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What's new for the clinician: excerpts from and summaries of recently published papers

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Compiled and edited by Prof V Yengopal

1. Does oral health influence school performance and school attendance? A systematic review and meta-analysis

MAB Rebelo, JM Rebelo Vieira, JV Pereira, LN Quadros, MV Vettore
Int J Paediatric Dent. 2019; 29:138–48.

Several chronic diseases are known to affect children, requiring significant adjustments in life management and leading to decreased quality of life. Among the most prevalent diseases of childhood are dental caries, asthma, diabetes, and obesity, with dental caries being the most common, occurring 5 to 8 times more frequently than asthma, the second-most common condition.

Chronic illness can interfere with a child's ability to succeed in school. Evidence shows that increases in missed school time caused by chronic illnesses can lead to declines in school performance.

Rebelo and colleagues (2019)[1] undertook a systematic review with meta-analysis to assess the evidence on the possible influence of oral health on school performance and school attendance in children and adolescents.

METHODS

The protocol of this systematic review was registered on PROSPERO and presented according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA Statement) checklist.

Studies involving participants aged 18 years or under that assessed oral health measures concomitantly with information regarding participants' school performance and/or school attendance were considered for selection.

Clinical trials and observational (cohort, case-control and cross-sectional) studies published in any language were eligible. Editorials, letters to editors, review papers, descriptive studies (case reports and case studies), and duplicated studies were excluded.

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ACRONYM

NOS: Newcastle-Ottawa Scale

A search strategy was developed and five electronic databases were searched without publication period restrictions to May 2018. No search of the grey literature was undertaken.

All the retrieved studies were screened for inclusion by three reviewers independently. Disagreements between the three reviewers were resolved by discussion with a fourth reviewer. Potentially eligible studies were then assessed in full for eligibility according to the selection criteria. Manual searches were conducted in the reference lists of the identified papers for discovery of additional relevant studies. Finally, the selected studies were assessed for inclusion in the meta-analyses.

Data extraction was carried out independently by the three reviewers in a method similar to that used for assessment of studies for inclusion. Data extraction forms were used to record the following information: **(a)** authors and year of publication; **(b)** study design; **(c)** country and study setting; **(d)** age group and sex; **(e)** sample size; **(f)** oral health condition and measurement; **(g)** outcomes: school attendance and/or school performance; **(h)** number of confounders assessed; and **(i)** summary of the main findings.

The methodological quality assessment was performed by the same three researchers using the Newcastle-Ottawa Scale (NOS) for cohort studies and case-control, and the modified Newcastle-Ottawa Scale for cross-sectional studies. NOS for cohort, case-control studies and cross-sectional studies is made up of 8, 8, and 6 items, respectively. Each item may receive one point (one star) except from the item "Comparability" in which the score ranges from 0 to 2 stars. Low risk of bias studies could receive a maximum score of nine stars

for cohort and case-control studies, and seven stars for cross-sectional studies. Cohort and case-control studies from 6 to 8 stars were classified as moderate quality, and those with five stars or less were considered to have low quality. Cross-sectional studies rating between 4 and 6 stars were evaluated as moderate quality, and those with three stars or less were considered to have low quality.

Meta-analysis was considered for included papers where the effect size (odds ratios) and 95% of CIs were reported or could be extracted. Continuous effect size measures (e.g.: mean differences) were translated into odds ratio standardized effect size using information from the comparison groups, including sample size, mean, and standard deviation. Since only observational studies were included in the meta-analysis, the random effect method was used to obtain pooled estimates, according to the outcome (school performance and school attendance) and the different oral health exposures.

Heterogeneity among studies was tested by Cochran's *Q* test. The proportion of the variance between studies due to heterogeneity was assessed using *I*2. Meta-analyses reporting $I2 \geq 75\%$ were rated of high heterogeneity. Potential publication bias was not tested since the meta-analyses included less than ten studies.

RESULTS

The initial search identified 9308 potential papers. Of these, 3706 studies remained after excluding duplicated documents. All titles and abstracts were then reviewed, and 3638 documents were considered irrelevant and were also excluded. The full texts of the remaining 68 papers were analysed for inclusion. Of these, 50 were thereafter excluded according to the inclusion criteria. In the end, a total of 18 studies were included in this systematic review. No additional paper was identified through manual search of the reference lists of the selected papers. Meta-analyses were carried out using data from 15 studies.

Of the 18 included studies, one cohort, one case-control, and 11 cross-sectional studies assessed the relationship between different oral health measures and school performance. Of these, five cross-sectional studies also evaluated the association between oral health and school attendance. In addition, a further five studies tested the relationship between oral health and school attendance.

Most studies were conducted in schools, and the sample sizes varied between 312 and 65,680 participants. Dental caries was the most investigated dental exposure. Other measures which were investigated included gingivitis, dental trauma, malocclusion, parent's perception of child's oral health, self-perceived oral health and toothache, school performance and school attendance.

The risk of bias assessment ranged from low to moderate quality for the included studies.

The pooled effect size of the association between dental caries and school performance was obtained using data from 3205 children from five studies. Children with one or more decayed teeth had 44% higher probability of poor school performance than caries-free children (OR: 1.44 95% CI: 1.24-1.64) (Figure 2). Data from 30 995 children from five studies were used to obtain the pooled effect size between parent's perception of child's oral health and school performance. Poor school performance was significantly associated with poor paternal perception of children's oral health (OR: 1.36 95% CI: 1.16-1.57).

No heterogeneity was observed in either analysis (dental caries: *Q*: 0.94, $P=0.918$; parent's perception of child's oral health: *Q*: 8.88, $P=0.064$). Meta-analysis of the estimates of the association of gingivitis (*Q*: 4.14, $P=0.042$, *I*2: 75.9%) and toothache (*Q*: 24.42, $P<0.001$, *I*2: 91.8%) with school performance revealed high heterogeneity.

Children with decayed teeth had significantly higher odds of having poor school attendance than those without dental caries (OR: 1.57 95% CI: 1.08-2.05). The pooled effect size was obtained from five studies using data from 4416 children. Parents of children with poor school attendance were 1.35 times more likely to report poor oral health of their child when data from 108 214 chidren from three studies were combined (95% CI: 1.22-1.42).

There was no statistical association of dental trauma and toothache with school attendance. Heterogeneity tests on the meta-analyses for school attendance were not statistically significant (dental caries: *Q*: 2.24, $P=0.816$; dental trauma: *Q*: 0.53; $P=0.467$; parent's perception of child's oral health: *Q*: 4.37; $P=0.113$); toothache: *Q*: 0.31; $P=0.580$).

CONCLUSIONS

Children and adolescents with dental caries and those reporting worse oral health experience poor school performance and poor school attendance.

Implications for practice:

Clinicians should note that the strength of the evidence used to assess the research question for this study ranged from low to moderate. The researchers acknowledged the need for more longitudinal high quality studies to add to the evidence pool for this topic. However, there is no doubt that school performance and attendance among school going children is negatively affected by poor oral health!

Reference

1. Rebelo MAB, Rebelo Vieira JM, Pereira JV, Quadros LN, Vettore MV. Does oral health influence school performance and school attendance? A systematic review and meta-analysis. Int J Paediatric Dent 2019; 29:138–148.

2. Changes in masticatory performance of edentulous patients treated with single-implant mandibular overdentures and conventional complete dentures

TE Nogueira, M Schimmel, CRJ Leles
Oral Rehabil. 2019; 46:268–27.

Patient satisfaction with a mandibular complete denture (CD) is frequently low due to its limited retention and stability, which negatively affects oral function and comfort. The use of a single implant in the mandibular midline to retain an overdenture has been considered an alternative for improvement of the oral function and comfort of conventional denture wearers and a less invasive and less costly option compared with the two-implant overdenture.[1]

However, although studies suggest significant improvement in patient-reported outcomes following treatment with the single-implant mandibular overdenture (SIMO), there is scarce information about functional changes, including the effect on masticatory function.

Nogueira and colleagues (2019)[1] reported on a clinical trial that sought to assess the changes in masticatory performance in edentulous patients rehabilitated with conventional maxillary dentures opposed to a CD or a SIMO, using a parallel-group randomised controlled trial comparing the two treatments options.

The colour-mixing ability of a two-coloured chewing gum was used for measurement of the patients' masticatory performance. The null hypothesis was that edentulous patients with conventional CDs do not benefit, in terms of masticatory performance, from stabilisation of the mandibular denture by means of a single implant.

ACRONYM

CD: Conventional Mandibular Complete Denture
SIMO: Single-Implant Mandibular Overdenture
VOH: Variance of the Hue

MATERIALS AND METHODS

This study reported the findings regarding masticatory performance from a randomised clinical trial that compared two treatment alternatives for edentulous subjects: conventional maxillary denture opposed to either a conventional mandibular complete denture or a single-implant mandibular overdenture.

Edentulous subjects were recruited and randomly assigned to the two study groups. All participants received a new set of conventional CDs and, additionally, participants assigned to the SIMO group received a Straumann® Standard Plus SLActive® regular neck implant in the symphyseal region of the mandible. After a three-week healing period, a retentive titanium anchor abutment (3.4 mm height, 2.25 mm ball; Straumann) was connected to the implant and the corresponding elliptical matrix was used for denture retention, which consists of a titanium housing into which a gold lamella retention insert is screwed.

Masticatory performance was measured by assessing the mixing ability of a two-colour chewing gum. For each participant, two masticatory tests were performed with 20 and 50 chewing cycles. The variance of the hue (VOH) was considered as the measure of mixing: the smaller the VOH value, the greater was the mixing of the two-coloured layers of the chewed gum, which in turn meant better masticatory performance.

Tests were performed for all participants after CD insertion (baseline) and at the six- and 12-month follow-ups. Only patients with baseline data and at least one longitudinal assessment were included in the final sample.

Mean (standard deviation) and 95% confidence intervals were used to summarise VOH data. Chi-square and independent *t*-test were used for comparison of the participants' baseline characteristics between treatment groups. For analysis of the factors affecting masticatory performance, considering the hierarchical structure of data, a multilevel linear regression was used to model the changes in masticatory performance, in which the outcome measure was clustered within the time points and the number of chewing cycles, and the two treatment options added as a fixed effect to the model.

The participant-level variable was used as the covariate that defined the subject grouping for the random effects model.

RESULTS

The final sample size was 15 for the single-implant mandibular overdenture (SIMO) group and 19 for the complete denture (CD) group. The overall mean age was 63.9 (SD = 9.0) years, 67.6 % were women.

The between-group comparison of baseline characteristics showed no significant differences regarding sex ($P = 0.397$) and age ($P = 0.143$). Time period between the new denture insertion and baseline measurements was similar in both groups: 5.0 ± 2.6 weeks for CD and 4.8 ± 2.3 weeks for SIMO group ($P = 0.746$).

The mean overall masticatory performance was similar between groups at baseline for the CD (VOH = 0.639 ± 0.098) and SIMO (VOH = 0.641 ± 0.097) (P = 0.924). However, there was a significant difference in overall measures between 20 (VOH = 0.602 ± 0.130) and 50 (VOH = 0.473 ± 0.142) chewing cycles ($P < 0.001$). A significant linear effect was observed for the different time points ($P < 0.001$).

Overall improvement in mixing ability, measured by the differences in VOH scores from baseline to 12 months, was −0.21 (±0.11) for 20 cycles and -0.23 (±0.10) for 50 cycles, ranging from +0.09 to −0.45 points for the whole sample. No differences between treatment groups regarding the overall improvement in masticatory performance were observed for 20 cycles (CD = – 0.24 ± 0.11; SIMO = – 0.19 ± 0.11/P = 0.232) and 50 cycles (CD = – 0.25 ± 0.08; SIMO = – 0.22 ± 0.13/P = 0.428). However, the improvement in masticatory performance as assessed at 20 cycles was higher in the SIMO (0.13 ± 0.10) than in the CD (–0.04 ± 0.12) group (P = 0.024), suggesting that the implant stabilisation of the mandibular denture promotes an earlier functional improvement compared with the CD.

For the regression analysis, the number of cycles and time points were inversely associated with VOH values (negative regression coefficients), which means that the higher number of cycles (from 20 to 50 chewing cycles) and longer follow-up (compared to baseline), the lower were the VOH values (and greater the mixing ability).

SIMO treatment did not improve the mixing ability compared to CD treatment (P = 0.935). However, the differential association across treatments were significant in the interaction terms for the time point factor at the six-month follow-up (P = 0.048), suggesting that SIMO treatment may perform better than CD in the shorter follow-up period.

CONCLUSIONS

The masticatory performance of edentulous patients rehabilitated with mandibular CD improved significantly after a 12-month follow-up period, irrespective of the stabilisation of the mandibular denture with a single implant or not. However, the greater improvement in the mixing ability of the SIMO group after six months suggests that the use of an implant to retain the mandibular denture may result in a different pattern of changes in masticatory performance compared with patients rehabilitated with a CD.

Implications for practice

For the outcome of masticatory performance, both treatments offered significant improvements for the patients.

Reference

1. Nogueira TE, Schimmel M, Leles CR. Changes in masticatory performance of edentulous patients treated with single-implant mandibular overdentures and conventional complete dentures. J Oral Rehabil. 2019; 46:268–27.