth than children of the same age in England (30%) (Table A1 #3).

Children aged 12 with 68%, in Wales and those aged 12 with 48% in Northern Ireland, compared to the same aged with 48% in England (Table A1 # 4) and those eligible for free school meals (41%) (Table A3 #1).

For 15 years old, 49% in Northern Ireland, 64% in Wales and 51% in England, respectively (Table A1#5) and 59% for free school meals (Table A3 #3).

B) Serious TD: Severe TD is defined by the proportions of many teeth affected by TD or some teeth affected by extremely serious TD comprising dental pulp infection and a large part of the tooth is ruined.

For 5 year olds, severe TD (TD into dentine), the rate for Wales (22%) and Northern Ireland (19%) was different from that of England (13%) (Table A1 #6). At the age of 15 with severe TD, over a third of children in Northern Ireland (36%), compared with 22% in Wales and 14% in England (Table A1 #7).

Additionally, those aged 12 in Northern Ireland (42%) were more likely to have fillings than those in Wales (28%) and England (18%) (Table A1 #8). 12 year olds in Wales were more likely to have teeth missing due to TD (7%) than those in Northern Ireland (6%) and England (3%) (Table A1 #9).

Periodontal Disease (PD)

A) Gingival inflammation: The rate of children aged 12 and 15 in England (61% and 53% respectively) was higher than those the same age in Wales (52% and 45% respectively) and Northern Ireland (49% and 45% respectively) (Table A1 #11, 12).

Difference by child's gender (male aged 12 with 63% and aged 15 with 55%, female aged 12 with 57% and aged 15 with 50%) (Table A2 #5, 6) in terms of gingival inflammation including gingival bleeding and pocketing (pocket is the space between gum and tooth).

12 and 15 year olds who brushed their teeth less than twice a day (70%, 64% respectively) had more gingival inflammation than those who brushed their teeth twice or more a day (57%, 49% respectively) (Table A4 #6, 7). 8 year olds (46%) had more gingival inflammation than 5 year olds (22%), Likewise the rate of 12 year olds (60%) had more gingival inflammation than 8 year olds (46%) (Table A4 #3).

Plaque and calculus

A) Plaque: The proportion of 8 year olds with plaque in Northern Ireland (65 %) was lower than 8 year olds in Wales (80%) and England (71%) (Table A1 #13). Additionally, the rate of 12 and 15 year olds with plaque present in Wales was 69% and 63% respectively, Northern Ireland (62%, 50 %) and England (64%, 49%) respectively (Table A1 # 14, 15).

By the age of 12, the percentage of boys (72%) with plaque was higher than girls (56%) (Table A2 #7). (Table A2 #8). The plaque rate of aged 15 showed male with 54% and female with 46%.

The percentage of the eligible for free school meals relating to the plaque shows that 12 years old eligible for free school meals had a higher percentage (71%) than those not eligible (62%). 15 year olds showed a similar pattern with those eligible 60% and those not eligible 47% (Table A3 # 13-16).

B) Calculus: The percentage of 8 year olds with calculus in Northern Ireland (19 %) was lower than 8 year olds in Wales (23%) and England (29%) (Table A1 #16). Additionally, the percentage of 12 and 15 year olds with calculus in Wales (27%, 34% respectively) and Northern Ireland (29%, 35 %) was less than children of the same age in England (40%, 47%) (Table A1 # 17, 18).

The difference between the percentage of male and female children with calculus was only significant at ages 12 and 15, with a higher rate for boys (46%, 50 %) having calculus than girls (31%, 42 %) (Table A2 # 9, 10). The gap was largest at age 12, where 46% of boys and 31% of girls had calculus (Table A2 # 9). The difference between boys and girls reduces at age 15, but the percentage of boys (50 %) with calculus was still higher than girls 42 % (Table A2 # 10).

Tooth brushing

It is clear that 5 year olds who brush their teeth twice a day or more suffer from less observed plaque (43%) and gum inflammation (20%) than children who brush less than twice a day (65% and 37%) (Table A4 # 8-9).

The 12 and 15 year old children who indicated that they brushed their teeth twice or more a day had less gum inflammation (57% and 49% respectively) than children who brush less than twice a day (70% and 64% respectively) (Table A4 # 6, 7).

Moreover, the percentage of the plaque for 12 and 15 year old children was also lower in children who brush twice a day or more (61% and 46%) than children who brush less than twice a day (74% and 66%) (Table A4 # 8, 9). Additionally, the percentage of 12 and 15 year old children with calculus who brushed twice a day or more was also lower than children who brush less than twice a day, with 12 % difference in 12 year olds (36% compared to 48%) and 16 % difference in 15 year olds (42% compared to 58%) (Table A4 # 10, 11).

NHS dental visits

Just over 80% of 12 and 15 year olds reported that they visited the dentist for a check-up (Table A1 # 22, 23). In England 12 year olds (81%) were less likely to visit the dentist for a check-up compared to children of the same age in Wales (87%) and Northern Ireland (89%) (Table A1 # 22). A similar relationship was seen in 15 year olds, England, Wales and Northern Ireland, 82%, 87% and 86% respectively (Table A1 # 23).

The 12 year olds in Northern Ireland (97%) were more likely to have visited the NHS dentist in the last 12 months compared to those in England (90%) and Wales (89%) (Table A1 # 24). A lower rate of 15 year olds in England (90%) were indicated to have visited the NHS dentist in the last 12 months compared to those in Wales (96%) and Northern Ireland (95%) (Table A1 #25).

Dental anxiety

12 and 15 year olds were classified as having extreme dental anxiety in England (14% and 10%), Wales (13% and 12%) and Northern Ireland (9% and 12%) respectively (Table A1 # 28, 30). In Northern Ireland (9%), 12 year olds were less likely to be assorted as having extreme dental anxiety than those in Wales (13%), England (14%). In addition, in Wales (30%) and in Northern Ireland (31%), 12 year olds were more likely to be classified as having low or no dental anxiety than children of the same age in England (23%) (Table A1 # 28, 29). With regard to differences by gender, in 12 year olds, 43% of boys and 59% of girls would be extremely anxious about having a tooth drilled. In 15 year olds, the respective figures are male with 30%, female with 49% (Table A2 # 13, 14). 42% of male and 62% of female at age 12 would be extremely anxious about having a local anaesthesia injection (Table A2 #15).

Children aged 12 and 15 who felt extremely anxious about having their tooth drilled (51% and 39% respectively) as well as receiving a local injection (54% and 41%) (Table A4 # 16, 17).

Sugary Drinks

Sugary drinks consumed 4 or more times a day by 12 years olds in England, Wales and Northern Ireland was of 16%, 18% and 13% respectively. 15 year olds in England, Wales and Northern Ireland had the same rates of 14% (Table A1 # 32, 33).

12 year old males who consumed sugary drinks revealed a rate of 19% whereas females of the same age revealed a rate of 13%. 15 year old males who consumed sugary drinks revealed a rate of 15%, whereas females of the same age revealed a rate of 14% (Table A2 # 17, 18).

12 year olds eligible for free school meals showed a much higher rate (26%) than those who were not eligible (13%) for free school meals concerning the consumption of sugary drinks 4 or more times a day.

The same case was observed with 15 year olds with 26% eligible school meal and 12% for non eligible school meals (Table A 3 # 25-28).

Selective Adult Dental Health Survey (ADHS) 2009

TD

A rate of moderate TD also varied between countries; 47% of adults in Wales had moderate TD compared with 30% of adults in England, and 28% in Northern Ireland (Table B1 #3). The rate of men (34%) was higher than that of women (28%) who had moderate TD (Table B2 #3). Additionally, adults aged 45 to 54 and aged 65 to 74 with 27% had the lowest rate and the opposite, the highest rate was those aged 75 to 84 with 40% (Table B3 #3). 13% of adults in Wales had severe TD compared with 10% of adults in Northern Ireland, and 8% in England (Table B1 #4). Men were more likely than women to have teeth with severe TD, 11% compared with 6% respectively and the rate of severe TD also differed between age groups (Table B2 #4). Adults aged 35 to 44 with 7% had the lowest rate, while those aged 75 to 84 with 15% had the highest rate (Table B3 #4).

PD

Gingival bleeding: Although small differences can be seen between England (54%) and Wales (56%) but there was a big difference between Northern Ireland (64%) and England (54%) relating to gingival bleeding, the rate of the adults with gum bleeding varied between age-groups. (Table B1 #6). Males were more likely than females to have

some gingival bleeding, 56% compared with 52% respectively (Table B2 #8). Specifically, gingival bleeding peaked amongst adults aged 45 to 54 (59%) compared with 49% amongst the adults aged 65 to 74. Between adults aged 45 to 54 (59%) and aged 65 to 74 (49%) there was a big difference of 10%. (Table B3 #5).

Gingival pocket: For periodontal pocketing 4mm or more, 50% in Wales was higher than 45% in England and 38% in Northern Ireland (Table B1 #7).

A small difference was measured by gender, 47% of male compared with 43% of female relating to periodontal pockets (Table B2 #9).

59% of adults in England used other dental hygiene products for dental hygiene while only 46% and 48 % of adults in Wales and Northern Ireland respectively did (Table B1 #12).

The rate of the group which had gingival pockets aged 25-34 had the lowest rate with 36% and those aged 55 to 64 and 75 to 84 had the highest rate with 61% (Table B3 #8).

Plaque and calculus

Differences of plaque rate were also evident, ranging from 77 % in Wales to 66 % in England and 51 % in Northern Ireland (Table B1 #8).

Additionally, the rate of calculus in England (69%) was higher than that of Wales (67%) and Northern Ireland (66%) (Table B1 #9).

Men were more likely to have plaque and calculus than women (71% and 72% compared with 61% and 65% respectively) (Table B2 #6, 7).

Regarding plaque rate, the group aged 55 to 64 was the highest with 70%, while those aged 35 to 44 had the lowest rate with 64% (Table B3 #6).

Concerning the calculus rate, the group aged 55 to 64 had the highest with 72%, on the other hand those aged 25 to 34 and 35 to 44 had the lowest rate with 68% (Table B3 # 7).

Tooth brushing

Adults who brushed their teeth twice or more a day were estimated in England (75%), Wales (71%) and Northern Ireland (75%) (Table B1 #15). 82% of women cleaned their teeth twice a day or more compared with 67% of men (Table B2 #10). Though the highest rate is the group aged 35 to 44 with 80%, the lowest rate is 85 and over with 63% (Table B3 #9).

NHS Dental Visits

Dental regular check-up

Adults who visit the dentist for a regular check-up in England (49%), Wales (59%) and Northern Ireland (54%), Wales (59%) had the highest rate of adults who visit the dentist for a regular check-up as opposed to the lowest rate of 49% in England (Table B1 #16). 55% of women have a regular check-up compared with 45% of men (Table B2 #16). For a regular check-up, the lowest rate among those adults was that of those aged 25 to 34 years (38%) and the highest rate among those aged 65 to 74 (59%) can be seen (Table B3 #14)

Dental visit times

When visiting a dentist at least every 2 years, the rate of England, Wales and Northern Ireland had similar percentages: 76%, 79% and 77% respectively (Table B1 #17).

Women were also more likely than men, to visit the dentist at least every two years (82% compared with 71%) (Table B2 #17). Relating to the lowest rate of visiting a dentist, among adults was that of those aged 25 to 34 (67%) and the highest rate was among those aged 65 to 74 (84%) (B3 #15).

Dental anxiety

For dental anxiety when visiting the dentist, 'Not anxious' and 'Extremely anxious' adults' data were analysed in drilled tooth amongst England, Wales and Northern Ireland and showed a similar rate; (28%, 30%), (33%, 26%) and (32%, 29%) respectively (Table B1, #18, #19).

Likewise, 'Not anxious' and 'Extremely anxious' adults data were analysed in local injection data amongst the three countries, England, Wales and Northern Ireland, 30% and 29%, 35% and 25% as well as 37% and 25%, respectively (Table B1, #20, #21). Comparing males and females, females (38%) felt more anxious than males (22%) when having their tooth drilled (Table B2 #19), Females (36%) also felt more anxious than males (21%) when receiving a local injection (Table B2 #21).

The age group of 25 to 34 year olds with 35% was the group that felt the most anxious, whereas the lowest rate with 17% can be seen in three groups comprising 65 to 74 year olds, 75 to 84 year olds and 85 and over (Table B3 #17).

Concerning socio-economic category in adults, MPO, IO and RMO in terms of 'Extremely anxious' in local injection rate was 25%, 28% and 31% respectively (Table B4 #16).

Sugar drinks

High sugar intake includes cakes biscuits, puddings, pastries, sweets, chocolate and fizzy drinks 6 or more times a week concerning high sugar intake.

A small difference can be seen in three countries, 50% in England, 51% in Wales and 54% in Northern Ireland (Table B1 #22). A significantly larger rate of men was classified as high sugar consumers (53%) compared with women (46%) (Table B2 #22). The rate of high sugar intake varied by age and the highest rate among adults was aged 85 and above (65%) and the lowest rate among adults was aged 45 to 54 years (42%) (Table B3 #18).

Smoking

England (22%), Wales (24%) and Northern Ireland (25%) had similar percentage rates in smoking (Table B1 #23). In detail, 24% of men were smokers compared with 21 % of women (Table B2 #23).

However, the group aged 25 to 34 with 30% had the highest rate, while those aged 85 and over is the lowest rate with 6% (Table B3 #19).

For smoking rate, Managerial and professional occupations (MPO) was lower than Intermediate (IO) or Routine and manual occupations (RMO).

In terms of all these items, MPO had better oral health conditions comprising TD, bleeding, pocket 4mm or more, plaque, calculus, tooth pain, no tooth pain and sign of sepsis than IO and RMO (Table B4).

Discussion

Selective CDHS 2013

TD: TD was caused by a wide variety of reasons such as age, gender, heredity, food, education and government policies. Males and females are similar in moderate TD at 60% (Table A2 #1,2). However, between the age of 5 and 15, 1 in 15 males and 1 in 15 females had serious TD, (16%) larger (Table A2 #3,4). Severe TD might be more likely to cause and accelerate systemic diseases for example root canal bacteria causing a focal dental infection and the bacteria being carried to the remote tissues or organs through blood and lymph vessels.

Serious TD rate of England was lower than that of Wales and Northern Ireland (Table A1 # 6,7). TD rate of permanent teeth gradually increased from 8 (28%) to 15 (46%), (Table 3 #2). Having severe TD can lead to a person becoming extremely ill and therefore incur exacerbation of hedonic and eudaimonic wellbeing.

PD: PD comprising of plaque, calculus or gingiva inflammation, has more complex circumstances because the onset of PD has multiple factors as mentioned before. Gingival inflammation rate is roughly equal between England, Wales and Northern Ireland. However, Plaque rate of Wales is higher than that of England and Northern Ireland (Table A1 #13,14,15). Additionally, calculus rate of Wales, Northern Ireland is lower than that of England (Table A1 #17,18). Regarding plaque and calculus, female rate (56%, 31%) was smaller than male (72%,46%) in 12 age (Table A2 #7). Additionally, Calculus rate in children increased gradually from 5 (9%) to 15 (46%) (Table 3 # 5).

Tooth brushing

Tooth brushing is significant to prevent TD and PD because of prevention of corrosion from acid which oral bacteria produce. Frequency of tooth brushing can determine the prediction of oral health including teeth, gingiva and mouth. Regarding tooth brushing, twice or more a day, brushing times were nearly same rate (average 80%) between England, Wales and Northern Ireland (Table A1#19,20,21). Tooth brushing times in male (nearly 70%) is lower than that of female(nearly 90%)(Table A2 #11,12). Moreover, tooth brushing times increased gradually from 5 (7-8%) to 15 (42-58%) (Table A3 #10,11). Healthy teeth and gingiva bring about a good physical and mental condition. Accordingly, that condition leads to enhance hedonic and eudaimonic wellbeing.

NHS Dental Visits

It is therefore vital for children to have access to NHS dentists. NHS dentists can help advise on prevention and promotion of oral health including teeth, ginviva and mouth.

Dental check-up rate of all three countries was more than approximately 80% (Table A1 #22,23) Visiting a dentist regularly is advisory as it boosts physical, psychological as well as social life and wellbeing. Concerning NHS dental visited last 12 months, Higher rate more than approximately 90% can be seen in all three countries (TableA1 #24,25), (NHS,2015C) [10]. Accessibility to dental services can enhance the promotion of oral health and lead to cultivation and advancement of eudaimonic as well as hedonic wellbeing.

Dental anxiety

Dental anxiety can aggravate the refusal to visit a dentist. As a result, exacerbating visiting a dentist causes TD and PD. This situation leads to deterioration of hedonic and eudaimonic wellbeing. Additionally, dental anxiety is extremely common in childhood (Marshman et al, 2016) [11]. Regarding dental anxiety (extremely anxious), approximately 10% can be seen in 3 countries (Table A1#28,30). Female rate in tooth drilling and local anaesthesia injection is higher (approximately 50-60%) than that of male (approximately 30-40%), (Table 2 #13-16). Furthermore, regarding dental anxiety (drilled tooth, local injection), 15 was lower rate (39,41%) compared to 12 (51,54%), (Table A3 # 16,17).When patients suffer from dental phobia and visit a dentist, some cases might need psychological or cognitive therapy including using musical or imaging instruments to help patients relax and have a sense of wellbeing.

Sugary drinks

Sugar causes not only TD but also serious health problems. Limitation of consumption of sugary drinks can bring about prevention of diabetes as well as a promotion of good oral health. Avoiding sugar can help with having better oral health and therefore maintaining teeth in a better condition helps feeling more confident and contributing to wellbeing.

Nearly 15% of sugary drinks consumption can be seen in 3 countries or male and female (Table A1 # 32,33), (Table A2 #17,18).

TD and obesity are the most common health status concerning

children. From 2011 to 2012 in England, 9.4% of children aged 5 were overweight and 28% had TD (BDA, 2015) [12].

Thus, sugar control can lead to quality of life as well as hedonic and eudaimonic wellbeing.

Selective ADHS 2009

TD

This NHS survey indicated a great number of dental implications. The NHS assessments give a precise explanation of the rate of diseases and the amount of dental treatments comprising TD (Table B1 # 3,4,5). Concerning TD rate including moderate TD, severe TD and sign of sepsis,

The rate of Wales was higher than that of England and Northern Ireland (Table B #3-5). Regarding TD rates, male was higher than female but the difference was less than 10% between male and female (Table B2 #3-9). Moreover, there was slightly difference between younger and older people (Table B3#3-7). Concerning serious TD, Dental pain has frequently urgent conditions including acute serious pain and severe discomfort. Untreated teeth with extensive TD occasionally incur on open dental pulps and sign of sepsis. Sepsis is the body's overwhelming and life-threatening response to infection that can lead to tissue damage, organ failure, and death. Regarding signs of sepsis, adults who suffer from this with 7%, 8% and 6 % in England, Wales and Northern Ireland, respectively (Table B1 #5). Regarding serious TD rates, male (11%) was larger than male (6%) (Table B2 #3-9). Systemic diseases have a critical condition to exacerbate both hedonic and eudaimonic wellbeing.

PD

Plaque rate of Wales (77%) was higher than that of 2 other countries (66% in England, 51% in Northern Ireland), calculus rate was almost same rate between 3 countries (nearly 70%) (Table B1 #8,9). Moreover, concerning plaque and calculus rate, male (71%,72%) was higher than female (61%,65%) Furthermore, gingival pockets have been increasing gradually from younger to elderly people (Table B3 #). the existence of calculus, formation of firm plaque, is a significant risk factor because it prevents appropriate cleaning and plaque clearance. Accordingly, effective cleaning and products are needed. Accumulation of dental calculus cause gingival inflammation, as a result, gingival pain and halitosis incurs. These conditions bring about the decline or deterioration of either hedonic or eudaimonic wellbeing.

Tooth brushing

Adults who brushed their teeth twice or more a day were estimated in England (75%), Wales (71%) and Northern Ireland (75%) (Table B1 #15). 82% of women cleaned their teeth twice a day or more compared with 67% of men (Table B2 #10). Though the highest rate is the group aged 35 to 44 with 80%, the lowest rate is 85 and over with 63% (Table B3 #9). Though younger adults have sufficiently a number of teeth, the elderly is less likely to have a number of teeth. As a result, elderly people might not be able to brush their teeth because of wearing dentures. Toothbrushing is a basically good habit to remove bacteria and virus in mouth. These regular actin is more likely to promote wellbeing.

NHS Dental Visits

Adults who visit the dentist for a regular check-up in England (49%), Wales (59%) and Northern Ireland (54%). The lowest rate of England can be seen.

Adults in England are less likely to see NHS but more likely to see private dentists compared to 2 other countries. 55% of women have a regular check-up compared with 45% of men. Women might visit NHS dentists to be examined to improve esthetic problem as well as pain control compared to men.

For a regular check-up, the lowest rate among those adults was that of those aged 25 to 34 years (38%) and the highest rate among those aged 65 to 74 (59%) can be seen (Table B3 #14). Younger adults might have much more busy time to study or work than the elderly because old people can have spare time as they retired their jobs.

As NHS dental visits regularly maintain good oral condition, wellbeing can promote.

Dental anxiety

Dental anxiety or fear of going to the dentist is one of the most common negative feelings. Females are more likely to document a high rate of dental fear than males (Table B2 # 21).

Approximately 30% of adults who had had a tooth drilled scored (Table B1 #18, 19) as being very as well as extremely anxious in England, Wales and Northern Ireland. Nearly 30 % had the same levels of anxiety with regard to having a local anaesthetic injection in the three countries (Table B1 #20, 21). Dental anxiety rate was decreasing gradually from 25-34 (35%) to 85 and over (17%) in extremely anxious in relation to local injection (Table B3 #17). A positive dental visit can prevent TD, PD and TL. Therefore, dental anxiety can incur negative hedonic and eudaimonic wellbeing comprising psychological functioning.

Sugar

Sugar plays an essential part in TD as it fuels acid formation due to oral bacteria. Tooth decay is connected with the habitual consumption of sugary drinks (RCS, 2015) [13].

Concerning high sugar intake rate, almost same rate (approximately 50%) can be seen between 3 countries (Table B1 #22). Moreover, Dental anxiety rate decreased gradually from 25-34 (35%) to 85 and over (17%) in extremely anxious in relation to local injection (Table B3 #17). Moreover, dental anxiety rate of males (53%) was higher than that of females (46%). Furthermore, the elderly are higher sugar consumption rate than young adults and middle aged people (Table #B3).

Obesity magnifies the risk of chronic disease and psychological problems and TD has a serious effect on the quality of life and wellbeing (GOV.UK, 2015b) [14].

Smoking

Tobacco usage, smoking as well as chewing tobacco, has a hazardous impact not only in general but also in oral health. The most substantial impacts on oral regions are oral cancers and serious and extensive PD and TL. Moreover, tobacco usage brings about stained teeth, a declined sense of taste and halitosis (John and Bain, 2000 by cited NHS, 2017f) [15]. Almost the same smoking rate (approximately 20-25%) can be seen between the 3 countries (Table B1 #23). Male smoking rate was slightly larger than female (Table B2 #23). The number of smokers decreased gradually from 25-34 to 85 and over (Table # B3). In consequence, tobacco free can lead to the enhancement of wellbeing.

Summarized Discussion

The summarized discussion section is concerned with oral health and wellbeing and is also addressed in this paper, in particular with the items below:

First of all, concerning systemic disease, gingivitis can lead to TL and also people can ultimately suffer from systemic diseases (Nazir, M. A, 2017) [16]. Consequently, poor gingival conditions might cause serious diseases and accordingly quality of life as well as life satisfaction and wellbeing are progressively aggravated. Therefore, normally gingival observation can cultivate positive hedonic and eudaimonic wellbeing.

Serious TD might cause increasingly and accelerate systemic diseases such as root canal bacteria resulting in a focal dental infection and can infect from the tooth to the whole body through blood and lymph vessels and the bacteria can be carried to the remote tissues or organs through mainly blood streams as well as diabetes and coronary heart diseases. Having serious TD can lead to a person becoming extremely ill (Low, W, Tan S, Schwartz S. et al, 1999) [17] and therefore incur exacerbation of hedonic and eudaimonic wellbeing.

TD and PD are the two substantial problems in oral health. TD and PD are caused by complicated factors including ageing, heredity, circumstances, educational situation and dental policies.

Therefore, sound oral health results in sound general health and wellbeing. Dental disease or pathologic oral health can lead to deterioration of general health including diabetes or arteriosclerosis. Alleviating TD and PD can improve quality of life and wellbeing.

With advancement of oral function and appearance, people can foster positive eudaimonic and hedonic wellbeing. Additionally, the prevention of oral health including TD and PD can lead to increased general health and hedonic (pain control) as well as eudaimonic (consistent moral life) wellbeing. Systemic diseases can incur in the deterioration, of both hedonic and eudaimonic wellbeing.

Secondly, regarding dental anxiety, Avoidance of dental visits due to dental anxiety might contribute to the patient ignoring and disregarding the beginnings of TD and PD.

Extremely serious dental treatments can lead to the avoidance of visiting a dentist (NHS 2015d) [18]. Refusing to visit a dentist can contribute not to being treated for TD and PD accordingly. As a result of this, oral health can deteriorate and alter one's general health. Therefore, dental anxiety can incur negative hedonic and eudaimonic wellbeing comprising psychological functioning as well as a life of satisfaction.

Successful treatment will need of dentists' and patients' cooperation. When patients suffer from dental phobia and visit a dentist, some cases might need psychological or cognitive therapy including using musical or imaging instruments to help patients relax and have a sense of wellbeing. In consequence, a relaxed patient will evidently lead to a less stressful atmosphere for the dentists and interdisciplinary workers (American Dental Association or ADA, 2018) [19]. Both patients and dentists can promote a life of oral health satisfaction and wellbeing.

Psychological measure is an effective intervention and can ameliorate anxiety (White AM, Giblin L, Boyd LD. et al, 2017) [20] It can enhance not only hedonic but also eudaimonic wellbeing because a patient can feel comfortable and relaxed.

Lastly, as for oral hygiene awareness, bacterial plaque is connected with TD as well as PD and its clearance is a great preventive behavior for both diseases (NHS, 2011) [9]. Similarly, the existence of calculus, formation of firm plaque, is a significant risk factor because it prevents appropriate cleaning and plaque clearance. Accordingly, effective cleaning and products are needed. Moreover, sugar control is essential because harmful bacteria from digesting the sugar in foods produce acids. Accumulation of dental calculus cause gingival inflammation, as a result, gingivitis and halitosis incur (Peterson, P.E. (2003b) *Continuous improvement of oral health in the 21st century – the approach of the WHO Global Oral Health Programme*, The World Oral Health Report 2003, pp. 1-45. [Online] Available from: <http://www.who.int/iris/handle/10665/68506> (Accessed: 26 June 2018) [21]. These conditions bring about the decline or deterioration of either hedonic or eudaimonic wellbeing.

Tooth brushing is significant to prevent TD and PD by brushing their teeth twice a day with fluoride tooth paste to prevent corrosion from acid which oral bacteria produce (GOV.UK (2016) [22] *Improving*

the oral health of children: cost effective commissioning, fluoride varnish. GOV.UK. Available from: <https://www.gov.uk/government/publications/improving-the-oral-health-of-children-cost-effective-commissioning> (Accessed: 15 May 2018).

Frequency of tooth brushing can determine the prediction of oral health including teeth, gingiva and mouth. Sound teeth and gingiva bring about sound physical and mental condition (Drummond B. K, Meldrum, D. Boyd, 2013) [23]. Improving oral health can promote quality of life including eudaimonic as well as hedonic wellbeing.

Conclusions

Regions including England, Wales and Northern Ireland

The discussion of selective survey indicates that dental check-up rate of all three countries was more than approximately 90% of children between 5 and 15 in England, Wales and Northern Ireland. Additionally, NHS dental visits for last 12 months, higher rate more than approximately 90% can be seen in children. On the other hand, check-up (50-60%) and dental visits at least every 2 years (75-80%) in adults in 3 countries.

British dental institution or NHS seems to be effective because children's dental fee is free. Children are more likely to receive NHS dental care. While, British citizens are less likely to visit dentists because they might have to pay 80% dental treatment fee.

Regarding tooth brushing, twice or more a day, brushing times was nearly same rate with 80% of children while, nearly 75 % of adults in 3 countries. The majority of British people not only children but also adults are mostly likely to have a great custom of tooth brushing in 3 countries.

Concerning dental anxiety (extremely anxious), over 10% of children can be seen in England, Wales and Northern Ireland. While, approximately 30% of adults who had had a tooth drilled scored extremely anxious in 3 countries. Nearly 30 % of them had the same levels of anxiety in terms of having a local anesthetic injection in the 3 countries.

When children visit dentists, their families are most likely to take them to dentists. Accordingly, the children might be able to relax and calm even if children suffer from pain by the injection. Additionally, dental patients are likely to be sensitive or nervous by taking injection and drilling teeth. When children had undergone dental and injured problem, they might remain in their serious memory and have a fear like a dental phobia.

Gingival inflammation rate is roughly equal with 50 % between children aged 8 and 15 of England, Wales and Northern Ireland. However, Plaque rate between 8 and 15 of Wales (63, 80%) is higher than that of England (49, 71%) and Northern Ireland (50, 65%).

Plaque rate in adults of Wales (77%) was higher than that of 2 other countries (66% in England, 51% in Northern Ireland), calculus rate was almost same rate between 3 countries (nearly 70%).

Plaque rate of Wales was higher than that of England and Northern Ireland. As a result, Wales people not only children but also adults are less likely to take an appropriate measure or technique of brushing. Additionally, they might have dental financial problems because dental treatment fee would be expensive than other medical fee in the UK.

Gender

Moderate TD rate in children aged 12 and 15 were nearly equal between male and female with approximately 60%.

Serious TD rate of male (16%) are higher than that of female (10%) in 5. On the other hand, serious TD rate of male are lower (13%) than that of female (16%) in 15 in children.

TD and PD rates in adults, male was higher than female but the difference was less than 10% between male and female. Additionally, serious TD rates, male (11%) was higher than male (6%).

Plaque and calculus rate of female (56%, 31%) was smaller than male (72%,46%) in children aged 12.

The plaque and calculus rate of male (71%, 72%) was higher than that of female (61%, 65%) in adults from aged 25 to 85 and over.

Concerning TD and PD, plaque and calculus, roughly these rates of male were higher than those of female.

Male are less likely to practice an suitable and a regular tooth brushing. Moreover, they might be extremely busy that they would not be able to observe their tooth regulation strictly. Furthermore, they might consume meal texture like soften and sticky good.

Age

TD rate of permanent teeth was gradually increasing from 8 (34%) to 15 (63%).

Calculus rate in children was increasing gradually from 5 (9%) to 15 (46%).

Gingival pockets have been increasing gradually from younger to elderly people.

Throughout life, various kind of substances and customs including bacteria, chemicals, excessive mastication, malocclusion and lack of regular tooth brushing are most likely to exacerbate gradually oral and tooth condition.

They should take dental guidance from dentists and dental hygienists and find out an appropriate procedure to improve dental condition.

Concerning dental anxiety (drilled tooth, local injection), 15 was lower rate (39, 41%) compared to 12 (51, 54%). Dental anxiety rate was decreasing gradually from 25-34 (35%) to 85 and over (17%) in extremely anxious in relation to local injection.

With the advanced age, juveniles and adolescents could have gained awareness and great confidence to control themselves and persevere through injection pain.

Society

Oral cavities can predict the presence of systemic diseases because of severe TD, PD and TL which is ordinarily an ageing characteristic (Chapple IL, Bouchard P, Cagetti MG. et al. (2017) [24]. Systemic diseases can have a serious impact on oral health and holistic dental treatment is needed, likewise poor oral health can affect general health as well as wellbeing including hedonic and eudaimonic wellbeing.

Dentists have an essential part to play in sustaining the general and oral health of the country. Committees of dental services need to approach suitable dental public health to obtain support of tactics to improve inequality situations in oral health relating to general health to promote holistic patient care (Wilson, N, 2017) [25].

What is more, government policy should take the initiative of stressing the prevention of oral diseases as well as advancement of oral health by assisting to reduce inequalities (British Dental Association or BDA, 2009) [26]. To progress with these approaches, dental professionals should be more integrated with health services to give patients with comprehensive and holistic care.

Additionally, the main target should be the serious vulnerable commonality in society such as children and adults with disabilities and impairments (BDA, 2009) [26].

Moreover, carrying out invaluable quality research is indispensable

to determine the effectiveness of interventions. These needs to be adjusted and included among a stakeholders involved in public health policy-making (BDA, 2009) [26].

Furthermore, cost-effective tactics would also cultivate interdisciplinary cooperation among national, local government and society as well as dental professionals. Thus, maintaining healthy teeth and gums has a positive financial influence and can foster quality of life and general wellbeing.

Oral health has a robust integration to general health and wellbeing (Sheiham, A, 2005) [27]. In consequence, good oral health can advance eudaimonic and hedonic wellbeing. Eudaimonic wellbeing can enhance personal growth, promote positive relationships and purpose in life (achievement of goal), while hedonic wellbeing can promote hope, joy and pride (pleasure fulfilment).

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