ORIGINAL ARTICLE

USE OF BRAILLE IN ORAL HEALTH EDUCATION FOR THE VISUALLY IMPAIRED PERSON - SYSTEMATIC REVIEW AND META-ANALYSIS

USO DO BRAILE NA EDUCAÇÃO EM SAÚDE BUCAL PARA DEFICIENTES VISUAIS – REVISÃO SISTEMÁTICA E META-ANÁLISE

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ABSTRACT

Objective: To evaluate the use of Braille, alone or in combination, as a method of oral health education for visually impaired patients. **Methods:** A search strategy was carried out in 6 databases and in the grey literature retrieving studies published until February 2021. Following the acronym PICOS, randomized controlled clinical trials (S) that evaluated people with visual impairment (P), who received oral hygiene instruction with educational methods containing Braille alone or together (I), compared to educational methods without Braille (C), and evaluated their influence on oral hygiene indices (O) were considered eligible. The risk of bias of the studies considered eligible was assessed using the ROB.2 and meta-analyses were performed to compare the different methods in relation to gingival and plaque index. The certainty of the evidence was assessed (GRADE). **Results:** A total of 9 articles were included in the present review and 5 in the meta-analysis. All studies were rated as 'some concern' regarding risk of bias. Braille, when used alone, is shown to be inferior to other methods ($p<0.05$); when used in association with audio or audio-tactile-performance (ATP) it is shown to be similar to ATP ($p>0.05$), and when implemented together with ATP it is shown to be superior to techniques without Braille ($p<0.05$). The certainty of the evidence ranged from very low to moderate. **Conclusion:** Braille used alone was less effective, whereas multisensory methods including Braille and ATP are more effective when compared to oral health education methods without Braille.

Keywords: Vision disorders, Oral health, Oral health education.

RESUMO

Objetivo: Avaliar o uso do braile, de forma isolada ou conjunta, como método de educação em saúde bucal para pacientes com deficiência visual. **Métodos:** Uma estratégia de busca foi realizada em 6 bases de dados e na literatura cinzenta resgatando os estudos publicados até fevereiro de 2021. Seguindo o acrônimo PICOS, foram considerados elegíveis estudos clínicos controlados e randomizados (S) que avaliassem pessoas com deficiência visual (P), que receberam instrução de higiene oral com métodos educativos contendo braile de forma isolada ou conjunta (I), comparados a métodos educativos sem braile (C), e avaliaram sua influência em índices de higiene oral (O). O risco de viés dos estudos considerados elegíveis foi avaliado através da ferramenta ROB.2 e meta-analises foram realizadas para comparar os diferentes métodos em relação ao índice gengival e de placa. A certeza da evidência foi avaliada (GRADE). **Resultados:** No total, 9 artigos foram incluídos na presente revisão e 5 na meta-análise. Todos os estudos foram classificados como 'alguma preocupação' em relação ao risco de viés. O braile, quando utilizado de forma isolada, mostra-se inferior aos demais métodos ($p<0,05$); quando usado associado ao áudio ou áudio-tátil-performance (ATP) mostra-se semelhante ao ATP ($p>0,05$), e quando implementado juntamente com o ATP, mostra-se superior a técnicas sem braile ($p<0,05$). A certeza da evidência variou de muito baixa a moderada. **Conclusão:** O braile utilizado de forma isolada apresentou-se menos eficiente, enquanto métodos multissensoriais, incluindo o braile e ATP, são mais eficientes quando comparados a métodos de educação em saúde bucal sem braile.

Palavras-chave: Transtornos da visão, Saúde bucal, Educação em saúde bucal.

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INTRODUCTION

According to 2018 data from the Brazilian Institute of Geography (IBGE), there are an estimated 22,500- 26,700 children up to 12 years old who are blind in Brazil, and visual impairment can range from low vision to blindness (educa.ibge.gov.br). According to the 10th revision of the International Statistical Classification of Diseases and Health Problems (CID-10), visual impairment may be classified into grades/categories, in which is considered light visual impairment or absence of visual impairment (category 0) when the value of visual acuity is equal to or greater than 0.3; moderate visual impairment (category 1) when the value is less than 0.3 and greater than or equal to 0.1; severe visual impairment (category 2) when the value is less than 0.1 and greater than or equal to 0.05; blindness (category 3, 4 and 5), when the value is less than 0.05 up to no light perception (1). Visual impairment can make people unable to lead an autonomous life, requiring the help of their families and, unfortunately, oral health is often neglected (2).

Regarding oral hygiene instruction (OHI) for this population, it is necessary to consider several tools used in day-to-day social dentistry. The use of plaque revealing, to allow the patient to visualize areas of impaired brushing, plays, videos, and informative brochures are excluded from this scenario (3). Visually impaired children have poorer oral hygiene and a higher rate of caries when compared to normally sighted children (4).

Braille, a tactile writing medium, is shown to be a useful tool to convey various information about oral health education for people living with low vision and blindness. Two studies (4,5) have reported that Braille and auditory media are effective in motivating and educating visually impaired patients, while other studies report that a multisensory approach is more effective than a unisensory approach (6,7). Thus, gaps remain open in the literature about the best form of oral health education for the visually impaired.

Considering that children with visual impairment and blindness tend to have a greater oral health impairment (3,4) , that many dentists do not feel qualified to care for them (4) and that there is no consensus in the literature as to the superiority of Braille in oral health education techniques, the aim of this study was to compare the efficacy of oral health education methods with Braille in relation to methods without Braille in people with visual impairment or blindness, by systematic review of the literature. The oral health education methods could be applied alone or in association (multisensorial methods).

METHODOLOGY

An electronic search was performed in the electronic databases *PubMed, Scopus, Embase, Web of Science, Cochrane Library, Lilacs (via Virtual Health Library) and OpenGrey* in February 2021, using mesh terms and free terms related to the theme of the present review. No language or publication date restrictions were placed. Table 1 shows the search strategy performed in each database.

Eligibility and study selection criteria

Two authors (G.O.F. and M.B.M.) independently evaluated the title and abstract of all articles retrieved from the databases for eligibility criteria for this systematic review. The predefined eligibility criteria were based on the acronym PICO (8): randomized controlled clinical trials that evaluated patients with visual impairment or total blindness (P), who received OHI with educational methods containing Braille alone or in combination (I), compared to educational methods without Braille (C), and their influence on oral hygiene (O). Non-randomized studies, studies that did not include Braille as an educational method, review articles, letters to the editor, single-arm studies (before and after), and observational studies were excluded from this review. Any disagreement among authors was resolved by consensus.

When the title and abstract did not provide enough information, the full text was retrieved and analyzed for a final decision regarding its inclusion or exclusion.

Data Extraction

All studies considered eligible were analyzed and characteristics such as authors, year, country of origin, study design, exclusion criteria, population (age and blindness level), comparison groups (with and without Braille), time of application of the educational method, follow-up time and evaluation periods, indexes and/or outcomes evaluated, and loss in the groups were tabulated and presented descriptively.

Bias Risk Analysis

Methodological quality and risk of bias were assessed using the *Cochrane* Risk of Bias Tool for Randomized Clinical Trials (RoB 2.0). For each item, scores representing low, uncertain or high risk of bias were accepted. This tool assesses the presence of bias in five domains: during the randomization process; deviations in intended interventions; missing outcome data; during outcome measurement; and in the reporting of results. Each domain, as well as the final judgment about each study's risk of bias, was rated as "low," "high," or "some concerns." Two examiners (G.O.F. and M.B.M.) performed the

TABLE 1. SEARCH STRATEGY (PERFORMED IN FEBRUARY 2021)

Pubmed (17)	#1 - dental caries[MeSH Terms] OR dental decay[Title/Abstract] OR “white spot”[thiab] OR “white spots”[thiab] OR Demineral*[thiab] OR ECC[thiab] OR DMF[thiab] OR DMFT[thiab] OR “Decayed, Missing, and Filled Teeth”[tiab] OR Deft[tiab] OR DMFS[tiab] OR ICDAS[tiab] OR NYVAD[tiab] OR carious[Title/Abstract] OR carie*[tiab] OR oral hygiene[MeSH Terms] OR oral hygiene[Title/Abstract] OR oral health[MeSH Terms] OR oral health[tiab] OR Hygiene, Oral[tiab] OR Dental Hygiene[tiab] OR Hygiene, Dental[tiab] OR Plaque Inde*[tiab] OR Gingival inde*[tiab] OR probing depth[tiab] OR bleeding on prob*[tiab] OR marginal bone[tiab] OR Patient Hygiene Performance index[tiab] OR biofilm[tiab] #2 - braille[thiab] #3 - visually impaired persons [MeSH Terms] OR visually impaired[thiab] OR blindness[MeSH Terms] OR blind*[thiab] OR Impaired Visually[thiab] Search #1 and #2 and #3
Scopus (19)	#1 INDEXTERMS ({dental caries} OR {oral hygiene} OR {oral health}) OR TITLE-ABS-KEY ({dental decay} OR {white spot} OR {white spots} OR demineral* OR ecc OR dmf OR dmft OR {decayed, Missing, and Filled Teeth} OR deft OR dmfs OR icdas OR nyvad OR carious OR carie* OR {oral hygiene} OR {oral health} OR {Hygiene, Oral OR Dental Hygiene} OR {Hygiene, Dental} OR {Plaque Index} OR {Gingival index} OR {probing depth} OR {bleeding on prob} OR {bleeding on probing} OR {marginal bone} OR {Patient Hygiene Performance index} OR biofilm) #2 TITLE-ABS-KEY (braille) #3 INDEXTERMS ({visually impaired persons} OR blindness} OR TITLE-ABS-KEY ({visually impaired} OR blind* OR {Impaired Visually}) Search #1 and #2 and #3
Web Of Science (13)	#1 TS=(“dental decay” OR “white spot” OR “white spots” OR Demineral* OR ECC OR DMF OR DMFT OR “decayed, Missing, and Filled Teeth” OR Deft OR DMFS OR ICDAS OR NIVAD OR carious OR carie* OR “oral hygiene” OR “oral health” OR “Hygiene, Oral OR Dental Hygiene” OR “Hygiene, Dental” OR “Plaque Index” OR “Gingival index” OR “probing depth” OR “bleeding on prob” OR “bleeding on probing” OR “marginal bone” OR “Patient Hygiene Performance index” OR biofilm) #2 TS=(braille) #3 TS=(“visually impaired” OR blind* OR “Visually Impaired”) Search #1 and #2 and #3
Cochrane (11)	#1 MeSH descriptor: [Dental Caries] explode all trees #2 MeSH descriptor: [Oral Hygiene] explode all trees #3 MeSH descriptor: [Oral Health] explode all trees #4 (“dental decay” OR “white spot” OR “white spots” OR Demineral* OR ECC OR DMF OR DMFT OR “decayed, Missing, and Filled Teeth” OR Deft OR DMFS OR ICDAS OR NIVAD OR carious OR carie* OR “oral hygiene” OR “oral health” OR “Hygiene, Oral OR Dental Hygiene” OR “Hygiene, Dental” OR “Plaque Index” OR “Gingival index” OR “probing depth” OR “bleeding on prob” OR “bleeding on probing” OR “marginal bone” OR “Patient Hygiene Performance index” OR biofilm):ti,ab,kw #5 #1 OR #2 OR #3 OR #4 #6 (braille):ti,ab,kw #7 MeSH descriptor: [Visually Impaired Persons] explode all trees #8 MeSH descriptor: [Blindness] explode all trees #9 (‘visually impaired’:ti,ab,kw OR blind*:ti,ab,kw OR ‘Visually Impaired’):ti,ab,kw #10 #7 OR #8 OR #9 #11 #5 AND #6 AND #10
Embase (10)	#1 ‘dental caries’/mj OR ‘mouth hygiene’/mj OR ‘oral hygiene index’/mj OR ‘oral health status’/mj OR ‘dental decay’:ti,ab,kw OR ‘white spot’:ti,ab,kw OR ‘white spots’:ti,ab,kw OR demineral*:ti,ab,kw OR ecc:ti,ab,kw OR dmf:ti,ab,kw OR dmft:ti,ab,kw OR ‘decayed, missing, and filled teeth’:ti,ab,kw OR deft:ti,ab,kw OR dmfs:ti,ab,kw OR icdas:ti,ab,kw OR nivad:ti,ab,kw OR carious:ti,ab,kw OR carie*:ti,ab,kw OR ‘oral hygiene’:ti,ab,kw OR ‘oral health’:ti,ab,kw OR ‘hygiene,:ti,ab,kw oral:ti,ab,kw OR dental hygiene’:ti,ab,kw OR ‘hygiene, dental’:ti,ab,kw OR ‘plaque index’:ti,ab,kw OR ‘gingival index’:ti,ab,kw OR ‘probing depth’:ti,ab,kw OR ‘bleeding on prob’:ti,ab,kw OR ‘bleeding on probing’:ti,ab,kw OR ‘marginal bone’:ti,ab,kw OR ‘patient hygiene performance index’:ti,ab,kw OR biofilm:ti,ab,kw #2 braille:ti,ab,kw #3 ‘visually impaired person’/mj OR ‘blindness’/mj OR ‘visually impaired’:ti,ab,kw OR blind*:ti,ab,kw OR ‘visually impaired’:ti,ab,kw Search #1 and #2 and #3
Lilacs via VHL (0)	((mh:(visually impaired persons)) OR (mh:(blindness)) OR (tw:(“visually impaired” OR blind* OR “Impaired Visually”))) AND ((tw:(braille))) AND ((mh:(dental caries)) OR (mh:(oral hygiene)) OR (mh:(oral health)) OR (tw:(“dental decay” OR “white spot” OR “white spots” OR Demineral* OR ECC OR DMF OR DMFT OR “decayed, Missing, and Filled Teeth” OR Deft OR DMFS OR ICDAS OR NIVAD OR carious OR carie* OR “oral hygiene” OR “oral health” OR “Hygiene, Oral OR Dental Hygiene” OR “Hygiene, Dental OR Plaque Index” OR “Gingival index” OR “probing depth” OR “bleeding on prob” OR “bleeding on probing” OR “marginal bone” OR “Patient Hygiene Performance index” OR biofilm))))
OpenGrey (0)	Braille AND (oral hygiene) Braille AND caries Braile AND biofilm

methodological quality assessment of the included studies independently.

Meta-analysis

Data from the studies were analyzed using RevMan software (Review Manager v. 5.3, The Cochrane Collaboration; Copenhagen, Denmark) to evaluate gingival and plaque index between the groups that used Braille, alone or in combination, and the groups that did not use Braille for oral health education. The mean, standard deviation, and number of participants assessed in each health education group (with and without Braille) were extracted and inserted into the software for calculation of the mean difference (MD) with a 95% confidence interval (CI). The analyses were performed according to the similarity between the health education methods. In cases in which the studies presented more than one intervention/ comparator group, the mean and standard deviation of the grouping was calculated through the random effect, with the aid of the Comprehensive Meta- analysis software.

The random effect model was applied, heterogeneity was tested using the I^2 index, and the prediction interval was calculated for analyses that included 3 or more studies.

Assessment of the certainty of EVIDENCE

The certainty of the evidence for each meta-analysis was determined using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach. According to the factors that decrease (risk of bias, inconsistency, external validity, imprecision, and publication bias) or increase (magnitude of effect, presence of spurious relationship/confounding factors, and dose response) the confidence in the results, the quality of the evidence can range from very low to high (9).

RESULTS

Search and selection of studies

Initially, 70 articles were identified. After removing the duplicates, 34 studies remained and, of these, 19 were selected for the full text reading. After careful reading, 10 articles were excluded for not meeting the eligibility criteria: 1 study did not present control without Braille, 8 studies presented before and after design, and 1 study did not perform randomization. Finally, 9 articles were included in the present review and 5 in the meta-analysis (Figure 1).

Data Extraction

The included studies were developed in India (2,4,6,7,10,13) and Indonesia (14), published between 2015 and 2019. Three studies included totally blind children (5,6,10), one study (13) included both totally and partially blind children, and five other studies (2,4,7,11,14) did not report the degree of visual impairment of the participants.

Braille was evaluated alone in 4 studies (4,6,7,13), associated with audio in 5 (2,6,10,11,14), associated with ATP in 2 (7,13), and with the tactile model in only 1 study (5). Braille was only evaluated in association with more than two techniques in three studies (6,10,11).

Oral Hygiene knowledge was assessed in 4 studies by applying questionnaires (2,6,13,14), plaque index was not assessed in 3 studies (4,11,14), gingival index was assessed in 4 studies (2,5,10,13) and in 2 the patient's hygiene performance was evaluated (4,11).

Table 2 and 3 show the characteristics and numerical results of the included studies, respectively.

Risk of bias

According to the RoB 2.0 tool, all studies were rated as "some concerns" in the domain related to the reporting of results, since they did not submit their designs. Additionally, six studies (4,10,11,12,14,15) were judged as "some concerns" in the domain related to bias during the randomization process as they did not describe how the method of randomization of included participants was performed ("Was the allocation sequence randomized?") as well as the blindness of the allocation sequence until enrollment and assignment to the interventions ("Was the allocation sequence blinded until participants were enrolled and assigned to the interventions?"). Seven studies (2,4,7,10,11,14,15) were rated as "some concerns," primarily for lack of information related to analyses to estimate the effect of assignment to interventions ("Was an appropriate analysis used to estimate the effect of assignment to the intervention?") and its impact ("Was there potential for a substantial impact, on outcome, of failing to analyze participants in the group to which they were randomized?").

Overall, all studies included in the present systematic review were rated as "some concerns." The risk of bias in the included studies is shown in Figures 2 and 3.

Meta-analysis and certainty of EVIDENCE

It can be observed that patients who received oral hygiene instructions with Braille associated with the tactile method, audio or ATP presented mean gingival index similar to the group of patients who received OHI without Braille ($p>0.05$). A significant difference was detected in the comparison Braille *versus* ATP, in which the group that received OHI using only Braille presented higher mean gingival index when compared to the group that received OHI through ATP (figure 4).

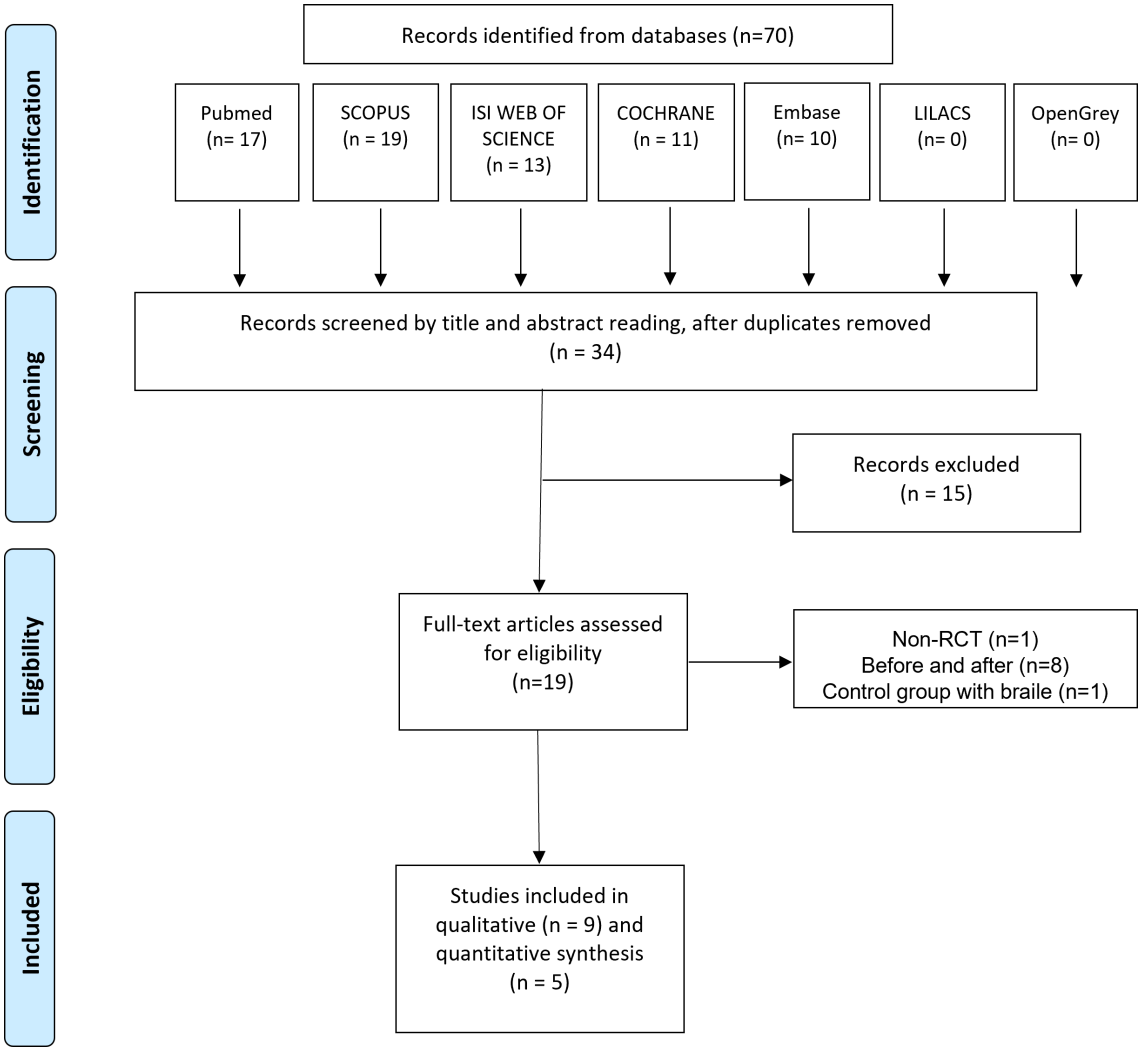

Figure 1. *Flowchart of study selection and inclusion.*

TABLE 2. DATA DESCRIPTION OF THE INCLUDED STUDIES.

Study			Population		Comparisons		Time of application of the educational method	Time of Evaluations	Key Figures or Outcomes Assessed	Losses in the groups
Author, year. Country.	Design	Exclusion Criteria	Age	Blindness level	Braille	Without Braille				
Alamsyah et al. 2017. Indonesia.	RCT	Wearing an orthodontic appliance and not presenting systemic abnormality.	> 5 Years old	NR	Braille (n=49).	Audio (n=44).	Once a day for 1 month.	1 week and 1 month after PE.	Knowledge about OH (12-question questionnaire) and OHIS.	0
Chowdary et al. 2016. India.	RCT	Children with other forms of mental or physical disabilities, medically compromised children, who use any chemical mode of plaque control, and under medication that can affect the condition of the gum tissues.	06-16 Years Old	Totally visually impaired since birth.	G2. Verbal + Braille (n=40). G3. Verbal + tactile (ATP) + Braille (n=40).	G1. Verbal + Tactile (ATP) (n=40).	NR	1, 3 and 6 months after EP.	Plaque index - (Silness and Loe) Gingival index - (Loe and Silness).	NR
Das et al. 2018. India.	RCT	Individuals with any other additional disabilities or syndromes, systemic diseases, uncooperative individuals, who are using any other oral hygiene supplements, with a recent history of dental treatment, systemic antibiotics or topical fluoride treatments 3 months prior to data collection, and individuals with dentures.	10-15 Years Old	NR	Braille + Audio resources (n=30).	ATP (n=30).	Periodically every three weeks.	30 and 90 days after EP.	Oral health knowledge and practice questionnaire, plaque and gingival index.	0
Deshpande et al. 2017. India.	RCT	Individuals with any other disability or syndrome and non-cooperative.	12-16 Years old	NR	G1. Braille (n=20). G3. Braille + ATP (n=20).	G2. ATP (n=20).	Reinforcement of the brushing technique was performed on the seventh day and after one month from the day the patients were first taught.	6 months post EP.	Plate index.	0

Ganapath et al. 2015. India.	RCT	Partially blind children, with underlying systemic disease and/or other disability, in orthodontic treatment, and non-cooperative.	08-14 Years old	Totally visually impaired child.	G2. Braille (n=40). G4. Braille + Audio + Tooth models (n = 40).	G1. Audio (n = 40). G3. Tooth models (n = 40). G5. No information (n = 40).	NR	8 months after EP.	Plaque index and oral health knowledge.	
Gautam et al. 2018. India.	RCT	Children with a recent dental treatment, history of systemic antibiotics or topical fluoride treatments, xylitol chewing gum, severe medical conditions.	05-18 Years old	NR	G1. Braille + Audio Resources (n = 20). G3. Braille + Audio resources + Tooth models (n = 20).	G2. Audio resources + Tooth models (n=20).	NR	1 and 3 months after EP.	PHP Index.	0
Gautam et al. 2020. India.	RCT	NR	09-17 Years old	NR	G1. Braille (n=60). G3. Braille + ATP (n=60).	G2. ATP (n=60).	The reinforcements were performed periodically every 15 days.	Initial consultation and after 3 months.	Plaque and gingival index.	0
Tiwari et al. 2019. India.	RCT	Medically compromised children, children with intellectual disabilities, children using any chemical mode of plaque control, and children on medications that can affect the condition of the gum tissues.	12-15 Years old	Partial and complete blindness (visual acuity ranging from 6/60 to 1/60).	G2. Braille (n=30). G3. Braille + ATP (n=30).	G1. Audio + Tactile (ATP) (n=30).	Periodically reinforced (unspecified).	21 days, 3, 6 and 9 months after EP.	Knowledge, plaque and gingival index.	0
Mahantesha et al. 2015. India.	RCT	Individuals with a recent history of dental treatment, systemic antibiotics or topical fluoride treatments 3 months prior to the initial appointment, habitual use of probiotics, xylitol chewing gum, serious medical conditions.	6-20 Years Old	NR	G1. Braille (n=25).	G2. Audio (n=25).	NR	7 days and 3 months after EP.	PHP index.	0

RCT Randomized clinical trial; NR Not reported; EP Educational program.

TABLE 3. DESCRIPTION OF THE NUMERICAL RESULTS AND CONCLUSION OF THE INCLUDED STUDIES.

Study	Results	Conclusion
Alamsyah et al. 2017. Indonesia.	*Oral Hygiene Knowledge* Database: Braille: 5.08±1.59 / Audio: 4.48±1.21. After 1 week: Braille: 10.57±1.59 / Audio: 10.52±1.81. After 1 month: Braille: 10.92±1.13 / Audio: 11.20±0.98. *OHIs* Database: Braille: 2.99±1.02 / Audio: 2.90±0.76 After 1 week: Braille: 1.77±0.71 / Audio:1.66±0.69 After 1 month: Braille: 1.56±0.63 / Audio: 1.44±0.72	The gain in knowledge and OHIs was similar in children who received OHI by audio and Braille.
Chowdary et al. 2016. India.	*Plaque Index* G1. Baseline: 0.91±0.29 / 1 month: 0.65±0.21 / 3 month: 0.46±0.16 / 6 month: 0.42±0.20 G2. Baseline: 1.00±0.20 / 1 month: 0.69±0.15 / 3 month: 0.60±0.10 / 6 month: 0.41±0.16 G3. Baseline: 1.09±0.19 / 1 month: 0.64±0.16 / 3 month: 0.40±0.14 / 6 month: 0.32±0.17 *Gingival Index* G1. Baseline: 0.52±0.32 / 1 month: 0.26±0.18 / 3 months: 0.13±0.11 / 6 months: 0.11±0.10 G2. Baseline: 0.74±0.25 / 1 month: 0.49±0.29 / 3 months: 0.19±0.08 / 6 months: 0.11±0.07 G3. Baseline: 0.65±0.17 / 1 month: 0.31±0.15 / 3 months: 0.13±0.10 / 6 months; 0.12±0.11	The combination of verbal instruction, Braille texts, and tactile mode of oral health education proved to be an effective tool for instilling good oral hygiene practices in visually impaired children.
Das et al. 2018. India.	*Plaque Index* Braille + Audio Database: 2.63 ± 2.02 / 30 days: 3.58 ± 1.3 / 90 days: 3.14 ± 0.88 ATP Database: 2.75 ± 1.76 / 30 days: 3.45 ± 1.9 / 90 days: 3.5 ± 1.18 *Gingival Index* Braille + Audio Database: 4.12 ± 1.66 / 30 days: 0.92 ± 2.52 / 90 days: 1.97 ± 1.48 ATP Database: 4.58 ± 1.63 / 30 days: 1.23 ± 2.43 / 90 days: 2.65 ± 1.64	ATP was considered equal to the control group (Braille and audio resources).
Deshpande et al. 2017. India.	G1. Database: 29.45 / 6 months: 42.98 G2: Database: 30.83 / 6 months: 29.90 G3. Database: 30.23 / 6 months: 18.73	Braille + ATP proved more effective than Braille and ATP alone.
Ganapath et al. 2015. India.	Plaque Index G1. Before (3.02 ± 0.90) / After (2.07 ± 0.63) G2. Before (2.73 ± 0.83) / After (2.35 ± 0.47) G3. Before (2.61 ± 0.82) / After (1.86 ± 0.51) G4. Before (2.63 ± 0.76) / After (1.80 ± 0.45) G5. Before (2.75 ± 0.51) / After (NR)	Multisensory approach that proved to be more effective than the unisensory mode.
Gautam et al. 2018. India.	G1. Base data: 0.75 (±0.44) / 1 month 0.55 (±0.51) / 3 months 0.3 (±0.47) G2. Base data: 0.65 (±0.49) / 1 month 0.55 (±0.51) / 3 months 0.35 (±0.49) G3. Base data: 0.65 (±0.49) / 1 month 0.50 (±0.51) / 3 months 0.15 (±0.37)	The combination of audio, Braille, and tactile models is an effective way to provide oral health education and improve the oral health status of visually impaired children.
Gautam et al. 2020. India.	*Plaque Index* G1. Baseline: 1.67± 0.51 / 3 months 1.16 ± 0.42 G2. Baseline: 1.85 ± 0.43 / 3 months 0.96 ± 0.31 G3. Baseline: 1.84 ± 0.39 / 3 months 0.80 ± 0.27 *Gingival Index* G1. Baseline: 1.7 ± 0.48 / 3 months 1.2 ± 0.45 G2. Baseline: 1.87 ± 0.38 / 3 months 1.00 ± 0.32 G3. Baseline: 1.85 ± 0.33 / 3 months 0.79±0.18	Visually impaired children can maintain an acceptable level of oral hygiene when taught using a combination of the Braille and ATP technique.

Tiwari et al. 2019. India.	*Plaque Index* G1. Base data: 1.68 ± 0.26 / 21 days 1.35 ± 0.17 / 3 months 1.15 ± 0.16 / 6 months 1.03 ± 0.13 / 9 months 0.93 ± 0.13 G2. Base data: 1.70 ± 0.29 / 21 days 1.62 ± 0.29 / 3 months 1.40 ± 0.24 / 6 months 1.25 ± 0.21 / 9 months 1.10 ± 0.19 G3. Base data: 1.74 ± 0.29 / 21 days 1.21 ± 0.22 / 3 months 1.01 ± 0.20 / 6 months 0.91 ± 0.18 / 9 months 0.79 ± 0.14 *Gingival Index* G1. Base data: 1.78 ± 0.25 / 21 days 1.43 ± 0.19 / 3 months 1.25 ± 0.15 / 6 months 1.12 ± 0.12 / 9 months 1.03 ± 0.12 G2. Base data: 1.81 ± 0.29 / 21 days 1.71 ± 0.30 / 3 months 1.50 ± 0.24 / 6 months 1.35 ± 0.20 / 9 months 1.20 ± 0.19 G3. Base data: 1.84 ± 0.29 / 21 days 1.31 ± 0.22 / 3 months 1.11 ± 0.19 / 6 months 1.01 ± 0.17 / 9 months 0.89 ± 0.13	The combination of ATP (audio, tactile, and performance technique) and Braille is an effective way to improve oral hygiene status in visually impaired children.
Mahantesha et al. 2015. India.	*PHP Index* G1. Baseline: 3.88±0.33 / 7 days: 3.42±0.36 / 3 months: 2.47±0.43 G2. Baseline: 3.90±0.38 / 7 days: 3.45±0.47 / 3 months: 2.86±0.42	Improved oral health status in the study population by decreasing the mean plaque score.

For specification of G1, G2, G3 and G4, see table 1.

TABLE 4: NUMERICAL RESULTS OF THE MATRIX ANALYSIS AND CERTAINTY OF EVIDENCE FOR GINGIVAL INDEX AND PLAQUE INDEX.

	No. of studies included	I^2	Difference from the mean	P value	Prediction interval	Certainty of evidence
Gingival Index						
Braille *versus* ATP	02	0%	0.23 [0.15, 0.31]	**<0.001**	NA	Very low ⊕◯◯◯
Braille + Audio *versus* ATP	02	70%	-0.20 [-0.89, 0.49]	0.57	NA	Low ⊕⊕◯◯
Braille + ATP *versus* ATP	03	90%	-0.11 [-0.25, 0.02]	0.10	NA	Very low ⊕◯◯◯
Plaque Index						
Braille + Audio *versus* ATP	02	40%	-0.08 [-0.36, 0.20]	0.56	NA	Low ⊕⊕◯◯
Braille *versus* Negative control*	04	61%	0.26 [0.13, 0.38]	**<0.001**	[-0.24 a 0.76]	Very low ⊕◯◯◯
Braille + ATP *versus* Control#	05	0%	-0.13 [-0.18, -0.09]	**<0.001**	[-0.19 a -0.07]	Moderate ⊕⊕⊕◯

DM. Difference from the mean; ATP. Audio tactile performance; NA. Not applicable; Control. Any other method without Braille.
**The control group (no Braille) in this analysis includes audio (1 study), tactile (1 study), and ATP (2 studies).*
 # The control group (no Braille) in this analysis includes audio (1 study), tactile (1 study), and ATP (3 studies).

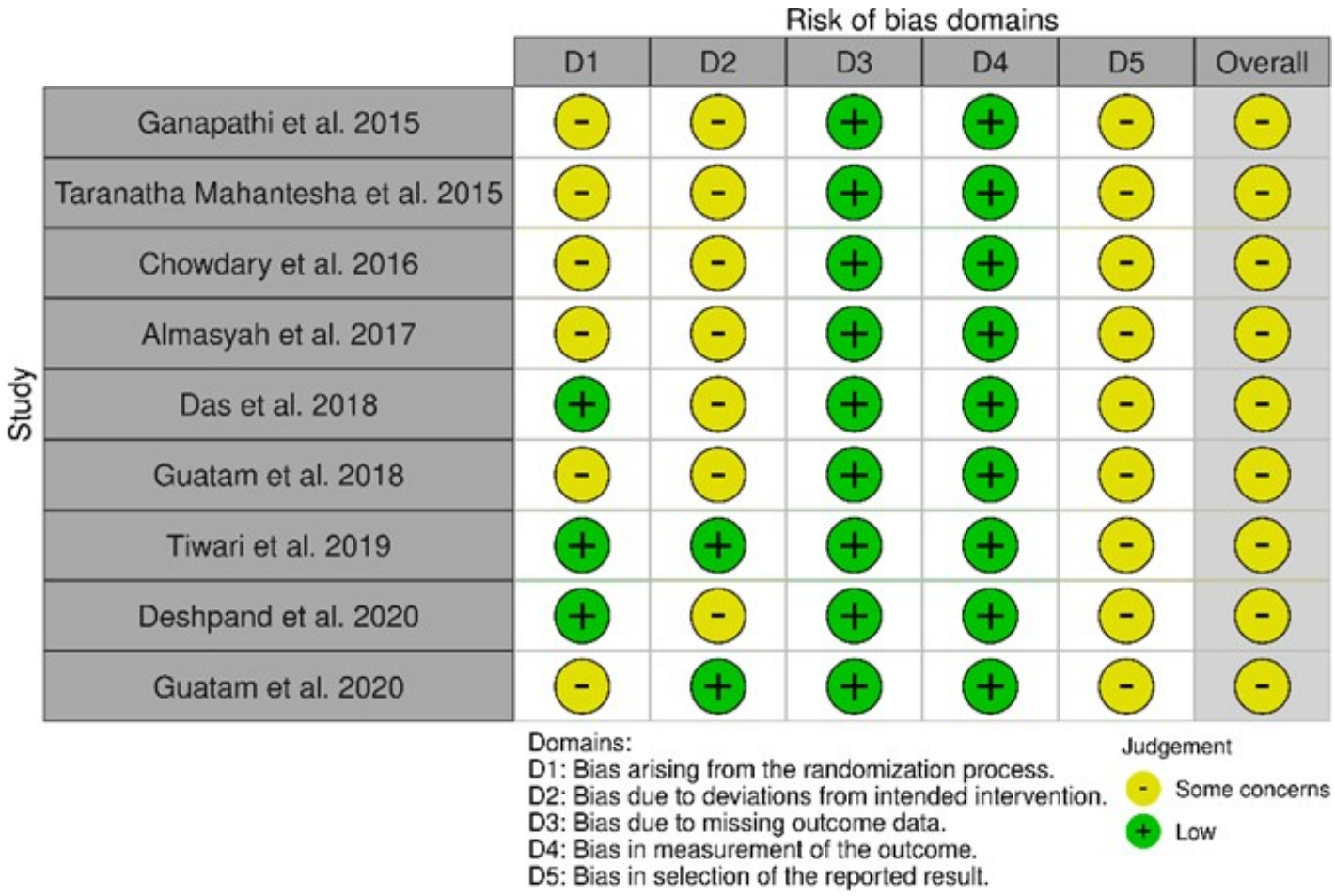

Figure 2: *Traffic light graph of the quality assessment of randomized trials (RoB.2).*

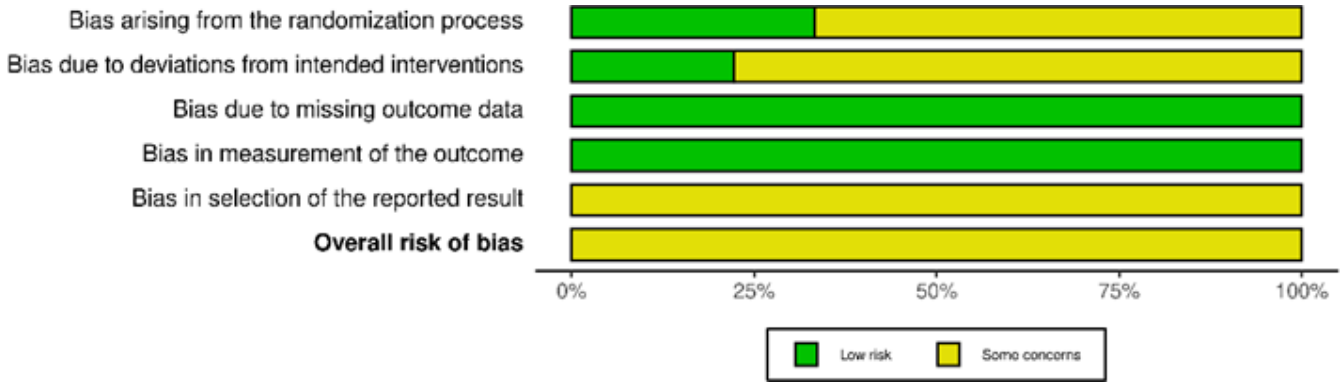

Figure 3. *Summary chart of the quality assessment of randomized trials (RoB.2).*

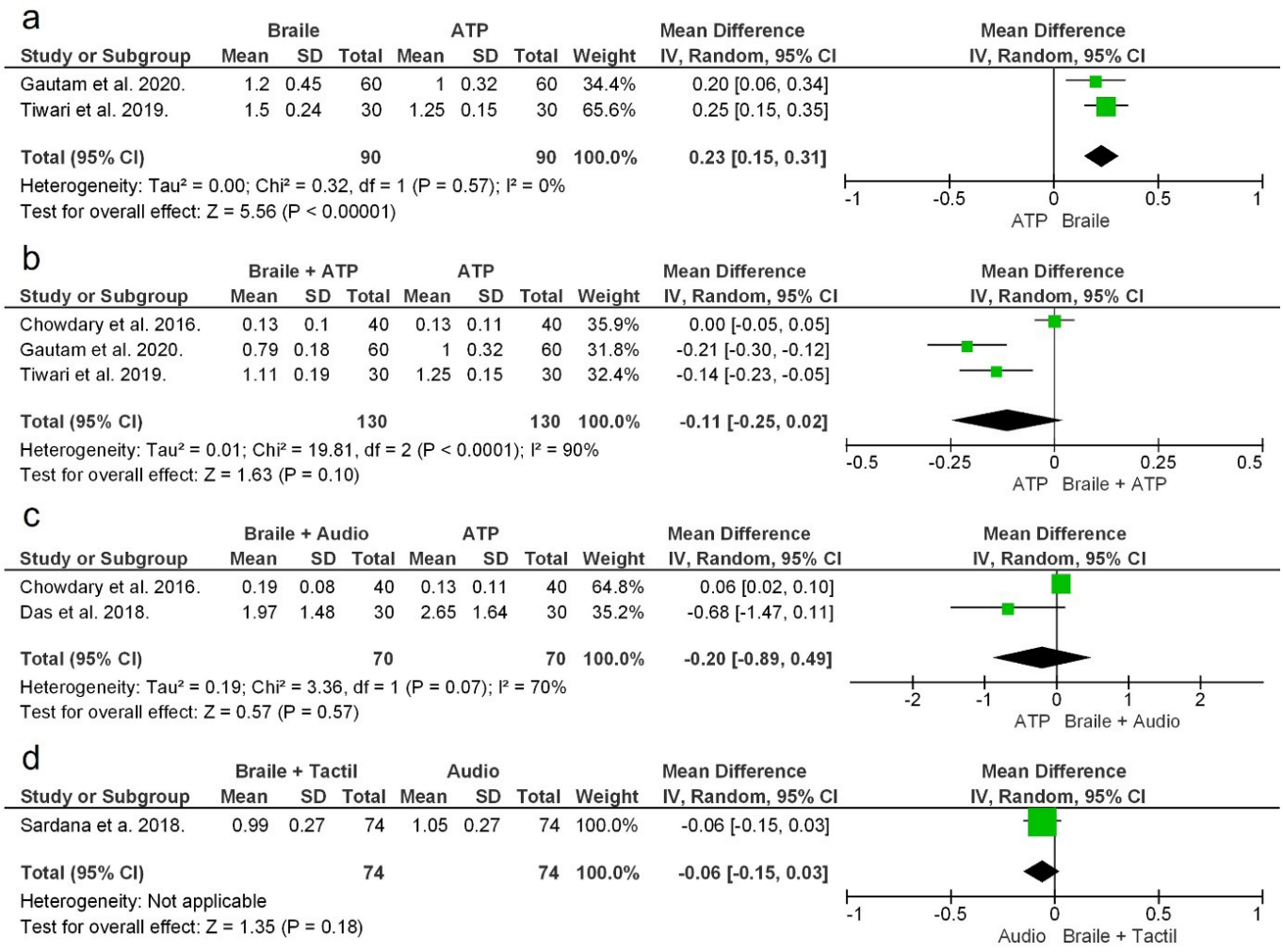

Figure 4. *Forest plot das análises para índice gengival: (a) Braile versus ATP, (b) Braile + ATP versus ATP, (c) Braile + Áudio versus ATP, (d) Braile + Tátil versus Áudio.*

Regarding plaque index, the group that received OHI with Braille only showed higher dental biofilm averages, compared to the groups that received different forms of OHI without Braille ($p<0.001$). Patients who received OHI using Braille associated with the tactile or audio method presented biofilm averages similar to the groups who received OHI without the Braille method ($p>0.05$). Only the group that received OHI through Braille associated with ATP showed lower biofilm averages compared to the groups that received different forms of OHI without Braille ($p<0.001$) (figure 5).

DISCUSSION

According to the data from the studies included in the present review, Braille, when used alone, is inferior to the other methods; when associated with audio or ATP, it is similar to ATP; and when implemented with ATP, it is superior to techniques without Braille.

Thus, it can be inferred that multisensorial methods including Braille are more efficient, while Braille used alone is less efficient, when both are compared to OHI methods without Braille. Visual impairment is characterized by a sensory deficiency (vision), leading to limitations for the people who have it and impairing their perception of the world (16). The multisensorial method allows a greater sensorial exploration and the development of different perceptive capabilities of the visually impaired individual, seeking to associate tactile and kinesthetic perceptions to the auditory stimuli.

ROB.2 is a tool used to consider the risk of bias in randomized clinical trial results, structured into five domains where bias can be introduced into the outcome (17). If performed successfully, randomization avoids the influence of known or unknown prognostic factors (factors that predict outcome) or confounding factors (factors related to the outcome) on the assignment of the intervention group (17). This means that, on average, the intervention groups have the same prognosis before the start of the intervention. Most studies did not provide details on how the process of randomization and allocation blindness was performed, as well as the possible impact of this process on group matching at the early stage of the clinical trial.

The clinical trial should be registered, as per CONSORT recommendations (18). Evaluation of this protocol minimizes intervention deviation and outcome reporting biases. Intervention drift relates to biases that arise when there are deviations from the intended interventions and may be related to administration of additional interventions not reported in the study protocol, failure to implement the protocol interventions as intended, or failure of study participants to adhere to their assigned interventions.

While reporting selection bias puts the outcome of a synthesis at risk because results are omitted based on their direction, magnitude, or statistical significance (17). Most studies did not provide the registration numbers of their protocols, so that biases related to intervention bias and reporting could be eliminated. The authors of the current review encourage that future studies be conducted based on the CONSORT statement to allow articles to provide complete, clear, and transparent information about their methodology and findings.

It is important to point out that all the studies included children and adolescents, and a small number of young adults, with the age of the participants varying from 5 to 20 years. The young age may have influenced the results, given that exposure to tactile stimuli is tiring for children, since they use another sensory channel (the hands). Studies highlight that tactile reading is more tiring than visual reading because it is slower, requires appropriate positioning of the arms and hands, requiring strength and manual dexterity to slide the fingers lightly over the text. Besides, temperature variations can cause a decrease in tactile sensitivity (19). Herein, further studies including adult and elderly populations should be carried out.

Another point worth noting is that almost all the studies included in the present review were conducted in India. This may be justified by the high prevalence of blindness in this country. Estimates suggest that there are 36 million blind people in the world (20), with India sharing almost a quarter of the entire global burden of blindness and visual impairment, with 8 million blind and 62 million visually impaired people (21).

The plaque index evaluated in some studies is the clinical analysis of the presence or absence of biofilm on the tooth surface and can assess whether brushing is being performed correctly. While the gingival index assesses inflammation and shows if the patient is performing oral hygiene and biofilm removal properly and routinely. The comparison between the method that included Braille and audio, or ATP showed similar results to the ATP method alone. While the Braille, when applied alone, showed inferior results to the ATP. It suggests that educational methods performed with Braille isolated may not provide adequate memorization of the content.

The knowledge related to oral hygiene was evaluated by questionnaires. In the study by Pagen *et al.* (14) the questionnaire consisted of 12 questions, while in the study by Das *et al*. (2) there were 17 questions. Both studies concluded that educational methods containing Braille are effective.

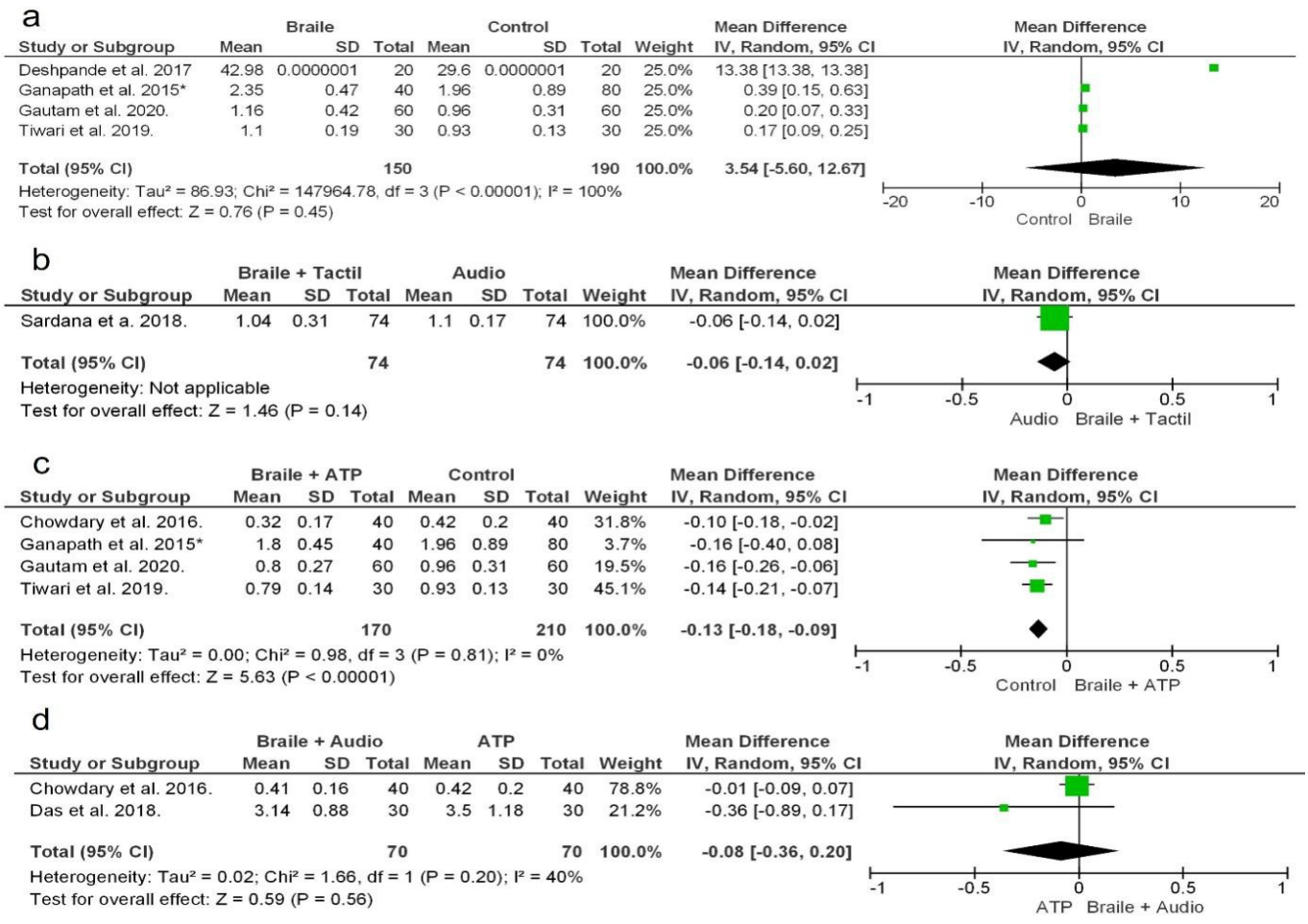

Figure 5. *Forest plot das análises para índice de placa: (a) Braile versus Controle, (b) Braile + Tátil versus Áudio, (c) Braile + ATP versus Controle, (d) Braile + Áudio versus ATP.*

Among the limitations of the present review we can cite the high heterogeneity of the studies included. The studies presented methodological differences in relation to the educational methods used, time of application and evaluation, as well as the indexes evaluated. These factors contributed to meta-analyses with a reduced number of included studies. Additionally, the presence of possible methodological biases contributes to the very low, low, and moderate certainty of the evidence. Future published studies may or may not agree with the results of the present meta-analysis.

The effort of dentists and teachers is extremely important, in order to include these habits in the routine of visually impaired youngsters. Dentists need to be qualified and aware of their importance in motivating oral hygiene instructions for this public, still so marginalized. Positive results are described when the instructions are given to the child with the help of others. The authors of the present review stimulate that projects on this theme, at universities and with the dentistry entities, must be carried out, since health is everyone's right and they will be working this way in favor of the inclusion of this population.

CONCLUSION

According to the data from the present review, Braille shows results equal to the negative control and inferior to the ATP when used alone as a method for oral health education. Only the Braille associated with the ATP showed better results among the multisensorial methods.

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