An online survey of oral health behaviours and impact on young children and families in Wales

Karki A J[1], Nurmatov U B[2], Atkinson M D[3], Naughton A[1], Kemp A[2]

Anup J Karki (Corresponding author)

[1] Public Health Wales, Capital Quarter 2, Cardiff, CF10 4BZ, Wales, UK

[2]Division of Population Medicine, School of Medicine, Cardiff University, Wales, UK

[3]Swansea University Medical School, Swansea, Wales, UK

Key points:

- Health Wise Wales (HWW), an online register of people in Wales who have volunteered to participate in research, provided access to 'research ready' population for this study. The disadvantage of the HWW was that the register was not fully representative of the Welsh general population.
- This paper provides an overview of oral health behaviours and reported impact on young children in Wales. Overall reported impact was low and 20% parents reported that their children brush their teeth less than twice a day.
- Drinking plain water twice a day or more compared to drinking no water was a significant predictor of low oral health impact. Increased use of plain water by children to meet their hydration need may also indirectly help oral health.

Abstract

Studies outside Wales have consistently reported reduced quality of life as measured by the Early Childhood Oral Health Impact Scale (ECOHIS). With relatively high levels of tooth decay in Wales as found through the regular dental surveys, it is important to understand different oral health related behaviours and impact so that findings can inform oral health promotion in Wales.

Methods: An oral health questionnaire was made available to volunteers registered with Health Wise Wales. Parents of children (two to six-years-old) participated in the study. Frequency analyses were carried out to understand the oral health related behaviours and regression analysis was carried out to understand the predictors of reported oral health impacts.

Results: Overall reported oral health impacts was low in this study. Twenty percent parents reported that their child brushed their teeth less than twice a day and 23%

reported toothbrushing without adult supervision. Drinking plain water twice a day or more was associated with good oral health in children.

Conclusion: Overall reported oral health impact was low which is likely to be due to under representation of study participants from the deprived areas in Wales. There is plenty of room for improvement in oral health related behaviours.

Introduction

Oral health disorders are one of the most prevalent and costly global public health problems. The Global Burden of Disease Study 2017 estimated that oral diseases affect close to 3.5 billion people worldwide with more than 530 million children suffer from caries on primary teeth[1]. Oral health is multidimensional in nature and includes physical, psychological, emotional, and social domains that are integral to overall health and wellbeing[2]. Good oral health is a state that, enables a range of functions such as eating, speaking, smiling, chewing, facial expressions and socialising, without discomfort, pain, or embarrassment. It exists in a continuum influenced by a person's values, attitudes, changing experiences, perceptions and expectations. [3]

Although dental health of children in Wales is improving, 34.2% of five year olds in 2015/16 were found to have experienced tooth decay with 28.2% had active untreated tooth decay at the time of the epidemiological survey. [4] However, the proportion of five year olds who had experienced tooth decay in the most deprived areas was 42.2% compared to 22.6% living in the least deprived areas in Wales[4]. High levels of tooth decay in young children results in pain, impaired function and difficulty in sleeping[5, 6] and requires a greater need for ongoing prevention programmes and provision of dental services. One of the consequences of high levels of tooth decay in child population is the need for dental treatment under general anaesthesia. In 2017/18, it was estimated that more than six thousand children in Wales required general anaesthesia for dental treatment, [7] the majority of whom are likely to come from the deprived areas. While there is an understanding of the level of caries in the child population of Wales, impact of the high level of disease on the quality of life of children and families is unknown.

Unlike clinical indicators, oral health quality of life measures aim to capture broad consequences of poor oral health on children as well as the family. Hence, oral health-related quality of life measures have been increasingly used to assess the impact of caries on the everyday lives of children and their families. The Early Childhood Oral Health Impact Scale (ECOHIS) was developed to assess the impact of oral health conditions on the quality of life of preschool children (aged 3 to 5 years) and their families[8]. ECOHIS has been evaluated for its validity and reliability among different populations around the world.[9,10,11] Studies have consistently reported reduced quality of life as measured by ECOHIS in children and families affected by dental caries in children in diverse populations.[12, 13, 14, 15, 16]

Health Wise Wales (HWW) is an online register of people in Wales who have volunteered to participate in research. HWW can support data collection for a study by hosting questionnaire modules on the HWW Platform. Further information about HWW can be found from its website https://www.healthwisewales.gov.wales/for-researchers/ . HWW provided an opportunity to study oral health related quality of life amongst young children in Wales; additional useful information over and above that collected through the regular child dental surveys in Wales. The main objectives of the study were to understand key oral health behaviours of children aged 2-6 years of age and the impact on oral health quality of life using the ECOHIS.

Methods

Health Wise Wales participants

Adults (aged 16 and above) living or receiving their healthcare in Wales are eligible and are thus invited to register as research participants in HWW. People who volunteer to be research participants give consent to participate in a particular project through an online web application, which is accessed via the project's website (www.healthwisewales.gov.wales) or they can be recruited face-to-face using tablets or paper-based sign-up forms.

Once participants provide consent, they are to be followed-up every 6 months so that their details can be used to access their routinely-collected NHS records for research purposes and they can be contacted about research projects within HWW in which they could participate. New questionnaires are added every six months. Data

collection on socio-demographic and lifestyle factors is repeated at two-to-three year intervals. There is ongoing recruitment to increase the number of people registering with the HWW. HWW received ethical approval from the Wales Research Ethics Committee (REC) 3 on 16 March 2015 (reference 15/WA/0076). Applications to use the HWW for data collection is reviewed by a Scientific Steering Group (SSG) and Patient and Public Involvement (PPI) representatives to assess if the proposed project fits with the ethos of the HWW and is scientifically sound.

Detailed description of the HWW has been described by Hurt et.al.[17]

Oral Health Study in the Health Wise Wales

An oral health questionnaire that included questions on oral health related behaviours and ECOHIS[8] was first made available to HWW participants in from October 2017 until December 2019. HWW registrants who were parents of children aged 2-6 years of age were invited to take part in the oral health study. If eligible parents had more than one child aged 2-6 year olds, they were asked to complete the questionnaire for their youngest child. The questionnaire also included questions about the parents' oral health behaviour on frequency of toothbrushing and reason for their usual visit to the dentist.

Statistical Analyses

For analysis, data were transferred onto a secure platform (UKSeRP)[17]. Statistical analyses were carried out using the R statistical environment (R Core Team, 2019). Frequency analyses were carried out on variables from the oral health questionnaire. Multiple logistic regression analysis was carried out with oral health impact as the binary dependent variable. Each of the twelve impact areas from the ECOHIS (pain, drinking, eating, words, school, sleep, irritable, smile, upset, absent, guilty, cost) were recoded so that each impact was binary: never and hardly ever were coded as 0 i.e. no impact, and occasionally, often and very often as 1 i.e. yes in terms of impact. Those declaring "don't know" were treated as having missing values. These 12 variables are then merged so that if any of the impact was present, the impact was recoded as 1 i.e. yes. All the independent variables in all of these analyses have been expressed as factors, i.e. not as continuous variables. Any case with missing values in any variable was not included in the analyses. Quintiles of the Welsh Index

of Multiple Deprivation (WIMD) were included in the regression analysis. This is a measure of socioeconomic status for small areas. Quintile 1 represents the highest level of deprivation. The significant level was set at 0.05.

Results

Seven hundred seventy three eligible parents responded to the oral health survey with children's age distribution as presented on the Table 1.

The distribution of parents in this study and the general Welsh population across the Welsh Index of Multiple Deprivation quintiles has been presented in Table 2. A smaller proportion of parents living in the most deprived quintile participated in this online survey compared to general Welsh population while a much higher proportion of parents living in the least deprived quintile participated in the study.

Oral health behaviours of children reported by parents have been presented in Table 3.

The questionnaire also asked how often parents gave different kinds of food and drinks known to have high sugar content, healthier foods like fruits, vegetables and tooth friendly drinks milk and water. Parental response has been presented in the Table 4.

Parents were asked if they received advice on oral health when they came in contact with different healthcare professionals. Forty seven percent of parents reported that health visitors had provided oral health advice and 27% had reported receiving oral health advice from an NHS professional other than a dental team member and health visitor. Sixty two percent of parents reported that their child had taken part in regular toothbrushing at a nursery or school and 34% reported that the children had received preventive treatment to stop teeth decaying e.g. fluoride varnish application either at school/nursery or a dental clinic. Only 1% reported receiving antibiotics for their dental problem from their general medical practitioner.

Reported oral health impact through the ECOHIS questionnaire was low as shown on Table 5.

Parents were asked about their own toothbrushing habit and their reason for their dental visit. Only 79% parents reported that they themselves clean their teeth twice a day or more. Similarly only 76% parents reported regular check up being the main reason for dental visit. The remainder 24% of parents reported visiting only for the occasional check-up, when they have trouble with teeth or not visiting the dentist at all.

A multiple logistic regression was carried out using impact derived from the ECOHIS (as a binary variable) as the independent variable as explained above. The independent variables were all variables from the study questionnaire that included two variables about parents (toothbrushing habit and reason for their dental visit) as independent variables. Child age and frequency of drinking water were significant predictors for reported oral health impacts. (Table 6). Parents of children aged 3, 4, 5 and 6 years had significantly lesser odds of reporting oral health impacts compared to parents of 2 year olds. Similarly, odds of parents reporting oral health impact for children was significantly less for children who drank water once a day or less and children who drank water twice a day or more compared to those who were reported not to drink water at all (Table 6)

Discussion

This study explored collection of oral health information using an existing Health Wise Wales platform, an online register of people in Wales who have volunteered to participate in research. HWW provides access to 'research ready' individuals who have consented to be contacted for research which decreases the cost of recruitment into the study. Limitations of this study includes shortcomings of the HWW itself that research volunteers are not fully representative of the Welsh general population.[17] Lower proportion of parents from the deprived quintiles participating in this study may have been reflected on reported low oral health impacts. Further limitations of the study was the reporting and recall bias of parents and well known tendency to give socially desirable answers.

Children who develop caries in primary dentition is at high risk of developing caries in the permanent dentition, giving lifelong consequences for oral health.[18] Children's

deciduous teeth usually start to erupt from age of 6 months and parents are advised to start brushing them as soon as they erupt to prevent caries.[19] Healthcare teams especially health visiting and dental teams should deliver this advice to parents.

A fifth of parents said their child brushed their teeth less than twice a day and 23% reported their child brushed their teeth without any adult supervision. Twice-daily brushing with fluoride toothpaste is associated with better oral health outcomes for children than brushing once per day.[20] A previous study in Wales has shown that parents understood the advice of twice a day toothbrushing but toothbrushing was dependent on their perception of how often other parents brushed their child's teeth and daily routines, especially evening routines.[21]

The concept of Oral Health Quality of Life links to the outcomes model that puts value on patients'/parents' self-reports. The ECOHIS is intended for use in epidemiological surveys to assess the burden of dental disease among young children. It considers a child's entire lifetime experience of dental disease and treatment in their parent's responses. Overall impact reported in our study was relatively low with pain in the teeth, mouth or jaw as the most frequently reported impact. However it must be noted that our study sample had underrepresentation from children living in the deprived areas where prevalence of caries is higher compared to non-deprived areas.

In our study, parents of two year old children reported significantly higher oral health impact compared to older children. One of the reasons for this may be due to parents of 2 year olds reporting teething pain as pain in the teeth, mouth, or jaw in the ECOHIS questionnaire. Drinking water twice a day or more was a significant predictor of no oral health impacts being reported compared to drinking no water. This is probably related to water replacing the cariogenic and erosive drinks which reduces the risk of caries development. Children drinking increased amount of plain water to make up for the recommended daily intake is also relevant from the hydration perspective.[22] Healthy food and beverage patterns, developed during childhood, are an integral component of a healthy lifestyle. Replacing caloric sugary beverages with plain drinking water is a public health priority in the UK which should also help with having good oral health.

Conclusions

Within this study population, which had underrepresentation from the deprived quintiles, oral health impact was low. A fifth of parents reported that their child brushes less than twice a day as recommended. Drinking water twice a day or more compared to drinking no water was associated with good oral health. Further research would be required to understand if an intervention to improve plain water intake by children would improve their oral health and consequently reduce oral health impacts.

Declarations

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

All authors contributed to the study design and writing of this paper for publication. Mark Atkinson carried out the statistical analyses.

Ethical Approval

HWW received ethical approval from the Wales Research Ethics Committee (REC) 3 on 16 March 2015 (reference 15/WA/0076). Applications to use the HWW for oral health data collection was reviewed by a Scientific Steering Group (SSG) and Patient and Public Involvement (PPI) representatives to assess if the proposed project fits with the ethos of the HWW and is scientifically sound. Participants for this study consented to complete the oral health questionnaire. Separate ethical approval was not required.

Availability of data and materials

The datasets for this study are not publicly available due to privacy and/or ethical restrictions in accessing data collected by Healthwise Wales. Oral health questionnaire data that support the findings of this study can be obtained through the corresponding author on a reasonable request.

References

1. GBD 2017 Disease and Injury Incidence and Prevalence Collaborators, Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet 2018; 392: 1789–8583

2. Peres M A, Macpherson L M D, Weyant R J,*et. al*. . Oral diseases: a global public health challenge. Lancet 2019;394(10194):249-260

3. Glick M, Williams D M, Kleinman D V, *et. al.* A new definition for oral health developed by the FDI World Dental Federation opens the door to a universal definition of oral health. J Am Dent Assoc 2016; 147:915-917.

4. Morgan M, Monaghan N, Picture of Oral Health 2017. Dental Caries in Five Year Olds (2015/16), Welsh Oral Health Information Unit, Cardiff University, June 2017

https://www.cardiff.ac.uk/research/explore/research-units/welsh-oral-health-information-unit

5. Gilchrist F, Marshman Z, Deery C, Rodd H D. The impact of dental caries on children and young people: what they have to say? Int J Paediatr Dent 2015; 25(5):327-38

6. Abanto J, Carvalho T S, Mendes F M, *et. al*. Impact of oral diseases and disorders on oral health-related quality of life of preschool children. Community Dent Oral Epidemiol 2011; 39:105–114.

7. Morgan, M Child General Anaesthetics in Wales, Dental Public Health Team, Public Health Wales, Aug 2018

http://www.wales.nhs.uk/sitesplus/documents/888/GA%20report%20-2017-18_v1-definitive%20English%20%28002%29.pdf

8. Pahel B T, Rozier R G, Slade G D. Parental perceptions of children's oral health: the Early Childhood Oral Health Impact Scale (ECOHIS). Health Qual Life Outcomes 2007 Jan 30; 5:6. doi: 10.1186/1477-7525-5-6.

9. Scarpelli A C, Oliveira B H, Tesch F C, *et.al*. Psychometric properties of the Brazilian version of the Early Childhood Oral Health impact Scale (B-ECOHIS). BMC Oral Health 2011; 11:19.

https://doi.org/10.1186/1472-6831-11-19

10. Li S, Veronneau J, Allison P J. Validation of a French language version of the Early Childhood Oral Health Impact Scale (ECOHIS). Health Qual Life Outcomes 2008; 6:9

11. Lee G H M, McGrath C, Yiu C K Y, King N M. Translation and validation of a Chinese language version of the Early Childhood Oral Health Impact Scale (ECOHIS). Int J Paediatr Dent 2009; 19:399–405.

12. Chaffee B W, Rodrigues P H, Kramer P F, Vítolo M R, Feldens C A. Oral health-related quality-of-life scores differ by socioeconomic status and caries experience. Community Dent Oral Epidemiol 2017; 45: 216–224.

13. Kramer P F, Feldens C A, Ferreira S H, *et. al*. Exploring the impact of oral diseases and disorders on quality of life of preschool children. Community Dent Oral Epidemiol 2013; 41: 327–335.

14. Wong H M, McGrath C P, King N M, Lo E C. Oral health-related quality of life in Hong Kong preschool children. Caries Res 2011; 45:370–376.

15. Ramos-Jorge J, Alencar B M, Pordeus I A. *et al*. Impact of dental caries on quality of life among preschool children: emphasis on the type of tooth and stages of progression. Eur J Oral Sci. 2015; 123:88–95.

16. Chaffee BW, Rodrigues PH, Kramer PF, Vítolo MR, and Feldens CA Oral health-related quality of life measures: variation by socioeconomic status and caries experience Community Dent Oral Epidemiol. 2017 June; 45(3): 216–224.

17. Hurt L, Ashfield-Watt P, Townson J, *et. al*. . Cohort profile: Health Wise Wales. A research register and population health data platform with linkage to National Health Service data sets in Wales. BMJ Open, 2019; 9:e031705. doi:10.1136/bmjopen-2019-031705

18. Li Y, Wang W. Predicting caries in permanent teeth from caries in primary teeth: an eight-year cohort study. J Dent Res. 2002; 81:561–566.

19. British Society of Paediatric Dentistry, A Practical guide to children's teeth. Accessed on 29/08/2021 https://www.bspd.co.uk/Portals/0/A%20Practical%20Guide%20to%20Childrens%20Teeth.pdf

20. Chestnutt I G, Schafer F, Jacobson A P, Stephen K W The influence of tooth brushing frequency and post-brushing rinsing on caries experience in a caries clinical trial. Community Dent Oral Epidemiol 1998; 26:406–411.

21. Trubey R J Moore S C, Chestnutt I G. Parents' reasons for brushing or not brushing their child's teeth: a qualitative study. Int J Paediatr Dent 2014 Mar; 24(2):104-112.

22. Vieux F, Maillot M, Constant F, Drewnowski A. Water and beverage consumption patterns among 4 to 13-year-old children in the United Kingdom. BMC Public Health 2017; 17:479

Tables

Table 1: Age of children whose parents responded to the survey

Child age	Frequency	%
2 years	224	29
3 years	163	21
4 years	133	17
5 years	138	18
6 years	115	15
Total	**773**	**100%**

Table 2: The percentages of the parents in this study compared to the general Welsh population resident in areas with each of the quintiles of the Welsh Index of Multiple Deprivation (WIMD).

WIMD Quintile	Parents in this study (%)	General Welsh population (%)
1 (most deprived)	14.3	21.8
2	17.9	19.8
3	17.5	19.2
4	20.8	18.5
5 (Least deprived)	29.4	19.8

Table 3: Oral health behaviours of children aged two to six years

How often brushed (n=770)	
Twice a day or more	80 % (615)
Less than twice a day	20 % (155)
Age when they started brushing (n= 770)	
Started brushing by age of 1 year	86% (663)
Started toothbrushing after age of 1 year	14% (107)
Who brushes child's teeth (n=768)	
Child	23% (177)

An adult	11% (85)
Both (an adult and child)	66% (506)
Child goes to dentist for? (n=771)	
For a check-up	89% (688)
Only when they have trouble with their teeth	1% (8)
Never been to a dentist	10% (75)

Table 4: Food and drinks consumption by children as reported by parents.

	Twice a day or more	**Once a day or less**	**Never**
Breakfast cereals including cereal bars (n= 767)	7% (52)	88% (679)	5% (36)
Fruits (n= 765)	71% (546)	28% (214)	1% (5)
Vegetables (n=767)	63% (486)	36% (273)	1% (8)
Yoghurt or Fromage Frais (n=768)	13% (103)	83% (638)	4% (27)
Pudding and desserts (n= 765)	4% (33)	89% (683)	6% (49)
Biscuits, sweets, chocolates or cakes (n=768)	10% (77)	87% (669)	3% (22)
Fruit juice (n=763)	6% (46)	62% (473)	32% (244)
Soft drinks e.g. fizzy drinks (n=761)	2% (15)	31% (236)	67% (510)
Milk (n=767)	43% (327)	53% (405)	5% (35)
Water (768)	84% (648)	111 (14%)	1.2% (9)

Table 5: Oral Health Impacts on children and families as reported by parents

	Never and hardly ever	**Occasionally, often and very often**
How often has your child had **pain in the teeth, mouth or jaws?** (n=766)	92% (701)	8% (65)
How often has your child had **difficulty drinking hot or cold beverages (drinks)** because of dental problems or dental treatments? (n=766)	99% (761)	1% (5)
How often has your child had **difficulty eating some foods** because of dental problems or dental treatments? (n=765)	98% (753)	2% (12)
How often has your child had **difficulty pronouncing any words** because of dental problems or dental treatments? (n=783)	97% (756)	3% (27)
How often has your child **missed preschool, day care or school** because of dental problems or dental treatment? (n=765)	99% (760)	1% (5)
How often has your child had **trouble sleeping** because of dental problems or dental treatments? (n=763)	97% (737)	3% (26)
How often has your child **been irritable or frustrated** because of dental problems or dental treatments? (n= 761)	99% (729)	1% (32)
How often has your child **avoided smiling or laughing when around other children** because of dental problems or dental treatments? (n=765)	99% (760)	1% (5)
How often have **you or another family member been upset** because of your child's dental problems or dental treatments? (n=766)	98% (751)	2% (15)
How often have **you or another family member felt guilty** because of	98% (746)	2% (18)

dental problems or dental treatments? (n=764)		
How often have **you or another family member taken time off from work** because of your child's dental problems or dental treatments? (n=767)	99% (756)	1% (11)
How often has your child had dental problem or dental treatment that **has had a financial impact on your family**? (n=768)	99% (763)	1% (5)

Table 6: Factors influencing oral health impacts on children by multiple logistic regression analysis

Variables	Odds Ratio (95% Confidence Intervals)	P value
Age of children (years) with age 2 years as the reference category		
3	0.40 (0.20, 0.82)	0.013
4	0.25 (0.19, 0.59)	0.002
5	0.35 (0.15, 0.80)	0.013
6	0.33 (0.13, 0.85)	0.022
Drinking water with never drink water as the reference category		
Once a day or less	0.09 (0.01, 1.01)	0.05
Twice a day or more	0.07 (0.01, 0.74)	0.03