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# Changes in oral health-related quality of life following dental care at the Canterbury Charity Hospital

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## Abstract

**Background:** The Canterbury Charity Hospital (CCH) provides a one-off course of dental treatment to low-income residents of the Canterbury region, at no cost to those receiving care. This study investigated the oral health-related quality of life (OHRQoL) of CCH patients prior to and following treatment.

**Methods:** CCH dental patients attending for care from 1 July 2020 were invited to participate in this study. Participants completed a baseline questionnaire immediately prior to their first appointment at CCH and again 2-4 weeks following completion of a comprehensive course of dental treatment and preventative care at CCH (n = 30 patients).

**Results:** The baseline questionnaire was completed by 48 patients and the follow-up questionnaire by 30 of these (follow-up rate 62.5%). Mean oral health impact profile score (OHIP-14) at baseline was 31.6 (SD=12.0) and 96.7% of participants reported experiencing one or more OHIP-14 impacts “fairly often” or “very often” during the past 2 weeks. At follow-up, mean OHIP-14 scores had dropped to 12.0 (SD=10.8) and only 46.7% reported one or more impacts at least “fairly often”. This represented a large improvement ( $r = 0.87$ ) in OHRQoL. There was a statistically significant difference in participants’ self-rated oral health (SROH), pre- and post-treatment ( $p < 0.001$ ), with 70% of participants experiencing a positive change in SROH.

**Conclusions:** Those seeking dental care at CCH are affected by substantial impacts on OHRQoL due to dental conditions, and this is markedly alleviated through provision of dental care by the service.

## Introduction

Socioeconomically disadvantaged and lower income New Zealanders are disproportionately affected by poor oral health, yet financial barriers mean they face greater difficulty in accessing dental care than those who are less disadvantaged (Ministry of Health, 2010). Sources of support to enable lower income adults to access primary dental care in private settings are limited and almost all public sector dental services have indicated that their service lacked the capacity to provide emergency and/or basic dental care for lower income adults (Smith et al., 2019). Canterbury District Health Board (DHB), for instance, offers lower income adult patients only two options for dental treatment—a (single-tooth) relief of pain service, or a full dental clearance service (Canterbury DHB, 2022).

## Charitable dental care in New Zealand (NZ)

Charitable dental providers are often the last resort when it comes to accessing dental care. Existing services include the Canterbury Charity Hospital (CCH), the Revive a Smile (RAS) charity and the annual “Free Dental Days” (NZDA, 2019). Additionally, the Southland Charity Hospital also plans to establish a dental service, based on the CCH model (Smith, 2020). Although these providers use strict eligibility criteria to provide targeted care for society’s most vulnerable, these are very limited services with relatively low capacity. Thus, their waiting lists are extensive. Dental care at CCH is provided free of charge by volunteer dental professionals. The CCH Trust’s medical and dental services are funded by charitable giving from the Canterbury and wider communities.

To be eligible for dental care at CCH, patients must be aged from 18 to 65<sup>1</sup> years of age, have been referred by a dentist and must meet at least one of the following criteria—a) currently receiving a Work and Income (WINZ) supported living payment, jobseeker support, sole parent support or child disability allowance; b) a client of the Christchurch City Mission or c) a WINZ Limited Service Volunteer. CCH and WINZ volunteers are ineligible for dental treatment at CCH. Dental treatment provided at CCH is limited to examinations, radiographs, extractions, direct restorations, scaling/prophylaxis, preventative care, anterior endodontics and third molar extraction under sedation (CCH, 2020b).

## Oral Health-Related Quality of Life

Oral health-related quality of life (OHRQoL) is a multidimensional concept that quantifies how oral conditions can have impacts on a person’s well-being and self-esteem (Sischo & Broder, 2011). Several measures have been developed to quantify this (Locker et al. 2005). The short-form oral health impact profile (OHIP-14) is one such measure, which describes impacts on quality of life in the following domains – functional limitation, physical pain, psychological discomfort, physical disability, social disability and handicap (Slade and Spencer, 1994). The OHIP-14 possesses high internal reliability ( $\alpha = 0.88$ ) and construct validity (Slade, 1997).

Several New Zealand studies have investigated dental treatment-associated changes in OHRQoL. Some have used the OHIP-14 to investigate changes in OHRQoL among children receiving treatment under general

1 This upper age limit is currently under review by the CCH Clinical Board.

anaesthesia (Anderson et al., 2004; Malden et al., 2007), orthodontic patients (Antoun et al., 2015) and in both Māori (Broughton et al., 2013) and youth (Jefferies, 2021) mental health service patients. Further studies used the child perception questionnaire to investigate the OHRQoL effects of adolescent dental caries (Foster Page & Thomson, 2012), orthodontic problems (Ukra et al., 2013; Healey et al., 2016) and cleft lip and palate (Fowler et al., 2020). Another study used multiple scales to assess changes in OHRQoL following treatment of early childhood caries under general anaesthetic (Thomson et al., 2014).

While there has been significant research into NZ's existing public sector oral health care provision, to date, there is a lack of research on NZ's charitable dental sector and the impact that these services have on OHRQoL for those they serve. This study aimed to examine the impact on OHRQoL that a course of dental treatment and preventive care had on CCH dental patients.

## Methods

This research project was reviewed and approved by the Clinical Board of the Canterbury Charity Hospital Trust. Ethics approval was granted by the Board's Research and Ethics Committee. All participants provided signed informed consent prior to participating.

### *Dental treatment provided*

All patients were examined and treated by registered volunteer dentists at CCH. Dental treatment at CCH is limited to the treatment modalities outlined in the introduction. All treatment was performed under local anaesthetic (LA). Some third molar extractions and dental clearances additionally required sedation. Due to a lack of access to dental technician support, no prosthodontic rehabilitation was offered at CCH. Patients requiring denture fabrication were referred to private denture technicians, following stabilisation of active disease processes. Patients were only discharged when the treating clinician determined that their CCH dental treatment plan had been completed and any adverse outcomes (e.g. failed restorations) had been successfully resolved. Data on baseline oral health status or the type and quantity of dental treatment provided were not collected for this research and patient records were kept separate from the research data, however, in each case the patient had been discharged as "complete" by the treating clinician; we thus assumed that all active disease processes had been stabilised and participants had no further treatment needs within the scope of care available at CCH.

### *Measuring Oral-Health-Related Quality of Life (OHRQoL)*

The short-form OHIP-14 was utilised, in which two questionnaire items are allocated to each of the seven OHRQoL domains. Participants responded using a 5-point Likert-type scale (0, never; 1, hardly ever; 2, occasionally; 3, fairly often; 4, very often). Scores range from 0 to 56, with a higher total score indicating a greater impact on OHRQoL. The OHIP-14 questionnaire was administered at two

time points—immediately prior to their first dental appointment at CCH and 2-4 weeks following completion of dental treatment. Post-treatment questionnaire data was collected verbally (via telephone).

Two additional self-report oral health items were also used. Participants were asked pre- and post-treatment "how would you describe the health of your teeth or mouth?", with 5 possible Likert-type responses (poor, fair, good, very good and excellent). Additionally, following treatment, participants were asked "all things considered, would you say that since we treated you, the health of your mouth has improved, stayed the same or gotten worse?" This provided a measure of self-perceived treatment efficacy, against which other study variables and instruments could be compared.

Further to the questionnaire, a case study qualitative approach was used, where written and verbal comments were collected at the same time as completion of the baseline and follow-up questionnaires.

### *Statistical analysis*

Quantitative data was analysed using SPSS (v.28) software. Following data cleaning and computation of descriptive statistics and scale scores, treatment-associated changes in OHRQoL were examined using the Wilcoxon paired signed-rank test for continuous scales (e.g., OHIP scores) and McNemar's test for categorical variables (e.g., self-rated oral health). Statistical significance was set at  $p < 0.05$ .

## Results

### *Study participants*

All 76 patients who commenced a course of dental treatment at CCH between 01/07/2020 and 31/12/20 were invited to enrol in this study. The study had an 18-month time frame, concluding on the 31/12/21. By this point, 28 enrolled participants had not yet completed their dental treatment, 15 participants had been lost to follow-up and 3 had withdrawn from the study. These 46 participants were excluded from the study. This resulted in a total sample size of 30 participants; 43.3% of whom identified as male and 56.7% as female. The mean age of participants was 41 (minimum age = 20, maximum = 67, SD = 14.7).

### *OHIP-14 scores*

The OHIP-14 mean total score values changed significantly following the course of dental treatment, with the pre-treatment mean OHIP-14 score value (31.6, SEM: 2.0) being significantly higher ( $p < 0.001$ ) compared to the mean OHIP-14 values obtained post-treatment (12.0, SEM: 2.0). Figure 1 presents this cohort's mean OHIP-14 scores before and after receiving a course of dental treatment at CCH.

Change scores were calculated by subtracting the OHIP-14 scores at baseline from those at follow-up. We calculated the effect size by dividing the absolute (positive) standardised Z-score by the square root of the number of pairs ( $N = 30$ ). Cohen (1988) has defined an effect size of 0.1 as small, 0.3 as moderate, and 0.5 as large.

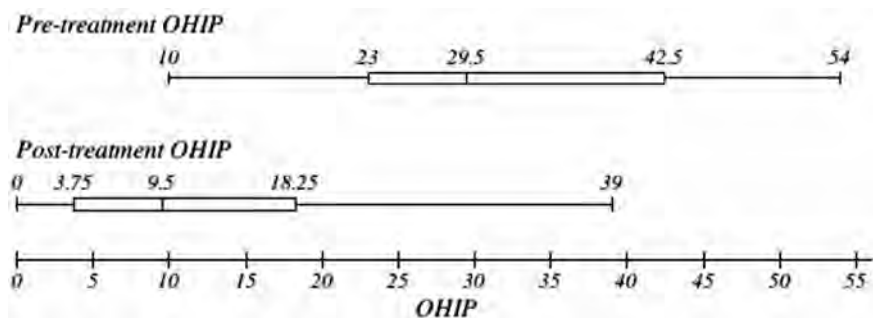


Figure 1. Box plot showing distribution of mean OHIP-14 scores.

### Impact prevalence of OHIP-14 domains: pre- and post-treatment

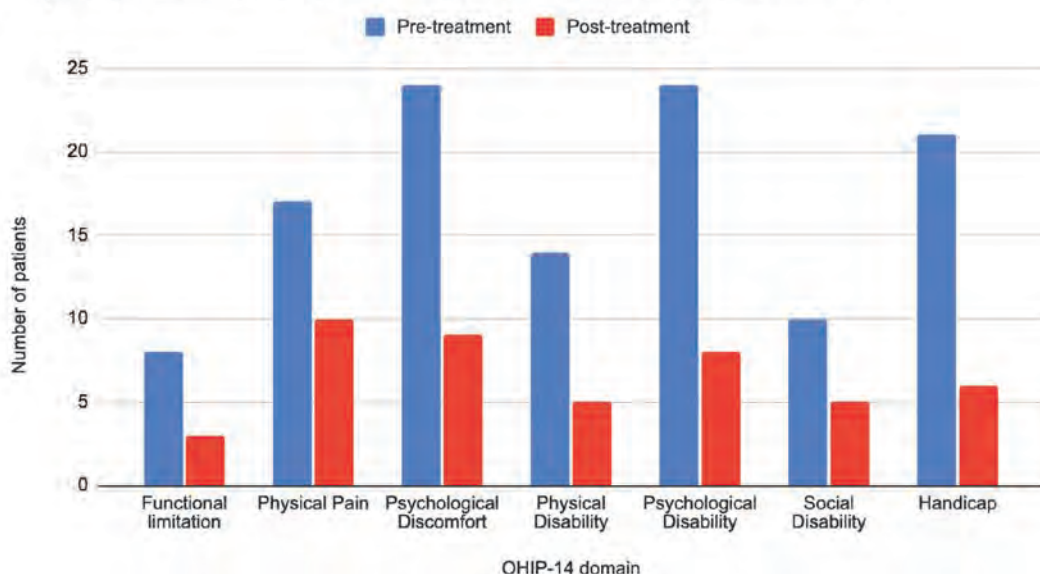


Figure 2. Impact prevalence of OHIP-14 domains: Pre- and Post-treatment.

A Wilcoxon signed-rank test showed that completing one complete course of free dental treatment elicited a statistically significant, positive change in OHRQoL ( $Z = -4.8$ ,  $p = <0.001$ ), with a very large effect size ( $r = 0.8$ ). Mean OHIP-14 score reduced from 31.6 (pre-treatment) to 12.0 (post-treatment).

#### OHIP-14 impact prevalence

This study defined OHIP-14 impact prevalence as participants experiencing more than one of the OHIP-14 domains “fairly often” or “very often”. Prior to receiving dental treatment at CCH, the impact prevalence was 96.7% and this decreased to 46.7% following completion of dental treatment (exact McNemar’s test,  $p = <0.001$ ).

A count method was used to score impact prevalence at the threshold of at least “fairly often”. Figure 2 presents the simple count of impact prevalence for each OHIP-14 domain, both pre- and post-treatment. Pre-treatment, psychological discomfort and psychological disability were the domains experienced most frequently by the greatest number of patients ( $n=24$ ). Of these two, psychological discomfort was the most severely-affected domain (i.e. experienced

“very often”). Statistically significant improvements were observed in all but two of the OHIP-14 subscales (functional limitations and social disability). Post-treatment, physical pain was the domain with the highest impact prevalence, experienced by 10 participants.

Locker’s single-item OHRQoL measure was measured pre- and post-intervention. Prior to analysis, the 5-point responses were dichotomised and divided at the level of “good” oral health—with ratings above and including “good” denoting positive self-rated oral health (SROH). 70% of participants experienced a positive change in SROH (i.e. from negative to positive) following a course of dental treatment at CCH (exact McNemar’s test  $p = <0.001$ ).

The post-treatment global transitional judgement item reflected participants’ overall perception of the CCH dental program’s efficacy. Four in every five participants reported an improvement in oral health following dental treatment at CCH. Fewer than one in five participants reported no change in perceived oral health. A single participant felt that their oral health had worsened following treatment; this participant had been recently diagnosed with cancer and was experiencing oral health-related side effects of chemotherapy/radiation.

### *Qualitative findings*

Clinical feedback from patients collected anecdotally during and following the course of treatment were positive. Many commented on the financial barriers to accessing dental treatment privately, remarking that they would not have been able to access dental treatment without the CCH service. Participants were well aware that the CCH dental service is staffed by volunteer clinicians, with many expressing their gratitude for services provided. Most participants were satisfied with the treatment they received, which correlates with this study's quantitative findings. However, several participants expressed concern regarding long-term follow-up.

### *Discussion*

At first presentation, CCH dental patients are affected by serious quality of life impacts due to pre-existing dental disease. Following treatment, dramatic improvements occur in SROH and the severity and prevalence of impacts on OHRQoL.

### *Strengths and limitations of the study*

This research has a number of important limitations, owing in large part to the narrow scope, small sample and observational nature of the research. The small sample size and convenience sampling method makes it difficult to generalise these findings. Selection may have been biased towards those with extensive treatment needs and/or challenging social circumstances (e.g. homelessness); however, this means that the sample may have represented individuals often difficult to recruit into other studies. Additionally, this study had a relatively short follow-up period, resulting in a lack of long-term outcome data to evaluate the effectiveness of oral hygiene education and prevention, as well as the long-term benefits of dental treatment. OHRQoL is inherently subjective, and accordingly, some of the improvements could be due to response shift – the change in internal standards and tolerance to oral health problems during and following the dental treatment. This study's global transitional item asked patients to assess their post-treatment state and assess how things have changed to produce a retrospective judgement (Vanier et al., 2021). Among the strengths of this research, the provision and scope of free dental services provided at CCH did not differ between study participants and patients who were not enrolled in the study, thereby minimising confounding. Clinicians were blinded as to whether patients were participating in the study, thereby minimising un/conscious bias in delivery of dental treatment.

### *Comparison to other studies*

The findings are confirmatory of previous reports of OHRQoL among vulnerable New Zealanders following dental treatment (Broughton et al., 2020, Jefferies et al., 2021). While the inclusion criteria of those studies (Māori and youth mental health patients respectively) differed to that of the present study (low-income individuals), all three described significant improvement in OHRQoL

following a course of dental treatment. This study reinforces international literature, which has also found that the baseline SROH of low-income or homeless individuals is poor and that dental treatment improves their quality of life (Beaton et al., 2018, Gibson et al., 2008, Hede et al., 2019, Luo & McGrath, 2008) and employment outcomes (Hyde et al., 2006).

### *Context and implications for policymakers*

Financial assistance for low-income adults in NZ to access dental care privately is limited, leaving vulnerable New Zealanders with a significant burden of unmet need for dental treatment. CCH only accepts patients who have exhausted their WINZ SNGS funding and are not eligible for general dental treatment in the publicly-funded hospital setting, thereby fulfilling unmet, unfunded dental treatment need. CCH dental services presently focus on stabilisation with some preventative care, but rehabilitation and long-term maintenance are beyond the scope of what CCH has the capacity and resources to deliver. The planned increase in WINZ dental funding up to \$1000 per annum is likely to increase the amount of treatment low-income adults will be able to access, which may reduce the stabilising needs of patients presenting to CCH. This may enable CCH to serve a greater number of patients or to fundamentally realign the service towards prevention, education and maintenance.

### *Criticisms of charitable dentistry*

Current literature regarding charitable dentistry raises several key criticisms. Many global, "voluntourism"-style charitable dental services, have drawn criticism for being unsustainable—both financially and in terms of a transient workforce (Benzian & van Palenstein Helderman, 2006). While CCH is unable to offer long-term follow-up, it is important to clarify that CCH is not a short-term, transient service, but a permanent charity clinic, staffed by volunteers who donate their time on a regular basis. Some authors consider charitable dental work an unacceptable substitute for sustainable systems designed to provide ongoing, comprehensive care and public policy reform. The limited, often episodic services provided by charitable clinics may become the standard of care for low-income individuals. This can be interpreted as an inequitable tiering of an important health service and thus an unacceptable breach of human rights (Dharamsi & MacEntee, 2002; McNally, 2003).

### *Policy implications*

The formation of Health New Zealand (Department of Prime Minister and Cabinet, 2022) may facilitate delivery and development of publicly-funded oral health services. Public funding for low-income adult oral health services differs widely by geographic region (Smith et al., 2019). Standardising such inequalities and eliminating barriers to accessing care may enable more equitable oral health service provision for society's most vulnerable populations.



### Future directions

Future quantitative research could analyse the demographics and baseline oral health status and treatment provided to study participants, which was a knowledge gap in the present study. An extended follow-up period, with repeat OHRQoL surveys a year or more post-treatment, could provide a more accurate reflection of the impact of free dental treatment on long-term SROH (Reissmann et al., 2018). Similar pre- and post-treatment OHRQoL research could also be performed on low-income adult patients receiving publicly-funded dental care. This study's early qualitative findings indicate that semi-structured interviews would give even greater insight into the efficacy and effectiveness of the CCH dental service.

### Conclusions

CCH patients experience significant impacts on OHRQoL due to unmet dental treatment needs. Provision of a free course of dental care by the service significantly improved the OHRQoL and self-perceived oral health of these individuals.

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