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Evaluation of Smiles for Life: A Caregiver Focused Oral Health Education Programme

Nathan J. Wilson ^{1,*}, Tiffany Patterson-Norrie ^{1,2}, Cheryl Bedford ³, Natalie Bergstedt ³, Lia Marri Mendoza ³, Amy R. Villarosa ^{1,2}, Ajesh George ^{1,2,4} and Avanti Karve ³

¹ Australian Centre for Integrated Oral Health (ACIOH), School of Nursing and Midwifery, Western Sydney University, Penrith, NSW 2751, Australia

² Ingham Institute Applied Medical Research, Liverpool, NSW 2170, Australia

³ Department of Oral Medicine, Oral Pathology and Special Needs Dentistry, Westmead Centre for Oral Health, Westmead Hospital, Westmead, NSW 2145, Australia

⁴ School of Dentistry, Faculty of Medicine and Health, The University of Sydney, Surry Hills, NSW 2010, Australia

* Correspondence: n.wilson@westernsydney.edu.au



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Abstract: *Background:* People with an intellectual and/or developmental disability are at increased risk of adverse oral health outcomes and often require support from caregivers to assist in maintaining or seeking treatment for their oral health needs. However, caregivers and support workers are often family members with limited formal oral health training. Hence, the aim of this pilot study was to review the outcomes of the ‘Smiles for Life’ oral health education workshop with reference to their knowledge, attitudes, and practices of caregivers of people with an intellectual or developmental disability. *Methods:* A single group pre-test post-test intervention design was used to explore the preliminary effectiveness and appropriateness of the Smiles for Life oral health education workshop. *Results:* A total of 244 participants completed both the pre and post knowledge test. Oral health literacy scores decreased following the post test. Those with higher levels of education achieved higher post-training knowledge scores. Overall, caregivers reported satisfaction on the material presented however, it could be improved with more practical demonstrations. *Conclusion:* Providing an oral health education tool that caters to the diverse caregiver audience presents a unique set of challenges, despite oral health education in this professional group being vital. Future studies may benefit from reviewing the efficacy of a more tailored educational intervention.

Keywords: carers; oral health; oral health promotion; special needs; intellectual disability; pilot study

1. Background

An umbrella term, intellectual and developmental disabilities are lifelong disabilities that start in childhood and limits the person's functioning in communication, mobility, self-care and learning [1]. The health disparities that exist between people with an intellectual and developmental disabilities and the general population has been well documented throughout the literature [2–4] including, significant oral health disparities [5]. A retrospective review of people with intellectual and developmental disabilities seeking dental treatment noted that 30% had untreated dental caries, 80% had periodontitis, and 10% were edentulous highlighting a considerable burden of dental disease in this population [6]. Further, adverse oral health status has been associated with aspiration pneumonia and major chronic conditions such as cardiovascular disease, diabetes, respiratory disease and stroke [7–13] and can greatly influence social and psychological wellbeing [14–19]. Essential in appearance, speech, digestion, and general wellbeing, if left untreated, poor oral health can have detrimental impact on general health and quality of life [16,17,20].

In light of most oral health concerns being considered preventable, factors including comorbidities, complex behaviours and level of dependency are contributors to the increased

risk of dental disease that people with an intellectual and developmental disabilities can experience [5,21,22]. Despite being vulnerable to poor oral health, a literature review has identified that people with intellectual and developmental disabilities were also less likely to engage in preventative dentistry and were limited in their access to dental services [4]. Furthermore, level of dependency for support by caregivers can also significantly impact their ability to access adequate oral hygiene due to competing health priorities and caregiver skill for managing challenging behaviour [5].

Generally, caregivers can be divided into two categories separated by either paid or unpaid support. Following the movement toward inclusive community-based living arrangements, informal caregivers have now formed the majority in providing care to people with intellectual and developmental disabilities. With often no financial compensation or job specific training, informal carers assist with an array of tasks from financial support to personal care including oral hygiene [23]. Usually parents or siblings, family caregivers are fundamental in supporting their family member with intellectual and developmental disabilities in maintaining personal care and accessing health services such as dentists and for disease prevention [5,23,24]. Family caregivers who have not had exposure to oral health training, identifying the early signs of compromised oral health and assisting with tooth brushing may be challenging.

In research investigating the impact of a long-term oral health programme, paid caregivers reported that supporting oral hygiene was difficult especially when trying to address other significant care demands [25]. Generally, paid caregivers had good insight into protective factors and risks to oral health, however the attitudes and priority placed on oral health care of their clients with intellectual and developmental disabilities was low. The majority (53%) reported learning about providing care to people with intellectual and developmental disabilities from co-workers or others [26]. Additionally, paid caregivers who had lower educational attainment were more likely to experience caregiver burden and less likely to support the people in their care in preventative dental care [27].

Educational programmes for improving caregiver delivery of oral hygiene to people with intellectual and developmental disabilities generally report an improvement in both caregiver attitudes, knowledge, and skill [28]. These improvements have been from education provided through a variety of mediums including information booklets, video, practical demonstrations, and train-the-trainer models. Topics for education included aetiology of poor oral health conditions and protective/risk minimisation strategies for managing oral hygiene which ranged from practical demonstrations and role play activities for oral hygiene tasks such as tooth brushing, to creating calming environments for reassuring clients. Overall, these education programmes proved to be quite effective in enhancing the knowledge, confidence and practice of paid caregivers [28,29]. Further, some studies showed an increase in supervision of people with intellectual and developmental disabilities during oral hygiene time, increased opportunities provided for the person to engage in oral hygiene during the day [26] and improved caregiver technique for practices such as tooth brushing [30,31]. Despite a range of limitations to all of the studies, these findings provide reassurance that with adequate theoretical and practical training, caregivers can improve the oral health of people with intellectual and developmental disabilities in their care. Nevertheless, the heterogeneity of people with intellectual disability and the diversity of their oral health status and overall support needs, as well as the divergence in caregiver roles and expertise, means that pilot educational programmes need to be developed and tested to explore if they can cater to as wide an audience as possible.

The management of oral hygiene in a person with intellectual and developmental disabilities requires specific skills and knowledge to perform the role effectively, appropriately and efficiently however, family caregivers can be disadvantaged in their access to appropriate training [30,31]. In order to improve the oral health of people with intellectual and developmental disabilities, it is imperative to provide all caregivers with the knowledge and skills for providing adequate oral hygiene management to improve oral health outcomes [2,31]. Guided by the literature that identifies a need for oral hygiene education

for caregivers, drawing on approaches to pilot and feasibility studies [32,33] a special needs dentistry centre in Sydney, Australia developed a pilot oral health educational intervention called *Smiles for Life*, aimed at increasing the oral health literacy of both paid and unpaid caregivers. Given the heterogeneity of the population of people with intellectual and developmental disabilities and such a diverse group of caregivers, whether such a broadly focused educational intervention is feasible, effective and appropriate needs to be evaluated to inform the development of future, and potentially more targeted, educational interventions.

Aim

To explore the efficacy and appropriateness of the pilot Smiles for Life oral health educational intervention as a tool to positively change caregiver oral health literacy and to learn from these results to improve future oral health educational interventions.

2. Method

2.1. Study Design

Pilot studies are an important and valuable aspect of developing sound study design and can help to increase the likelihood of success in larger studies. This pilot study seeks to understand how components of the Smiles for Life pilot programme work together and to inform the future development and conduct, and success, of larger scale, controlled studies [32,33] in this area. A single group pre-test post-test intervention design was used to explore the preliminary effectiveness and appropriateness of the Smiles for Life oral health educational intervention. The intervention was submitted and approved as a quality assurance project to the Western Sydney Local Health District Human Research Ethics Committee in 2015. This was to facilitate data collection to improve current and future content and delivery. As the data were never analysed due to resource limitations, subsequent approval for this research study—a university and industry partnership where the university provided the funding for research expertise and research assistants—was granted by the Western Sydney Local Health District Human Research Ethics Committee (ID: 2020/ETH02454). Non-identifiable pre-post datasheets were collected from participants in the Smiles for Life educational intervention and so consent was implied by completion of the datasheet. Prior to participation in the educational intervention, all participants were assured of confidentiality in relation to data collection and dissemination of findings. Trainer-created identification codes were used at the end of each educational intervention session to link the datasheets as all responses were anonymous. Data storage and security for the project followed guidelines as recommended by the National Health and Medical Research council.

2.2. Participant Recruitment

Participants were primarily paid and unpaid caregivers of people with intellectual and developmental disabilities, as well as for nurses involved in direct or indirect care and/or support roles. The programme was promoted to the target audience via emails, at patient appointments and with the use of promotional material in the waiting rooms of the Special Care and Conscious sedation units in the Westmead Centre of Oral Health (WCOH).

2.3. The Educational Intervention

The Smiles for Life education workshop was a renewed initiative at the Department of Special Needs Dentistry (Special Care Unit), Westmead Centre for Oral Health. The unit is a quaternary referral service and cares for NSW residents who have one or more of the following: intellectual and developmental disabilities, physical disability, neurodegenerative disease, complex medical conditions, mental illness, severe dental anxiety and dental phobia. People with intellectual and developmental disabilities make up the majority of the unit's patient base ($\pm 75\%$), with the remaining 25% being medically complex patients, or patients with complex mental illness, or dental phobia. This version of the oral health

education programme was developed following initial iterations in 2003 (Smiles for Life programme developed by Drs Peter King and Linda Wallace) and 2005 (Smiles for Life: Oral care for people with Special Needs train the trainer intervention developed by Dr Leda Mugayar). The education seminar also had a focus on the multidisciplinary team approach in caring for the oral health of residents inspired by the Better Health in Residential Care (BOHRC) initiative spear headed by South Australia Health Oral health therapists, a dietitian and a prosthetist all contributed to the development of this intervention.

Smiles for Life was an oral health education seminar aimed at nurses, paid and unpaid caregivers of the Centre's target population. The education intervention was funded by the Centre, with no external/outside financial stakeholder involvement, and was offered as a half-day (4 h), face-to-face programme at the Westmead Education and Conference Centre (WECC) between the years 2014 and 2018. In total, 15 education sessions were offered. Content delivery involved interactive PowerPoint presentations given by Oral Health Therapists (CB, NB, LM) (55 min), a Dietician (SM) (1 h) and a Prosthetist (DS) (30 min), which covered an introduction to oral health as a part of general health, oral diseases, oral hygiene instruction, dietary advice and denture care and maintenance. This was followed by a practical hands-on workshop with assistance from oral health educators (EH, SP) (1 h) where attendees participated in the demonstration of tooth brushing methods, the use of appropriate oral health products, retraction techniques, and behaviour management strategies to assist in the provision of daily oral care to persons with disabilities.

2.4. Data Collection Tool and Procedure

A purpose designed tool was developed by the intervention content developers (CB, NB, & LM). Survey data included questions that covered demographics (gender, caregiving role, and highest education level), four items about the oral health status and oral care routine of the person they cared for, and knowledge questions based on two topics to measure information uptake and change in oral health knowledge: (1) tooth decay and (2) gum disease. A total of 13 items were asked for each of the two topics, totalling 26 items, based on a combination of the most common and universally known causes and signs/symptoms of each and some false responses. A correct response was scored as 1, an incorrect response scored as 0. Participants also completed a feedback form that expressed their perceptions and thoughts on the programme after its delivery on a five-point Likert-type scale, where five was the highest rating. There was also an open-ended qualitative response in the post-test survey asking what information participants would want added into a future programme. Baseline data were collected prior to the start of the intervention, and post-intervention data were collected on the same day at the end of the intervention before attendees left.

2.5. Data Transfer Process

In anticipation of the data transfer a data dictionary was developed with the assistance of a biostatistician (ARV). The data dictionary mirrored the pre-and post-surveys and used a numerical key to assist with coding participant responses. To commence the transfer process, the data custodian at the Centre was identified. Data transfer occurred over multiple days between April and May 2021. The hardcopy non-identifiable surveys were transferred manually into an Excel spreadsheet by two members on the research team (TP-N & NB). Every 20th survey that was entered into the Excel database was audited for data entry accuracy. Any discrepancies identified were noted and following discussion consensus was reached on how to code missing data. The Excel database containing the soft copy non-identifiable pre and post survey responses was saved on a password protected USB which was then uploaded onto a secure share drive, via password protected laptop, owned by Western Sydney University in accordance with ethics requirements. Only members of the research team with prior ethics approval had access to the Excel database.

2.6. Data Analysis

Transferred data were imported into IBM SPSS Statistics, where all descriptive and inferential analyses were undertaken. Demographic and perceptions variables were analyzed using frequencies and percentages. Oral health knowledge items were recoded into correct vs. incorrect, and frequencies of correct responses were computed for both before and after the training. Continuous total knowledge variables were inspected for normality, and following the rejection of the null hypothesis of normality, non-parametric tests were used to analyse these variables, including Spearman's Rho, Mann–Whitney *U* and Kruskal Wallis *H*. The exception to this was the paired *t*-test for pre- and post-training knowledge, which had sufficient sample size for the Central Limit Theorem to apply. Predictors of knowledge post-training were explored using a binary logistic regression model, including pre-training knowledge, relationship to client, and level of education. Open ended questions were subjected to a content analysis and grouped into the major recommendations for a future programme.

3. Results

3.1. Demographic Profile

A total of 251 participants completed the pre survey, and 250 participants completed the post survey, of which 244 completed both. After excluding participants who did not complete all knowledge items, 169 paired responses remained. Of these 169 participants, over three quarters (82.2%, *n* = 139) were female, with the rest male. Most (79.4%, *n* = 131) identified as caregivers for people with disability, however 13.9% (*n* = 23) were health care professionals, and 6.5% (*n* = 11) were family or social support people. Just over a quarter had an educational level up to high school (26.0%, *n* = 44), 40.2% (*n* = 68) had a diploma or apprenticeship, and the remaining 29.6% (*n* = 50) had an educational level at a university degree or above.

3.2. Oral Health Status and Care Routine

Almost all participants (97.0%, *n* = 164) agreed that oral health is an important part of general health. When participants were asked to elaborate about the oral health and oral care of the persons they were caring for (Table 1), most indicated they assisted these people with oral care (91.1%, *n* = 154), and rated their oral health as good or fair (78.1%, *n* = 132).

Table 1. Carers' perceptions of the person's oral health status and care routine.

Item	<i>n</i> (%)
How would you rate the oral health of the person(s) you are caring for?	
Excellent	11 (6.5)
Good	74 (43.8)
Fair	58 (34.3)
Poor	20 (11.8)
Unknown	58 (34.3)
On average, is oral care:	
Assisted	154 (91.10)
Unassisted	12 (7.1)
On average, how would you classify the frequency of oral care for the person(s) you are caring for?	
Regular (daily)	147 (87.0)
Irregular (less than daily)	17 (10.1)
Seldom (no regular pattern)	4 (2.4)
On average, what is the duration of oral care per brushing occasions?	
1–2 min	90 (53.3)
2–5 min	69 (40.8)
More than 5 min	9 (5.3)

3.3. Oral Health Knowledge

Oral health knowledge was scored using the 26 knowledge items for tooth decay and gum disease, combined, where higher scores indicate better knowledge. On average, participants scored 17.76 ± 3.46 out of a total possible 26 points before the training, and this decreased to 17.38 ± 3.50 after the training. There was a statistically significant difference found between the decrease in pre- and post-knowledge scores ($t = 2.127$, $p = 0.035$, 168 df). See Table 2 for proportions of correct responses for each knowledge item.

Table 2. Proportions of correct responses (CR) to knowledge questions pre- and post-training.

Item	Pre <i>n</i> (%)	Post <i>n</i> (%)
What do you think causes tooth decay?		
Lack of calcium (CR = False)	78 (46.2)	76 (45.0)
Runs in the family (genetics) (CR = False)	112 (66.3)	129 (76.3)
Poor oral hygiene (CR = True)	167 (98.8)	124 (73.4)
High sugar diet (CR = True)	128 (75.7)	166 (98.2)
Frequent snacking (CR = True)	76 (45.0)	4 (2.4)
Unsure (CR = False)	166 (98.2)	15 (8.9)
What are the signs and symptoms of tooth decay (dental caries)?		
Holes in teeth (CR = True)	151 (89.3)	149 (88.2)
White spots on teeth (CR = True)	58 (34.3)	90 (53.3)
Pain (CR = True)	147 (97.0)	150 (88.8)
Lost filling (CR = True)	77 (45.6)	90 (53.3)
Numbness (CR = False)	133 (78.7)	105 (62.1)
Swelling of face (CR = True)	87 (51.5)	134 (79.3)
Unsure (CR = False)	167 (98.8)	165 (97.6)
What do you think causes gum disease?		
High sugar diet (CR = False)	64 (37.9)	12 (7.1)
Poor oral care (CR = True)	160 (94.7)	166 (98.2)
Lack of calcium (CR = False)	108 (63.9)	91 (53.8)
Runs in the family (genetics) (CR = True)	37 (21.9)	41 (24.3)
Smoking/lifestyle factors (CR = True)	120 (71.0)	124 (73.4)
Unsure (CR = False)	166 (98.2)	164 (97.0)
What are the signs or symptoms of gum disease?		
Bad breath (CR = True)	138 (81.7)	149 (88.2)
Swollen gums (CR = True)	149 (88.2)	163 (96.4)
Bleeding gums (CR = True)	162 (95.9)	164 (97.0)
Pain (CR = True)	131 (77.5)	142 (84.0)
Loose teeth (CR = True)	93 (55.0)	106 (62.7)
Sensitive teeth (CR = True)	89 (52.7)	108 (63.9)
Unsure (CR = False)	167 (98.8)	167 (98.8)

3.4. Associations with Post-Knowledge

As the change in knowledge following the Smiles for Life programme was not as expected, other factors predicting knowledge post-training were explored. Specifically, variables including pre-training knowledge, relationship to client, and level of education were explored for any significant associations with post-training knowledge. Pre-training knowledge was significantly correlated with post-training knowledge, whereby those with higher pre-training knowledge also had higher post-training knowledge (Spearman's Rho = 0.581, $p < 0.001$). Although there were no significant associations between relationship to client and post-training knowledge, there was a nonsignificant trend that those from a healthcare profession had higher post-training knowledge than carers and family or social support persons (Table 3). In addition, there was a trend that those with higher levels of education achieved higher post-training knowledge scores, with scores of those with a university degree or higher (mean 18.98) significantly higher than those with a high school or lower level of education (mean 17.64, Mann–Whitney $U = 821.0$, $p = 0.033$).

Table 3. Non-parametric tests of association between relationship to client, level of education and post-training knowledge scores.

	Post-Training Knowledge (Mean $\pm$ SD)	Kruskal-Wallis H (df)	<i>p</i> -Value
Relationship to client			
Family/social support person	17.55 $\pm$ 3.012	1.737 (2)	0.420
Carer	18.22 $\pm$ 2.881		
Healthcare professional	19.14 $\pm$ 2.695		
Level of education			
Up to high school	17.64 $\pm$ 3.051	5.110 (2)	0.078
Diploma/apprenticeship	18.19 $\pm$ 2.662		
University degree or higher	18.98 $\pm$ 2.535		

Pre training knowledge, relationship to client and level of education were entered as independent variables into a binary logistic regression model with post-training knowledge score as the dependent variable. However, after adjusting for all of these variables, pre-training knowledge was the only significant predictor of post-training knowledge, with each additional point in pre-training score increasing odds of higher post-knowledge scores by almost 75% (see Table 4).

Table 4. Predictors of higher post-training knowledge scores among Smiles for Life participants.

Variables	Coefficient (B)	Standard Error	Adjusted Odds Ratio (95% CI)	p-Value
<i>Post-training knowledge score (above the median)</i>				
Total pre-training knowledge	0.551	0.10	1.74 (1.43–2.11)	<0.001
Relationship to client (reference: family/social support person)				
Carer	0.14	0.76	1.15 (0.26–5.08)	0.853
Healthcare professional	−0.133	0.94	0.89 (0.14–5.46)	0.887
Level of education (reference: up to high school)				
Diploma/apprenticeship	0.19	0.46	1.21 (0.49–2.95)	0.680
University degree or higher	0.61	0.51	1.85 (0.67–5.04)	0.236

3.5. Appropriateness

Caregiver perceptions on the appropriateness of the presented material and suggestions for future improvement were reported from an open-ended survey question, and suggested three recurring themes based around (1) satisfaction with the current programme, (2) a need for more practical and (3) theoretical oral health education. An overall satisfaction with the presentation and information covered was a major recurring theme throughout the responses. Many participants reported that the presentation was ‘great’ or ‘everything covered in today’s presentation are all informative and really helps to recommend these things for your presentation for the next batches’ and ‘This was very comprehensive!’.

Other participants felt that the programme material may be improved with the inclusion of more practical demonstrations. Most commonly, caregivers who reported this specifically wanted support focused on ‘how to control the client (s) who have challenging behaviour for teeth brushing to be able to help their good oral hygiene with better equipment or technique’, managing bite reflexes or dysphagia, ‘assisting people with facial/jaw injuries and unable to open their mouth’ and appropriate oral health products to use for ‘dental care and denture care’. Some caregivers were also interested to know more about how they could support other specific population groups with their oral care although this was not within the scope of this programme: ‘Oral care for palliative care patients’; ‘How to deal with oral hygiene of dementia residents’.

Lastly, participants reported that further information on the aetiology of periodontal related conditions, risk minimisation strategies for oral health and further training encouraging client involvement in their oral hygiene would be beneficial: *“Other oral diseases which are preventable by good oral hygiene”*; *“More information on how to involve our residents and all staff to care for teeth”*; *“Learn more about the symptoms and causes”*; *“If you can educate the residents too about the importance of proper oral hygiene, that would be better”*. Some participants also reported that *‘more on healthy food’*, diet and access to free samples would be beneficial for future presentations.

4. Discussion

This pilot study has shown that the Smiles for Life programme did not increase overall oral health literacy, in fact overall literacy levels were marginally lower after the programme. Nevertheless, as a pilot study that sought to identify the programme components that worked well, and those that did not [32,33], the study served a very useful purpose and will inform future studies. Specifically reviewing the knowledge items and individual scores, two tooth decay items (*‘frequent snacking’* and *‘unsure’*) and one gum disease item (*‘high sugar diet’*) stand out where the number of correct responses post-test were extremely low. Two points can be made here: (1) it would seem that key messages about snacking and high sugar diets did not get conveyed in an accurate manner, and (2) so many *‘unsure’* responses for the tooth decay domain suggests that the overall content about tooth decay led to confusion. Given the trend for greater oral health literacy in those with higher education levels and that higher baseline knowledge predicted higher post-programme knowledge, the only conclusion to draw is that the content was pitched at too high a level of complexity for the diversity of the audience. This is the only plausible explanation for why many participants scored lower after the training and suggests that some content may have confused participants or that the wrong message, or emphasis, was conveyed. Certainly this issue has been reported previously where disability support workers got some of the direct messaging from an oral health education programme confused at the implementation level [34]. The majority of participants in this study were caregivers or health professionals, with only a small proportion being family members. Such a small proportion being family members supports previous oral health literacy research highlighting that they are a hard to reach and disadvantaged group and finding ways to ensure that oral health education is accessible to them remains an important issue.

Although oral health literacy improved for a small number of participants, these improvements were not universal, suggesting that a more nuanced approach to enhancing oral health literacy is needed. That is, the heterogeneity of participants in the programme, the people that they support and the contextual issues pertinent to the provision oral health care and support, points to the need for a systems-based approach that is adaptable to these differences [28]. As far as we are aware, no such adaptable programme has been developed, tested and reported in the literature, with most caregiver programmes offering generic oral health information regardless of the diversity in the people they support. For instance, being a caregiver to someone with profound and multiple disabilities and associated chronic and complex health problems, is very different to supporting someone with autism and behavioural problems. Thus the caregiver skills required, and the oral health issues that are presented to the caregiver, will differ [27].

4.1. Implications for Future Oral Health Literacy Programmes

Improving the oral health literacy of all carers of people with intellectual and developmental disabilities is crucial. However, when developing such training programmes, this pilot study has shown that it is important they are tailored to the individual types of carers rather than being generic and take into account their health literacy levels as well as the diverse types of people they support. One such tailored model was a disability support worker-led champions programme where the disability support workers are provided with oral health training specific to their scope of practice, and were then expected to take this

into the workplace and provide peer-led support to other staff to foster practice change and improve the oral health outcomes of the people they support [34]. In this champions programme, although some positive anecdotal outcomes were noted, there remained some confusion when champions interpreted key messages from the training, suggesting that follow-up from the health professionals was needed to ensure that key messages did not go awry after the initial training session. A systems-led biopsychosocial model has also been proposed that takes account of not only the heterogeneity of support needs in the population of people with intellectual and developmental disabilities, but also the diversity in their oral healthcare needs [35]. That is, a model that is flexible enough to account for the needs of people with intellectual and developmental disability who have pervasive support needs in addition to complex oral health issues, through to those who have low support needs and few oral health issues. Fundamentally, there are critical issues related to both the heterogeneity of carers and the people they support meaning that oral health training can not be a one-size fits all approach. Co-designing these training programme with carers could be a suitable approach to counter some of the issue noted in this programme, and others. Equally important is to explore feasible and effective dissemination strategies including the use of social media that could help hard to reach carers like family members access such training programmes.

4.2. Limitations

The pilot of the *Smiles for Life* education programme provided insights that can be valuable to other researchers or specialist oral health clinics who are looking to implement a similar model to address oral health training disparities for carers of individuals with intellectual and developmental disability. However, some limitations in the study design, data collection and analysis should be acknowledged. To begin, the pre- and post-survey design were not informed nor guided by a validated tool, pilot tested for face validity or created in consultation with a biostatistician. Questions were mostly presented in a 'tick all that apply' format and the majority of responses listed in the knowledge questions were correct, leaving little room for participants to make any potential errors or reveal a knowledge deficit in a particular area. This could provide an explanation for why there was no significant change in knowledge of participants post training. Further to this, the questions included in both surveys were not reflective of the entire content of the training programme. For instance, there were no questions testing participant knowledge of diet or prosthetics despite participants receiving training in these topics. The rationale behind this was survey developers felt that although these topics were important for carers to receive education it was not relevant to the aims of this study and were hence excluded. Finally, an issue with version control during the data collection phase of the study resulted in a portion of the participants receiving an updated version of the pre- and post-surveys which included additional responses to two knowledge questions. In order to not compromise the statistical power, the particular cases that had the updated knowledge questions were excluded from the analysis. Finally, it is not possible to generalize from these results and the nature of self-report data is always open to response bias. The absence of rich qualitative data, although not addressing the issues of generalisability, would have given some insight into individual participant circumstances and facets of the program that needed to be adjusted, and why, are not possible using the survey tool designed for this study.

5. Conclusions

This pilot study has highlighted the challenges of developing a generic oral health educational intervention for paid and unpaid carers of people with intellectual and developmental disabilities. Adopting a "one size fits all" approach may not be effective in improving the oral health literacy of all carers. Various strategies have been put forward to help future studies develop more targeted and tailored educational interventions in this area.

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