Treatment Outcomes and Assessment of Oral Health Related Quality of Life in Treated Hypodontia Patients

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ABSTRACT

Objectives: 1. Assess treatment outcomes and oral health related quality of life (OHRQoL) of hypodontia patients after completing dental treatment at the Eastman Dental Hospital and compare it with British public norms. 2. Assess factors which have an association with patients' reported OHRQoL. Methods: Hypodontia patients who finished their treatment completed a 16-item questionnaire (UK oral health related quality-of-life measure), a list of four questions about their satisfaction with treatment received and a clinical assessment using modified USPHS criteria. Results: The sample included 52 participants: median age 28 years (range 16 - 61 years). All participants had completed treatment for at least 6 months (range 6-60 months). Clinical assessment revealed 4 of the participants had complications requiring treatment. The OHRQoL mean scores of the sample were statistically significantly higher than the mean scores of the British public norms for most age groups ($P<0.05$). Factors which revealed association with OHRQoL scores were: gender ($P=.047$) and satisfaction with dental aesthetics ($P=.006$). Conclusions: Hypodontia patients following treatment reported higher OHRQoL average scores compared to the British population. Higher OHRQoL scores were related to patients' satisfaction with dental aesthetics after treatment. Females tended to report higher OHRQoL scores than males.

INTRODUCTION

Hypodontia, is the general term frequently used to describe the developmental absence of one or more primary or secondary teeth, excluding the third molars.[1] The prevalence of hypodontia seems to be different between different continents, racial groups, and gender.[2] A variation between 2.6 %[3] and 36.5 %[4] have been reported for hypodontia in the permanent dentition. A prevalence of 5.5 % has been reported for the European continent.[2]

Hypodontia could have detrimental functional and aesthetic effects on patients affected.[5] These effects could lead to physical, physiological, psychological and social disturbances[6] which could affect patients' quality of life.

Formerly, worldwide health was thought of as a disease based concept, which related health to the absence of disease. More recently, the understanding of health has evolved into a newer, multidimensional, more complex concept, which takes into account social, psychological, and physiological factors.[7] Therefore, quality of life is now recognised as a valid parameter in patients' assessment in nearly every area of physical and mental healthcare, including oral health.[8]

Various measures have been developed to measure oral health related quality of life (OHRQoL), such as the Oral Health Impact Profile measure,[9] the Dental Impact on Daily Living measure,[10] the Child Perception Questionnaire[11] and the UK Oral Health-Related Quality of Life measure.[12]

The studies which have assessed the effect hypodontia has on patients' OHRQoL are shown in table 1. These studies varied in the population and age-group targeted, in the severity of hypodontia, and in the instrument used to measure the effects oral health has on the quality of life. However, regardless of the differences in these studies, the general consensus is that hypodontia has a negative impact on the OHRQoL.

Table 1. Summary of key studies which reported the effect of hypodontia on OHRQoL.

Reference	Location	Age 'yrs'	OHRQoL Measure	Study Design
Wong et al., 2006 (18)	Hong Kong	11-14	CPQ Measure1	Cross-sectional
Locker et al., 2010 (19)	Canada	11-14	CPQ Measure	Cross-sectional
Laing et al., 2010 (20)	UK	11-16	CPQ Measure	Cross-sectional
Kotecha et al., 2013 (21)	UK	11-14	CPQ Measure	Cross-sectional
Hashem et al., 2013 (22)	Ireland	18 -45	OHIP-492	Cross-sectional
Anweigi et al., 2013 (23)	Ireland	16–34	OHIP-49	Cross-sectional
Anweigi et al., 2013 (24)	Ireland	16–34	OHIP-49	Longitudinal
Dueled et al., 2009 (25)	Denmark	Mean 31	OHIP-49 (D.V.)3	Cross-sectional
Meaney et al., 2012 (26)	Ireland	16–25	OHIP-49/ Interviews	Qualitative

1 Child Perception Questionnaire (16)
2 Oral Health Impact Profile – 49 (11)
3 Oral Health Impact Profile – 49 Danish Version (27)

Assessing the effect comprehensive dental treatment has on hypodontia patients' OHRQoL could provide valuable information for future treatment planning and management of hypodontia patients.

This study was carried out in the UK at The Eastman Dental Hospital in London. The 16-item UK oral health related quality-of-life measure (OHQoL-UK ©) was chosen for this study. It has a unique ability to detect the positive aspects of participants' perceptions of oral health as well as the negative aspects, while other measures such as the OHIP are only capable of detecting the negative aspects.[13] This measure has been developed based on the UK public's perceptions of the key areas of OHRQoL,[12] and national norms scores for the OHRQoL-UK measure are available for the British public.[14] This would allow comparison of the results of this study to the British national norms, which would put the results in context and make any comparison with other European and international studies more feasible.

The aims of this study are to:

1. Assess treatment outcomes and OHRQoL of hypodontia patients after receiving prosthodontic dental treatment at Eastman Dental Hospital (EDH) and compare it with the available British public norms.[14]
2. Assess the associations between patients' reported OHRQoL following treatment and:

- Patients' satisfaction with different aspects of treatment provided.
- Social factors (gender, age, and ethnicity).
- Presence and absence of clinical dental complications.

METHODS

The study was granted an ethical approval with a favourable ethical opinion by the NHS National Research Ethics Service, Central London REC 3, Charing Cross Research Ethics Committee.

THE SAMPLE

Fifty-two adult hypodontia patients who were referred for the hypodontia clinic at the EDH and completed their dental treatment were recruited. Referrals to this hospital are usually from all locations within the UK but are received particularly from London and the south-East of the country. The referrals are usually from general dental practitioners, specialist practitioners and tertiary from other hospital dental departments. The inclusion criteria of the sample were: patients who have started and completed their dental treatment at EDH for a minimum period of 6 months and up to 5 years, patients who received prosthodontic treatment as part of their overall treatment and patients who are 16 years of age or above.

The exclusion criteria were: patients who did not receive prosthodontic treatment, patients who are below 16 years of age, or patients with hypodontia as part of a severe craniofacial syndrome such as cleft lip and palate.

DATA COLLECTION

The impact of oral health on the patients' life quality was assessed using the OHRQoL-UK measure. Employing the OHRQoL-UK measure, patients were asked to rate the impact of their oral health on 16 key areas of oral health-related quality of life.

This was in the format of: "what effect, if any, does your oral health (dental treatment received at Eastman Dental Hospital) have on each of the 16 key areas of life quality (for example; your speech)?"

The 16 items are classified into 3 main domains; the physical domain (eating/enjoyment of food, appearance, speech, general health, comfort and breath odour), the psychological domain (confidence, sleep/ability to relax, carefree manner, mood, and personality) and the social domain (social life, romantic relationships, smiling/laughing, work/ability to do usual jobs, and finance).[13]

Possible response categories included "very good effect, good effect, no effect, bad effect and very bad effect". With very good effect giving a score of 5 and very bad effect giving a score of 1.

The total score can range from 16 to 80; a score of 16 represents the poorest OHRQoL score possible, and a score of 80 represents the highest OHRQoL score possible.

Four extra questions were added to assess the participant's satisfaction with four different aspects following completion of treatment; satisfaction with improvement in dental condition, with duration of treatment, with dental appearance, and with the overall dental treatment and care they received at EDH.

Each patient then underwent a comprehensive examination. The examination included assessments of medical, social and dental history as well as thorough clinical examination and clinical photographs. Radiographic examination was carried out only when clinically indicated.

A clinical assessment of the restoration and/or prosthesis type provided, was carried out using a United States Public Health Service (USPHS) evaluation method modified from the criteria suggested by Ryge and Snyder.[15] In employing these criteria each restoration and/or prosthesis type (plastic restorations, resin bonded bridges, removable prosthesis, crowns, fixed partial dentures, implants and implants retained restorations) received a grade of either 3, 2, or 1. Grade 3 represented good dental condition, grade 2 represented minor complications which only required routine maintenance and grade 1 represented major complications which required intervention such as major repair or replacement. The examinations were conducted by two training specialist prosthodontists and checked by an experienced consultant in restorative dentistry. Data was analysed using the statistical package SPSS,[16] and software package Stata where necessary.[17]

RESULTS

DESCRIPTIVE RESULTS

The sample in this study consisted of 52 participants [22 males and 30 females]. The age range was 16 to 61 years with a median of 28 years [IQR = 21-35 years]. Of the participants, 36 were of white ethnicity and 16 of other ethnicity.

20 of the participants (38.5 %) had a positive family history of hypodontia. Family members reported to have hypodontia were; mother, father, sister, brother and grandmother.

The mean OHRQoL score reported for the 52 participants was 63.3 [95 % CI 60.7-66.0, SD 9.6]. The minimum reported score was 41 and the maximum reported score was 80 (*figure 1*).

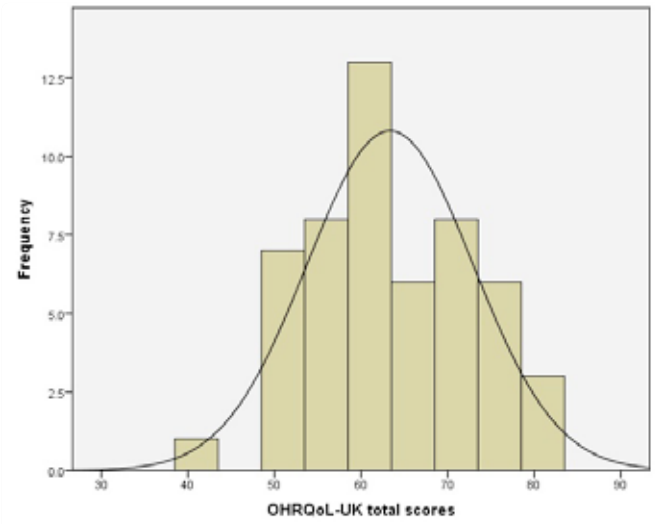

Figure 1: Histogram showing OHRQoL scores distribution for the sample.

The participants reported their satisfaction with four different aspects of the treatment. The main areas of dissatisfaction were the duration of treatment (12 participants), followed by dental appearance (4 participants). All participants felt their dental condition improved and all, except one, were satisfied with the treatment provided at EDH.

A clinical assessment of the different types of restorations revealed 35 (67.3 %) of the patients had good dental conditions and no complications, 13 (25.0 %) had minor complications, and 4 (7.7 %) had major complications.

Table 2 shows detailed results for each type of prosthesis/restoration and figures (2-4) give examples of the three different grades of the clinical assessment.

The minor complications found were; plastic restorations (staining, marginal discolouration and occlusal wear), RBBs (greyness of abutments), removable dentures (discolouration of the acrylic material and minimal wear of denture teeth), and implants (reduced keratinized tissue and redness of tissues around implants).

Figure 2a: Participant A presented with no complications and showing good overall dental condition (grade 1). Treatment included dental implants in UR5, UL5, LR5 and LL5 sites.

Figure 2b: Maxillary occlusal view of participant A.

Figure 2c: Mandibular occlusal view of participant A.

Major complications found were mechanical failures of implant components and implant retained restorations such as looseness of the abutment retaining screws in cement retained prostheses, ceramic chipping and damage of the attachment components of implant retained overdenture. Loss of retention of a resin bonded bridge (RBB) occurred within one year of treatment.

Table 2. Descriptive results of clinical assessment of treatment provided.

Restoration types	Patients	Good	Minor problems	Major problems
Plastic restorations	30	22 (73.3%)	8 (26.7%)	0 (0%)
Resin retained bridges	25	23 (92.0%)	1 (4.0%)	1 (4.0%)
Crowns	8	8 (100%)	0 (0%)	0(0%)
Conventional FPD	3	3 (100%)	0 (0%)	0(0%)
Removable dentures	5	1 (20.0%)	3 (60%)	1 (20.0%)
Implant retained restorations	36	29 (80.6%)	5 (13.9%)	2 (5.6%)

Figure 3: Participant B presented with a minor problem (staining of composite) and required regular maintenance (routine polishing) procedure (grade 2).

Figure 4a: Participant C presented with a major problem (loss of retention of a RBB) replacing UR4, which was then re-cemented in a tilted position and required intervention (removal and re-bonding or possible remake) (grade 3).

Figure 4b: Maxillary occlusal view of participant C.

ANALYTICAL RESULTS

Comparing the sample OHRQoL-UK scores with British public norms

An independent sample t-test was carried out to compare the means of OHRQoL-UK measure scores between the sample of this study and the available British norms for different age groups. The data for the OHRQoL-UK measure for the British public were provided by McGrath and Bedi[14] The comparison is presented in Table 3.

The OHRQoL mean scores for the sample were statistically significantly higher than the British public norms for the age groups 16-24, 25-34, and 35-44 years. The number of subjects were too small for any statistical analysis for the 45-54 and 55-64 years age groups.

Identifying factors that could have influenced the reported OHRQoL Score

In order to identify which factors (variables) might be important predictors of OHRQoL scores, uni-variable analyses were performed using an independent sample t-test to compare the mean OHRQoL scores between two groups. Spearman's coefficient correlation was evaluated to assess any association between age and OHRQoL scores. A significant level of P=.01 was used at this stage.

Factors which revealed a statistically significant association with OHRQoL scores were gender in favour of females (P= .047) and satisfaction with dental aesthetics (P =.006). Factors which did not reveal statistically significant association with OHRQoL scores were age, ethnicity, satisfaction with treatment duration, and presence/absence of clinical complications (P > 0.01).

Table 3. Comparison between the samples' OHRQoL-UK mean scores and the British norms for different age groups.

	Sample			Population Norms				
	N	Mean	SD	N	Mean	SD	Mean difference (95%CI)	P-value
16-24	20	62.8	8.8	179	56.1	9.6	6.7 (2.3 – 11.1)	.003*
25-34	18	64.3	10.7	355	57.1	10.6	7.2 (2.1 – 12.1)	.005*
35-44	7	67.3	12.1	343	57.1	10.4	10.2 (2.4 – 18.0)	.010*
45-54	4	58.5	5.8	290	56.0	11.0	--	--
55-64	3	58.7	0.6	255	54.8	10.2	--	--

*Statistically significant

Factors which were found to be significant at P=.01 level in the uni-variable analyses (gender and satisfaction with dental aesthetics) were incorporated into a multivariable linear regression analysis to examine the independent effect of each factor on OHRQoL scores. A significant level of P=.05 was selected for the multi-variable analysis.

Both factors remained significant predictors of OHRQoL scores in a multi-variable linear regression analysis; females were likely to report 5 point higher scores than males [95 % CI 0.1 - 9.9, P=0.46], and participants who were satisfied with their dental appearance were likely to report 13 point higher scores than participants not satisfied with their dental appearance [95 % CI 3.9 - 22.0, P=.006].

DISCUSSION

This current study was conducted at the Eastman Dental Hospital in London and included a small sample size of 52 participants. However, currently available studies in the literature reported samples of 40 patients or less,[18, 19] which reflect the difficulty in recruiting adult hypodontia patients.

A lower age limit of 16 years has been included in the inclusion criteria. This age limit was deemed necessary since the OHRQoL-UK measure has been only validated on an adult population of 16 years of age and above.[14] In addition, including participants below 16 years of age would have required using a different OHRQoL measure with more age appropriate questions. Hypodontia patients usually start treatment during their childhood and finish during their adolescence or early adulthood, and generally there is no measure of OHRQoL that can be applied for children and adults during the same study.

Patients with hypodontia as part of a severe craniofacial syndrome, such as cleft lip and palate, were excluded as it would be difficult to differentiate the impact of these conditions from the impact of hypodontia alone.

Methods of restoration assessment are still under development and a single method, which is universally accepted, is not currently available. The USPHS criteria continue to be used in many studies.. Other more sophisticated and detailed methods in the literature are available.[20] However, as the methods of clinical assessment become more sophisticated, the quality assessment can become more difficult.[21] The modified USPHS criteria used in this study allowed the assessment of different types of restorative treatments provided. The categories were reasonably defined but broad enough to allow reproducibility. The more detailed the clinical assessment is, the less reproducible the observations recorded become.[22] The three categories were correlated with the likely clinical management required. Patients with hypodontia have reported reduced OHRQoL in the literature available on children[23-26] and in the literature available on adolescents and adults.[18, 19, 27, 28]

A cross-sectional study in Denmark assessing OHRQoL in hypodontia patients following treatment with dental implants, reported generally good OHRQoL scores following treatment, albeit slightly inferior to the control group of non-hypodontia patients following treatment with dental implants.[29] In a longitudinal study in Ireland with 40 young adult hypodontia patients, the provision of resin bonded bridges has been reported to improve OHRQoL scores.[18]

The present cross-sectional study uniquely assessed hypodontia patients' OHRQoL following the provision of comprehensive prosthodontic dental treatment, without being limited to a specific treatment modality, and the reported scores were compared with the available British public norms.[14]

OHRQoL scores on their own are difficult to interpret, and thus, comparing the OHRQoL scores of the sample to the norms of the population help put them in context by providing a frame of reference.[14, 30] This was possible since McGrath and Bedi[14] provided national normative values of OHRQoL scores using the same measure used in the present study (the OHRQol-UK measure). Unfortunately, universal normative values of OHRQoL scores are not currently available.

The average OHRQoL scores were generally higher for the sample compared to the British public norms, which was found statistically significant for the age groups 16-24, 25-34, and 35-44 years. The higher OHRQoL scores reported by hypodontia patients after treatment compared to the British population, is not unexpected. The OHRQoL for hypodontia patients before treatment is probably reduced compared with the general population, and so it would be expected to become higher after treatment. This is in agreement with a study in Germany where they looked at OHRQoL scores before and after prosthodontic treatment in a group of patients, as compared to the German population.[31]

Patients' concerns about social functions, such as communication and aesthetics, are prioritised over the physical function of the teeth, such as biting and chewing.[32, 33] In the present study, significant association was found between aesthetics and OHRQoL scores, and no association was found between presence/absence of dental complications and OHRQoL scores. However, a limitation of the former analysis is the low number of participants in the group, which included participants not satisfied with their dental appearance.

These results are in agreement with other studies in the literature where aesthetic concerns were found to have a predominant influence on hypodontia patients[5, 27, 28] and on the British public in general.[14]

Weak and inconsistent association between clinical measures and subjective measures was reported in the literature.[34] In the present study, most participants' OHRQoL scores appeared to be unaffected by complications in their dentition. This endorses the need for regular reviews as participants' might not be affected or aware of clinical complications.

It is important to mention that subjective health measures such as OHRQoL measures were not developed to predict treatment needs, and should only be used to complement objective measures such as clinical examinations.[35]

Small number of major complications was documented in this study, and most were attributed to mechanical failure in implant components, and one due to loss of retention of a resin-bonded bridge. High mechanical complication rates in implant retained restorations have been reported in the literature.[36] Loss of retention of a RBB within the first year could be due to the difficulty involved in constructing RBBs for young hypodontia patients, due to shorter clinical crowns with reduced area for bonding,[37] or could be attributed to a suboptimal design or operator experience[38, 39]

Of the social factors tested (age, gender and ethnicity), gender was found marginally statistically significant; females reported higher OHRQoL than males. In the population based norming in Britain of the OHRQoL-UK measure, females were also more likely to have a higher OHRQoL scores compared to males and these results were also described by the author as marginally statistically significant.[14]

A literature review carried out in order to determine the degree of association between different social factors and OHRQoL found that females tended to perceive more impact of oral health on their quality of life (positive or negative) than males and found the association between age and OHRQoL to be unclear.[40]

A study in South-East England reported reduced satisfaction with the oral health in minority ethnic groups[41] which is in disagreement with the result of the present study. This could be due to the small sample size.

This study was a cross-sectional study which examined patients following treatment. A longitudinal design where a cohort of patients is followed from the start of treatment to its completion is not generally possible for all hypodontia patients. The reason for that, hypodontia patients usually start treatment during their childhood and finish during their adolescence or adulthood, and generally there is no measure of OHRQoL that can be applied for children and adults during the same study. Moreover, patients' attitude seem to change markedly from childhood to adulthood.[28] The recently developed condition-specific measure for hypodontia could overcome this problem, as it was developed and validated based on patients aged 11 to 18 years.[42, 43] Another way to overcome this issue, is to enrol adult patients who are about to start their treatment;[18] however, recruiting participants would be a challenge since most patients start their treatment earlier in life.

LIMITATIONS

The sample size in this study was small and limited to a single centre in the UK; conducting a larger scale multi-center study in the UK or across different countries would be considered useful at the European and international levels.

A longitudinal study in Germany reported an increased OHRQoL in subjects treated with fixed prostheses compared to removable prostheses.[31] This type of study could be carried out on hypodontia patients to assess the effect a specific treatment modality would have on hypodontia patients' OHRQoL. It would be helpful if study design and assessment methods could be universally agreed to allow international comparison of clinical outcome data.

CONCLUSIONS

- On average, hypodontia patients following treatment reported higher OHRQoL scores compared to the British public norms for most age groups.
- High OHRQoL scores seemed related to satisfaction with dental aesthetics, and females tended to have higher OHRQoL scores than males.
- Age, ethnicity, satisfaction with treatment duration, and presence/absence of clinical complications did not reveal association with OHRQoL scores.
- Patients may not be aware of dental complications and regular reviews are essential.

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