Original Paper

Effectiveness of a short web-based film targeting parental knowledge and behavior with respect to the oral health of children

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Abstract

Background: Children necessarily rely on their parents with respect to oral health routines but parental behavior in this area is not always adequate. Web-based interventions are a promising way of improving parental behavior in the area of oral health.

Objective: To evaluate the effectiveness of a web-based film about oral health, oral hygiene and dental care targeting parental knowledge and behavior with respect to oral health, directly after exposure and six months later.

Methods: We performed a non-blinded quasi-experimental study of the effects of a 8.5 minute web-based film in Dutch, English, Turkish and Moroccan/Berber about the oral health of children. Parents attending well-child clinics in mixed urban and rural areas in the Netherlands were assigned to an intervention (n=88) or control group (n=41). The control group received care as usual. We measured parental knowledge and behavior with respect to oral health before and directly after the intervention and six months later, and assessed differences between the intervention and the control group.

Results: Parental knowledge about oral health improved: the mean knowledge score was 93% correct after watching the film in the intervention group by comparison with 59% correct in the control group, Cohen’s d=2.64, and it was still better in the intervention group six months after watching the film. Oral health behavior did not differ between the intervention group and the control group after the intervention.

Conclusions: A web-based educational film for parents is an effective way to address specific health topics like oral health and to improve parental knowledge.

Keywords: film; oral health; knowledge; Child Care; modeling
Introduction

Dental caries, dental decay on any surface of a tooth, is the most common pediatric disease [1]. It is a multifactorial infectious disease, with frequency of sugar/carbohydrate intake, use of fluoride, and the buffering capacity of saliva as crucial factors. Among 5- to 17-year-olds in the United States, caries is over five times more common than asthma and seven times more common than hay fever [2]. Caries in advanced stages may lead to pain, discomfort, infections and tooth loss, and it has a major impact on children’s general health, growth and development. Caries affects the ability to chew and eat properly. In addition, it can lead to lost school hours and affect children’s overall wellness and self-esteem [3,4].

Caries has a known etiology that implies routes for prevention since it depends on behavioral factors such as twice-daily tooth brushing with fluoride toothpaste and dietary patterns [5,6]. Children necessarily rely on their parents with respect to oral health routines. Research suggests that oral health behaviors are not always adequately performed by parents, especially by parents with low socioeconomic status [6-9]. As the first tooth erupts at the age of six months, it is vital to encourage adequate oral health behaviors in parents as soon as the first tooth erupts.

In the Netherlands, the routine policy is to arrange for a first oral check and advice at a dental practice when a child reaches the age of 2 to 2.5 years. However, oral health promotion should preferably be initiated at the age of six months, in other words with the eruption of the first tooth. Well-child clinics are an excellent route for infant oral health promotion, with a web-based approach offering a relatively cheap route, since the clinics are in contact with 99% of parents and children from birth, including groups with low socioeconomic status and ethnic minorities [10]. Nevertheless, evidence-based and structured interventions for oral health promotion in 0-5-year-olds are not standard in well-child clinics and the encouragement of adequate oral health behavior is not part of routine care.

It is known from health behavior models that correct knowledge is essential as a basis for adequate health behaviors. The first step leading to adequate oral health behavior is therefore the acquisition of knowledge about oral health and the associated behaviors. Since 94% of the parents in the Netherlands have access to internet, a web-based intervention about adequate oral health behaviors targeting parents attending well-child clinics could benefit the scale and sustainability of implementation [11]. Alsada et al. reported an increase of 32% in knowledge in young mothers and early childhood educators about infant oral health after oral health information was given in a film [12]. Another study reported an improvement in oral health knowledge in parents in Nebraska after they watched a PowerPoint and video presentation [13]. Bates and Riedy (2012) reported an increase in knowledge and beliefs regarding oral health among pregnant women and new mothers between
pre- and post-survey after the women had watched an oral health commercial on a website [14]. However, none of these studies had a control group and they did not explore whether the effects persisted after a longer period of time. The advantages of supplying information in a film are, first, that knowledge is transferred and, second, that the desirable behavior is demonstrated by actors (mechanisms of role modeling) [15-17]. A web-based film that demonstrates oral health behaviors to parents could therefore be an effective way of educating parents about adequate oral health behaviors.

The aim of this study was to determine the effectiveness of a web-based film about oral health, oral hygiene and dental care targeting parental knowledge and behavior with respect to oral health. We assessed levels of knowledge immediately after the film was seen and determined whether the effect persisted after six months.

Methods

Study design
We performed a non-blinded quasi-experimental study with a pre-, post- and follow-up measurement in the intervention group and a post-measurement only in the control group. In the intervention group, we restricted the analyses to those who participated in the intervention. In the control group, we restricted the analyses to those who were willing to watch the web-based film after the measurement in order to obtain groups with similar levels of motivation.

Study setting and participants
The population targeted by the study consisted of parents of 0-4-year-olds in mixed urban and rural areas in the Netherlands who attended well-baby clinics in municipalities in the provinces of Zeeland, South Holland and Flevoland (see Figure 1). The study took place in routine well-child care with all children from any given clinic being allocated to either the control or intervention group. Since doctors and nurses in well-child clinics serve entire clinics, five clinics, rather than children, were allocated to intervention or control condition.
**Intervention**

A web-based information film of 8.5 minutes "Healthy teeth for children" was designed by oral health professionals working at the Netherlands Organization for Applied Scientific Research TNO and produced by Elan video productions. The film aimed to enhance parental knowledge and attitudes about oral-health-related behavior in parents of children aged 0-5 years. The film discussed standard oral health recommendations about how to care for children’s teeth until the age of 5 years (see Multimedia Appendix 1: Advices from the Dutch Dental Advisory board ‘Ivoren Kruis’). It was available in Dutch and in English, Turkish and Moroccan/Berber in order to serve the parents with the
most prevalent ethnicities in the Netherlands. The film is available online at www.tno-kindergebit.nl (Figure 2).
Procedure: Intervention group

Parents in the intervention group were asked to fill out a questionnaire on three occasions. They were asked to fill out the first questionnaire at the well-baby clinic before the intervention (T0) and received a card with the link to the website with the film and a personal login code. They were then asked to watch the film online at home. Immediately after watching the film online, the participants were asked to complete the second questionnaire online (T1). Parents who did not complete the second questionnaire were excluded. After six months (T2), parents in the intervention group were asked to complete the third questionnaire about oral health knowledge and behavior online. We included all parents who completed the first and second questionnaires (n=88) and also analyzed the data from the third questionnaire (n=67). Parents of children without teeth were excluded (n=4) from the analyses of oral health behavior.

Control group

Parents who were allocated to the control group were asked to fill out a questionnaire (pre-measurement) at the well-baby clinic at the same time as the post-measurement (T1) in the intervention group. The T0 measurement was omitted to avoid the effects of the actual completion of the questionnaire (effect of measurement).

After filling out the questionnaire, parents were offered the intervention as well. Analyses of the T1 measurement in the control group were restricted to those participating in the intervention in order to
obtain similar levels of motivation as in the intervention group (n=41). Parents of children without teeth were excluded (n=5) from the analyses of oral health behavior.

Outcome measures
Parents in both groups completed questions on background variables, dental knowledge and behavior. The primary outcomes were parental knowledge and oral health behavior. There were twelve questions addressing levels of knowledge. All the questions had one correct answer and the total sum score could therefore vary between 0 and 12. Oral health behavior was measured with four questions about parental behavior (see Multimedia Appendix 2: Questionnaire Oral health knowledge and oral health behavior).

Background variables
The background variables covered by the questionnaires were the educational level of the mother, the age of the child with an appointment at the well-child clinic, ethnicity of the mother, presence of baby teeth, and number of children in the family.

Ten years of education or less was considered to be a low educational level; more than ten years of education was coded as a high educational level. This decision was made in accordance with the International Standard Classification for Education 2011 [18].

Statistical analyses
We first described the background characteristics of the two groups before assessing the effects of the intervention on dental knowledge and oral health behavior by comparing the intervention (n=88) and control groups (n=41) at T1 using independent-sample t-tests. We then determined the persistence of the effects in the intervention group by comparing the results after six months with the T0 measurement using paired-sample t-tests. Parents of children without erupted teeth were excluded from these analyses. Statistical analyses were performed using SPSS 22.0 and a P value < 0.05 was considered statistically significant.

Results

Background characteristics
Eighty-eight parents in the intervention group and 41 parents in the control group were compared at T1. We recorded maternal educational level, maternal ethnicity, number of children in the family and age of the child. We found a significant difference between the intervention and control groups for mean number of children in the family (intervention group: 1.8, SD=0.9 vs control group: 2.3,
Differences between the two groups for ethnicity were close to being statistically significant.

Table 1. Background characteristics of the participating parents of children aged 0-4 years.

<table>
<thead>
<tr>
<th></th>
<th>Intervention group</th>
<th>Control group</th>
<th>( P ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n=88 )</td>
<td>( n=41 )</td>
<td></td>
</tr>
<tr>
<td>Ethnicity of mother</td>
<td></td>
<td></td>
<td>( P = .06 )</td>
</tr>
<tr>
<td>Dutch</td>
<td>91</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Non-Dutch</td>
<td>9</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Educational level of mother</td>
<td></td>
<td></td>
<td>( P = .76 )</td>
</tr>
<tr>
<td>Low</td>
<td>54</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>46</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Age child</td>
<td></td>
<td></td>
<td>( P = )</td>
</tr>
<tr>
<td>0 to 1 years</td>
<td>69</td>
<td>66</td>
<td>( P = .69 )</td>
</tr>
<tr>
<td>1 to 2 years</td>
<td>21</td>
<td>22</td>
<td>( P = .85 )</td>
</tr>
<tr>
<td>2 to 4 years</td>
<td>10</td>
<td>12</td>
<td>( P = .74 )</td>
</tr>
<tr>
<td>Mean number of children in family (SD)</td>
<td>1.8 (0.9)</td>
<td>2.3 (1.5)</td>
<td>( P = .048 )</td>
</tr>
</tbody>
</table>

Effect of the intervention

Table 2 shows mean levels of parental oral health knowledge and behavior scores for T0, T1 and T2 in the intervention and control groups.

Table 2. Mean parental oral health knowledge and behavior scores at T0, T1 and T2 in the intervention group and control group and \( P \)-values from the independent samples \( t \)-test.

<table>
<thead>
<tr>
<th></th>
<th>T0 mean SD</th>
<th>T1 mean SD</th>
<th>T2 mean SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral health knowledge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention (n=88)</td>
<td>6.9 (1.7)</td>
<td>11.1 (1.3)</td>
<td>9.1 (1.3)</td>
</tr>
<tr>
<td>Control (n=41)</td>
<td>7.1 (2.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohen’s d, ( P )</td>
<td></td>
<td>Cohen’s d = 2.64, ( P &lt; .001 )</td>
<td></td>
</tr>
<tr>
<td>Oral health behavior</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention (n=63)</td>
<td>2.5 (1.0)</td>
<td>2.9 (1.0)</td>
<td></td>
</tr>
<tr>
<td>Control (n=36)</td>
<td>2.6 (0.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohen’s d, ( P )</td>
<td></td>
<td>Cohen’s d = 0.05, ( P = .81 )</td>
<td></td>
</tr>
</tbody>
</table>
Parental oral health knowledge at T1 was significantly higher in the intervention group (mean 11.1; 93% correct) than in the control group at T1 (mean 7.1; 59% correct), Cohen’s d = 2.64, \( P < .001 \) [19]. There was no difference in parental oral health behavior between the intervention and control groups at T1 (Table 2).

At T2, 67 parents in the intervention group filled out the questionnaire. Those parents had higher knowledge scores at T2 than at T0 (9.1; 76% correct and 7.2; 60% correct respectively), Cohen’s d = 1.41, \( P < .001 \). In the intervention group, parents had higher knowledge scores at T1 than at T0 (mean 11.1; 93% correct and mean 6.9; 58% correct, respectively, \( P < .001 \)) and the difference between T1 and T0 was large (Cohen’s d = 2.31). There was no improvement in oral health behavior at T2 by comparison with T1, Cohen’s d = 0.21, \( P = .18 \).

Discussion

To our knowledge, this is the first study to assess the longer-term effect of a web-based film on parental knowledge about oral health. We found that parents in the intervention group had higher knowledge scores immediately after watching a web-based film about oral health routines than parents in the control group. This improvement persisted even after six months, even though the knowledge scores were lower than the scores measured directly after watching. This measured effect in the longer term makes this study unique since other studies have explored the effects over time [12-14].

The difference in knowledge between the parents who received the intervention and the parents in the control group was in line with the results from the currently limited evidence on this topic [12-14]. One explanation for the improvement in knowledge could be our use of the concept of modeling in the film. Video modeling can facilitate the transfer of knowledge, reduce anxiety and improve self-care, and have a positive effect on the self-efficacy of parents [15-17; 20].

We found no effect of the web-based film on oral health behavior in our study. Previous studies with a video for parents showing infant oral hygiene evaluated the effect on oral health knowledge only [12-14]. In addition to knowledge [21, 22], perceived behavioral control, attitude, social norms, family context, barriers and parenting strategies are also important factors in terms of changing behavior [23, 24]. Those other factors are difficult to address in a film since they require adjustments that are more tailored to the specific audience.

Strengths and limitations

In studies like ours, individuals who actually receive an intervention are often more motivated than a random control group because, generally speaking, it is often reasonable to assume that people in a
random control group are less motivated to undergo an intervention than individuals who actually participate in the intervention group. A strength of our study is therefore that we were able to establish the intervention and control groups in such a way that the motivation levels to watch a film about oral health promotion were similar. This implies that the effect in improved knowledge can genuinely be assigned to watching the film and that it was not due to differences in motivation levels. In addition, 9% of our intervention group consisted of mothers with a migration background; there were no mothers with a migration background in the control group. It is known from the literature that migrant parents’ levels of dental attendance and self-care practices are lower than in the native population [25].

Our study has some potential limitations. Firstly, we measured oral health behavior with four items only, limiting accuracy and therefore the potential to identify effects. In future research, more extensive questioning should be considered. Secondly, we explored the effects of the intervention after six months but not after a longer follow-up. Future research with a longer follow-up period of 1-2 years should be conducted to confirm these findings for the longer term.

Implications
We found that a web-based film had a large effect on oral health knowledge, showing that this intervention is a promising and self-supportive way of promoting oral health knowledge among parents in a community health setting. Major advantages are that the dissemination of messages by internet to promote health is inexpensive, that it has a high reach and that it is straightforward to implement in well-child care settings. Dissemination is probably best left to trusted intermediaries such as community health centers and well-child clinics.

Future research looking at web-based films targeting parental behavior with respect to the oral health of children should therefore include the effects of additional interactive components to address perceived behavioral control, attitude, social norms, family contexts, barriers and parenting strategies as important factors in changing oral health behaviors [24]. In addition, the effects in the longer term should be explored. Future research in this area could also address the effects of web-based films for promoting health on other health topics that receive less attention now, rather than being limited to oral health behavior in well-child clinics.

Conclusion
A web-based educational film for parents is an innovative and effective way of increasing knowledge relating to oral health care. It opens up a promising avenue for addressing various topics in preventive child health care and represents a positive contribution to child public health in the future.
Acknowledgements

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Abbreviations

SD : Standard deviation

Multimedia Appendix 1

Advices from the Dutch Dental Advisory board ‘Ivoren Kruis’.

Multimedia Appendix 2

Questionnaire Oral health knowledge and oral health behavior.

References


