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Evaluation of Turkish illustrated story books on oral hygiene

Serpil Sağdıç^{1*} and Zeynep Öztürk¹

Abstract

Background The acquisition of oral hygiene habits during early childhood plays an important role in the prevention of dental caries. Illustrated storybooks can be an effective tool for teaching children oral hygiene behaviors. This study examined the content of available Turkish illustrated storybooks related to oral hygiene from various perspectives.

Methods Internet searches were conducted for books related to oral hygiene. The publication year, price, page count, original language, image–text coherence, target audience age, reading level, author's profession, and reference information of the books that met the inclusion criteria were recorded. The content of the books was evaluated based on the guidelines of the American Academy of Pediatric Dentistry (AAPD).

Results A total of 33 books with relevant content fulfilled the inclusion criteria. The publication years of the books ranged from 2015 to 2023. The average price was 53.95 ± 27.71 liras, and the average number of pages was 28.06 ± 13.13 . Thirteen of the books were originally written in Turkish, while the others were translated into Turkish. Most of the books were found to be very readable. Only three books were written by a dentist. Tooth brushing was the most frequently mentioned oral hygiene practice.

Conclusions The books did not fully cover the AAPD guidelines. It is important for authors to consult professional sources or expert opinions to ensure the accuracy and comprehensiveness of the health information conveyed in their books.

Keywords Oral hygiene, Children, Storybooks

Background

Oral health is an essential component of children's overall health and an important indicator of quality of life [1, 2]. Oral health is a crucial component of a child's systemic health and has been correlated, as evidenced in the literature, to various systemic diseases with direct or indirect associations. The numerous correlations, including those with cardiovascular diseases as indicated in reference by

Nocini et al. [3] as well as with diabetes and neurodegenerative diseases, underscore the importance of oral health monitoring from pediatric age as the primary method of prevention for the individual's future health.

Despite being preventable, dental caries is the most common disease that affects oral health in children [4]. Home-based oral hygiene practices are critical in preventing caries, starting from the eruption of the first tooth [1]. The performance of these practices in childhood significantly influences oral health in adulthood. Therefore, it is recommended to begin dental care in early childhood [2].

The most effective period for learning and habit formation is early childhood [5]; however, daily oral hygiene

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practices can be tedious and challenging for children [6]. Therefore, making proper brushing techniques enjoyable is crucial for behavior acquisition [7].

Since oral hygiene practices are within an individual's control, they can be improved through behavior modifications [8]. Education plays an important role in facilitating behavior change. Various tools, ranging from simple and inexpensive measures to more complex and costly interventions, have been developed to raise awareness and disseminate knowledge among parents and children [4, 9]. The results of a meta-analysis demonstrate that oral health education and promotional interventions have positive effects on children's dental visits, toothbrushing habits, and flossing practices [10].

The use of written and visual tools in education contributes to faster and longer-lasting learning. Books hold an important place in this context, as they appeal to both written and visual learning styles [11]. They also play a significant role in promoting positive behavioral outcomes [5, 12, 13]. In particular, storybooks contribute to the development of positive behaviors by offering constructive role models and behavior patterns through characters with whom children can identify [14].

Storybooks have been used as effective tools for conveying health information to children [5, 15]. While studies examining illustrated children's books pertaining to dermatology [5, 16], neurology [15], anesthesia [17] and other medical disciplines [11, 18] are available. Raising awareness among parents and children about dental health not only provides individual health benefits but can also contribute to reducing preventable dental health problems in society as a whole. The main purpose of this study is to analyze the extent to which Turkish illustrated storybooks provide guidance in terms of oral hygiene education and to contribute to making these materials more effective in the future by revealing potential deficiencies.

Methods

A Google search was conducted using the Turkish words *resimli çocuk kitabı* (illustrated children's book) on June 11, 2024. On the first 10 websites selling books, searches were performed using the keywords *oral hijyen* (oral hygiene), *ağız sağlığı* (oral health), *diş fırçalama* (tooth brushing), *diş hekimliği* (dentistry), *diş hekimi* (dentist), and *diş* (tooth). Based on the results of these searches, all the illustrated children's books containing potentially relevant texts, as determined by their titles and content summaries, were purchased. All purchased books were read. The study included fictional storybooks that directly provided information on oral hygiene. However, books focusing on general self-care topics (e.g., hand-washing, healthy eating) or addressing health issues unrelated to oral hygiene were excluded. Additionally,

non-narrative informational books were not included in the study (Fig. 1).

The publication year, price, page count, original language, image–text coherence, target audience age, reading level, author's profession, and reference information of the books that met the inclusion criteria were recorded. The content was assessed according to the guidelines of the American Academy of Pediatric Dentistry (AAPD). Through collaborative discussion, the authors reached a consensus on the inclusion and evaluation stages. The reading level was calculated using the Flesch–Kincaid readability formula, which was adapted to Turkish by Ateşman.

$$198,825 - (40,175 \frac{\text{total syllables}}{\text{total words}} - 2,610 \frac{\text{total words}}{\text{total sentences}})$$

In the Ateşman readability formula, text readability is scored on a scale of 0 to 100 (Table 1). As the score increases, the readability of the text improves [19, 20].

Results

Fundamental descriptive characteristics of the books

A total of 52 books were evaluated; after evaluation, 19 books were excluded. Hence, 33 books were included (Table 2). The publication years of the books ranged from 2015 to 2023; over half were published in 2020 or later. Of the books, 20 were translations, while 13 were originally written in Turkish. The average price was 53.95 ± 27.71 liras, and the average page count was 28.06 ± 13.13 . Only 10 books specified the target age group. According to Ateşman's readability formula, two books were found to have an "easy" readability level, while the others were classified as "very easy."

Two of the books were written by a pediatric dentist, while one was written by an orthodontist. The remaining books were written by non-physician authors. However, two books were written with expert opinions from dentists.

Content analysis of the books

In 12.12% ($n=4$) of the books, the topic of toothbrush replacement was addressed. Furthermore, 9.09% ($n=3$) of the books discussed the recommended frequency of toothbrush replacement, while 9.09% ($n=3$) of them covered the selection of appropriate toothbrushes. Brushing of the tongue and soft tissues was mentioned in 12.12% ($n=4$) of the books, and 9.09% ($n=3$) of them emphasized the importance of using individual toothbrushes. A total of 78.78% ($n=26$) of the books included information on the frequency of toothbrushing, while 36.36% ($n=12$) of them addressed the duration of brushing. The use of dental floss was mentioned in 24.24% ($n=8$) of the books, and 21.21% ($n=7$) of them discussed the appropriate

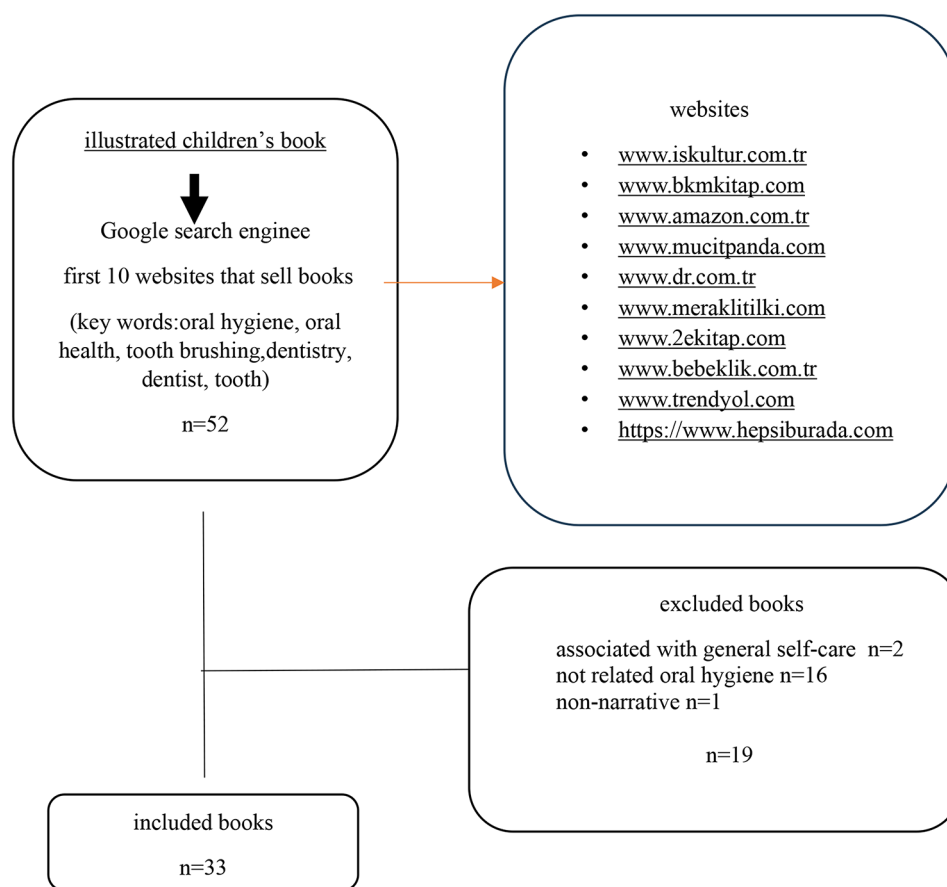


Fig. 1 Prisma flow diagram of book sample selection and screening method

Table 1 The score measured in the Ateşman readability formula is the level of readability and the corresponding education level

| Points | Readability level | Education level |
|--------|-------------------|------------------------------|
| 90–100 | Very easy | 4th grade and below |
| 80–89 | Easy | 5th or 6th grade education |
| 70–79 | | 7th or 8th grade education |
| 60–69 | Medium difficulty | 9th or 10th grade education |
| 50–59 | | 11th or 12th grade education |
| 40–49 | Difficult | 13th to 15th grade education |
| 30–39 | | Undergraduate education |
| ≤ 29 | Very difficult | Postgraduate education |

amount of toothpaste. Toothbrushing techniques were covered in 45.45% ($n=15$) of the books, and 18.18% ($n=6$) of them emphasized the importance of parental involvement in oral care. Diet control as a component of maintaining oral hygiene was mentioned in 48.48% of the books, and 33.33% ($n=11$) of them highlighted the need for regular dental checkups. In the illustrated storybooks examined in this study, dental caries were generally depicted directly through black, brown, and gray images or germ figures, without the use of any metaphors. However, in one book, the pain and discomfort caused by decay were metaphorically described as witches dancing

inside the teeth or frogs entering the mouth and tickling the teeth.

Discussion

Dental caries has serious psychological and biological impacts, but the disease can largely be prevented through proper oral hygiene practices. Therefore, health behavior modifications aimed at improving oral health outcomes in children are essential. Educational programs designed to increase knowledge of oral hygiene serve as an important tool for positively influencing oral health in children [13]. Storybooks play a significant role in conveying information through their narratives and illustrations. The interaction resulting from reading stories is crucial for delivering a high-quality educational program at an early age [21].

O'Malley et al. [13] designed the Kitten's First Tooth storybook and DVD in collaboration with an animation company to evaluate parents' attitudes, intentions, and self-efficacy regarding their children's oral health. They assessed the impact of this intervention using the Oral Health Behaviours Questionnaire (OHBQ). The study results indicated a significant increase in the self-efficacy of parents in the intervention group in supporting their

Table 2 Illustrated story books about oral hygiene included in this study

| Book Title | Author(s) | Publisher | Publication Year |
|---|-----------------------------------|--|------------------|
| 1. Ah Dişim Vah Dişim | Ioanna Bouldoumi | Pena Publications | 2017 |
| 2. Ahmet ve İsa Diş Sağlığı | Houda Rami | Motive Publishing | 2022 |
| 3. Arkadaşım Dişçi | Ralf Butschkow | Türkiye İş Bankası Kültür Publications | 2022 |
| 4. Bora ve Buzo'nun Harikalar Dünyası-Diş Fırçalamak Harika | Collective | Yumurcak Publications | 2019 |
| 5. Canavarlar Bile Diş Fırçalar | Jessica Martinello | Bilgi Publishing House | 2018 |
| 6. Çağlar'ın Süt Dişi | Christian Tielmann | Türkiye İş Bankası Kültür Publications | 2022 |
| 7. Dalgın Diş Perisi | Sibel Şengül | Yapı Kredi Publications | 2023 |
| 8. Diş Doktoru | Koray Avcı Çakman | Kırmızı Kedi Çocuk | 2020 |
| 9. Diş Fırçalamak Yasak | Andreas Dierssen | Gelengi Publications | 2016 |
| 10. Diş Gezegeni | Sabiha Tuncel Günçtekin | İskenderiye Kitap | 2021 |
| 11. Diş Hekimi | Jess Stocham | Türkiye İş Bankası Kültür Publications | 2023 |
| 12. Diş Hekimi Filiz | Bridget Heos | Beta Kids | 2019 |
| 13. Diş Hekimi Nildişi ile Gülmenin Formülü | Dr.Gilman Yüce Feyza Öz | Doğan Çocuk | 2022 |
| 14. Elif Diş Bakımını Öğreniyor | Liane Schneider | Türkiye İş Bankası Kültür Publications | 2022 |
| 15. Elif'in Dişi Sallanıyor | Liane Schneider | Türkiye İş Bankası Kültür Publications | 2022 |
| 16. Emre Büyüyor Diş Bakım Günü | Wikan Satriati | Bambu Kitap | 2021 |
| 17. Fırça, Diş İpi ve Çalkalama | Amanda Doering Tourville | Teleskop Popüler Bilim | 2019 |
| 18. Güzel Alışkanlıklar Diş Fırçalama Oyunu | Kolektif | Matara Çocuk | 2020 |
| 19. Haylaz Timsah Dişlerini Nasıl Fırçalar | Jane Clarke | 1001 Çiçek Kitaplar | 2021 |
| 20. Hayvanat Bahçesinde Diş Fırçalama Günü | Sophie Schoenwald | Türkiye İş Bankası Kültür Publications | 2022 |
| 21. İnci Dişlerini Fırçalıyor ve Annesi Ona Yardım Ediyor | Anna Wagenhoff | Türkiye İş Bankası Kültür Publications | 2022 |
| 22. İnci Diş ile Kuyruklu | Şenol Ceviz | Giz Çocuk | 2019 |
| 23. İnci Gibi Dişlerim | Özge Selçuk Bozkurt | Timaş Çocuk | 2023 |
| 24. Kendime İyi Bakıyorum-Dişlerimi Fırçalıyorum | Liz Gogerly | Almidilli Publications | 2017 |
| 25. Kita ve Timsah Dişlerini Fırçalıyor | Thomas Kingsley Troupe | 1001 Çiçek Kitaplar | 2018 |
| 26. Küçük Diş Dodo | Gürkan Kap | Çocuk Eğitim Akademisi | 2022 |
| 27. Küçük Kız Polin Dişlerini Fırçalıyor-Haydi Yatağa | Didier Dufresne | Çoki Publishing | 2019 |
| 28. Mira'nın Diş Doktoru Maceraları | Ahmet Coşkun | Goya Publications | 2021 |
| 29. Nil Dişlerini Fırçalıyor | Anna Taube | Türkiye İş Bankası Kültür Publications | 2021 |
| 30. Pofi ile Tam Zamanında Dişlerim Pırıl Pırıl | Nurşen Şirin | Sıncap Kitap | 2019 |
| 31. Şirin'in Rüyalari-Diş Temizliği | Ercan Dinçer | Polat Kitapçılık | 2015 |
| 32. Tavşan Cino'nun Dişi Ağrıyor | Gülsüm Duruk Sultan Bedelciğil | Akademisyen Publishing House | 2015 |
| 33. Tay Dişlerini Fırçalıyor | Michael Dahl | 1001 Çiçek Kitaplar | 2021 |

children's toothbrushing behavior. Similarly, Sharma et al. [12] evaluated the effects of conventional education, game-based education, and researchers designed storybook-based education on the oral hygiene of children aged 7 to 12 years. In the study, children's oral hygiene status was assessed using the Oral Hygiene Index-Simplified (OHI-S), Debris Score (DI-S) both before the intervention (on the first day) and at the end of the third month. The results of this study showed that oral hygiene education provided through storybooks was more effective than game-based or brochure-based approaches. The use of children's storybooks for educational purposes is advantageous because they can be read at the child's own pace; they also allow parents and children to read and discuss topics together and support the consolidation of knowledge through repeated readings. To achieve these

beneficial effects, it is essential that the information in the books is both comprehensive and accurate [15].

In the literature, there are studies examining children's books pertaining to atopic dermatitis [5], sun safety [16], Alzheimer's disease [15], surgical procedures [17], injections [11] and the role and image of the nursing profession [18]. However, to the best of our knowledge, no studies have been conducted that review children's storybooks covering dentistry topics.

Readability and target audience adaptation

When imparting knowledge and fostering proper behavior, the effective conveyance of content is directly linked to the readability of the materials [22]. The present study found that the majority of the reviewed books were very readable, which is consistent with the results of Tappel

et al. [5]. This characteristic made them appropriate for children and parents with low literacy levels. However, it was notable that most of the books provided no information regarding their target age ranges. This absence can be seen as an obstacle to guiding parents in selecting books suitable for their children.

The role of parents in teaching children positive oral health behaviors is crucial [1, 23]. Parental assistance is essential for effective toothbrushing until children develop sufficient motor skills [24]. According to the AAPD guidelines, children should brush their teeth under parental supervision until the age of seven or eight [25]. However, most of the reviewed books did not emphasize parental support. Some of the books mentioned parental involvement in brushing, but they showed images of children brushing their teeth alone. Parental supervision should be highlighted in both visual and textual content. The rate of independent tooth brushing among preschool-aged children varies widely, ranging from 9 to 72%. Without parental assistance, the average duration of tooth brushing by children alone is approximately 10 s [4]. While tooth brushing appears to be a simple and effective way to remove plaque, children's brushing duration and performance are often inadequate [26]. The recommended tooth brushing time is two minutes [27]. Most of the reviewed books lacked information on this aspect. Although several of the books advocated the regular brushing of teeth, only two emphasized that brushing should begin with the eruption of the first tooth.

The AAPD guidelines recommend using a rice-sized amount of toothpaste for children aged 0–3 years and a pea-sized amount for children aged 3–6 years [28]. Although some of the reviewed books described the use of a pea-sized amount of toothpaste, none of them specified toothpaste quantities according to age. Instead, the amount of toothpaste was described using vague terms, such as “chickpea sized” and “tooth sized.”

Fluoride application and its importance

Regardless of the risk of caries, the use of fluoride toothpaste twice daily is recommended [28]. Fluoride serves as the cornerstone of noninvasive therapeutic and preventive treatment for both cavitated and noncavitated carious lesions [29, 30]. In addition to fluoride toothpaste, topical fluoride applications are recommended for children at high risk of caries [27]. Although fluoride application is known to be safe and effective, some parents reject it due to beliefs that fluoride negatively impacts their children's digestive system or causes learning difficulties by affecting brain tissue [31, 32]. Illustrated children's books may serve as an aid in alleviating such concerns. However, in this study, only a limited number of books included information on fluoride use for children.

Integrating fluoride information in children's illustrated books on this topic may lead to positive shifts in parental beliefs.

Oral hygiene procedures

A soft toothbrush is recommended for children, which should be replaced every three months; this should be done sooner if the bristles become worn or if the child experiences an infectious disease [25]. In this study, the number of books mentioning toothbrush replacement and individual brush use was notably low.

Dental floss removes plaque located in the interproximal and subgingival areas, which a toothbrush cannot reach [33]. Regular flossing in children is notably rare [34]. The findings of a meta-analysis show that over 70% of children under the age of six do not use dental floss [35]. Awareness and motivation are significant factors in its use [36]. Storybooks may play a role in fostering this awareness and motivation. Among the illustrated storybooks reviewed here, the number addressing the use of dental floss was very limited.

According to the AAPD guidelines, the first dental examination should happen no later than 12 months of age [37]. However, very few children visit the dentist before the age of three [38]. Incorporating dental visits into storybooks could help raise awareness about this issue. Dental visits are associated with an increased frequency of tooth brushing and flossing [39] as well as a reduction in dental anxiety [40]. Approximately half of the illustrated storybooks reviewed in this study referenced dental visits. Among the books that mentioned such visits, most recommended biannual checkups, although some suggested annual visits or regular exams without specifying an interval.

Reading materials that employ simple texts and contextually appropriate illustrations have great potential to capture children's attention and support their learning processes. In particular, the presence of colorful illustrations enhances a child's interest in a text [41]. Exposure to specific visuals through picture books has been found to be highly effective in promoting positive behaviors in young children [21].

Images of toothbrushes and toothpaste in storybooks are also considered to be influential in encouraging oral hygiene behaviors and conveying accurate information. However, if the illustrations are not consistent with the text, they may lead to conceptual confusion in children. Several instances of inaccurate visual representations were identified in this study.

Limitations of the study

Among the limitations of this study is the potential for differing results due to algorithmic biases inherent in internet searches conducted through bookstore

platforms and search engines. Although the aim was to analyze commercially available children's books widely accessible within a specific time frame, conducting the same search in a different period could yield varying outcomes. Additionally, the focus on evaluating only books published in Turkish, aimed at ensuring easy accessibility, is another noteworthy limitation of the study. Moreover, exclusively utilizing the AAPD guideline in evaluation may result in disregarding the approaches of another professional associations.

Conclusions

The reviewed books did not fully cover the AAPD guidelines. It is important for authors to consult professional guidelines or experts to ensure the accuracy and comprehensiveness of the information they provide to children and parents. Furthermore, encouraging dentists to write storybooks could help address gaps in the field, thus enhancing the effectiveness of oral health information dissemination.

Abbreviations

| | |
|-------|---|
| AAPD | American Academy of Pediatric Dentistry |
| DI-S | Debris score |
| OHBQ | Oral Health Behaviours Questionnaire |
| OHI-S | Oral Hygiene Index-Simplified |

Acknowledgements

None.

Author contributions

S.S. Conceptualization, Methodology, Supervision, Data Acquisition and Interpretation, Analysis, Writing-Original Draft Preparation. Z.O. Conceptualization, Methodology, Data Acquisition and Interpretation, Analysis, Critically Revised the Manuscript. All authors gave final approval and agreed to be accountable for all aspects of the work.

Funding

None.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Received: 27 December 2024 / Accepted: 28 March 2025

Published online: 13 April 2025

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