

The relationship between parents' oral hygiene knowledge and children with Down Syndrome's oral hygiene via OHI-S [version 2; peer review: 1 approved]

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RESEARCH ARTICLE

REVIS¹ED The relationship between parents' oral hygiene knowledge and children with Down Syndrome's oral hygiene via OHI-S [version 2; peer review: 1 approved]

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Abstract

Background: Down Syndrome (DS) is a genetic disorder that causes structural, functional anomalies, and intellectual disability. The common oral hygiene problems found in DS children are gingivitis, periodontal problems, pain, infection, and problems with the masticatory system. This study explored the relationship between parents' oral hygiene knowledge and oral hygiene of children with DS.

Method: This was an observational analytical study. To assess parents' oral hygiene knowledge, a questionnaire consisting of 25 questions was distributed to 100 parents whose DS children in POTADS (Down Syndrome Parents Association) Surabaya. To assess the DS children's oral hygiene, dental exams were performed to calculate the individual Oral Hygiene Index-Simplified (OHI-S) scores by dividing the sum of the individual debris and calculus scores by six (the number of teeth examined). The data were analysed using regression analysis.

Results: There was a significant and strong inverse relationship between parents' oral hygiene knowledge and DS children's oral hygiene. Parents' oral hygiene knowledge affected DS children's oral hygiene. The results of the regression analysis indicated that a 1% increase in parents' knowledge caused a reduction in the OHI-S score to 7.377.

Conclusion: A significant inverse relationship between parents' oral hygiene knowledge and DS children's oral hygiene was observed in

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1

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(revision)
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view



version 1

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view

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Any reports and responses or comments on the article can be found at the end of the article.

this study. Further studies could be conducted to determine other variables that may influence both parents' oral hygiene knowledge and DS children's oral hygiene.

Keywords

Primary care, Mental Disease, Down Syndrome, Index Score OHI-S, Oral Hygiene



This article is included in the IIARP Publications gateway.

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REVISED Amendments from Version 1

More details have been added in the discussion and result section, some references which support the OHI-S score. It is also included the reviewers' suggestions.

Any further responses from the reviewers can be found at the end of the article

Introduction

Children with special needs require more care than those without. Special care is given to these children as they carry specific physical, mental, intellectual, social, and emotional disabilities or abnormalities.¹ Mentally disabled children are one of many examples of special needs children as they possess a below-average intellect with mild, severe, and very severe abnormalities (IQ between 25 and 70).²

Down Syndrome or DS is a genetic disorder that affects a child's development and causes mental retardation. Down Syndrome occurs when a person has a third copy of the Trisomy 21 Chromosome. The third copy of Trisomy 21 causes structural and functional anomalies in the human body and some degree of intellectual disability.³ Down Syndrome occurs in one of 700 births and is present in all ethnicities. The chance of someone having a baby with DS is higher when she is 35 years old or older, and baby boys are more likely to have DS rather than baby girls.⁴ Children with DS tend to have poor oral hygiene as they are unable to understand and are unaware of the importance of oral hygiene.⁵ Oral hygiene problems commonly found in children with DS are gingivitis, periodontal problems, pain, infection, and problems with the masticatory system.⁶ Mental retardation or MR, developmental delay, physical disability, and other problems could affect disabled children's daily activities and are reasons why they could not maintain their oral hygiene. Therefore, it is necessary for parents, nannies, and people close to these children to help them maintain their oral hygiene.⁷

Children's oral hygiene has become a particular concern in this era. Knowledge is the result of curiosity and occurs because someone senses particular objects through human senses. Education regarding children's oral hygiene should be obligatory for parents as it could significantly help their children's teeth development and growth. The parents' knowledge and ability in maintaining their children's oral hygiene could be influenced by several aspects such as age, education, economic and social status, experience, mass media, and environment. The parents' ability to maintain their children's health will significantly impact their children's attitude and behavior.⁸

To boost awareness and effort towards the maintenance of the oral hygiene of children with special needs, this study analyzed parents' knowledge levels in maintaining their children's oral hygiene at POTADS (Down Syndrome Parents Association) Surabaya.

Methods**Ethical statement**

We obtained ethical approval for this study from Universitas Airlangga Faculty of Dental Medicine Health Research Ethical Clearance Commission on 21-2-2020 (058/HRECC.FODM/II/2020). Due to the COVID-19 pandemic, ethical approval was also re-issued on 24-02-2021 (082/HRECC.FODM/II/2021).

Written informed consent was obtained from the parents for their own and for their children's involvement in this study as children were not able to consent. Participants were informed of their right to withdraw and that they could refuse to answer any questions, end the survey, or refuse the child's dental exam at any point.

Research design

An analytical-observational study was conducted in Surabaya, 2020-2021, via Google Forms to 100 parents whose children require special care (Down Syndrome) in POTADS Surabaya. The sample size was based on the Lemeshow formulas. The dental examination procedure is further explained below.

The Lemeshow formula to count the number of samples is shown below:

$$n = \frac{(Z\alpha\sqrt{2PQ} + Z\beta\sqrt{P_1Q_1 + P_2Q_2})^2}{(P_1 - P_2)^2}$$

Description:

n = the minimal of the number of samples

$Z\alpha$ = adjusted standard deviation for α (5%) ($Z\alpha = 1,96$)

$Z\beta$ = adjusted standard deviation for β (95%) ($Z\beta = 1,6449$)

P_1 = the proportion of the expected response

P_2 = the proportion of the unexpected response

P = proportion of combined responses ($(P_1 + P_2)/2$)

$Q_1 = 1 - P_1$

$Q_2 = 1 - P_2$

$Q = 1 - P$

Participants

The populations of this study are children who require special care (Down Syndrome) and their parents in POTADS Surabaya. Inclusion criteria are parents whose children were diagnosed with Down Syndrome, children aged 7-9 years old, and parents or guardians who agreed to be a part of this study. The samples used in this study were purposive as they were taken based on specific considerations of the researcher.

Research procedure

The potential participants were recruited from the POTADS. We also used social media, such as Twitter, WhatsApp, Instagram, and Line, as our recruitment strategy to identify the POTADS' members and distribute the questionnaire. To be eligible for participation in this study, the participants had to be parents whose children were aged 7 to 9 years old and were diagnosed with Down Syndrome, and be a POTADS' member. Participants were first contacted to give their consent to participate. Those who did not consent did not progress to the questionnaire. The questionnaire had been tested for its validity and reliability.

We conducted a self-administered questionnaire survey using Google Forms to collect data about parents' knowledge. After the participants completed the questionnaire, we contacted them to arrange a time to do their child's oral hygiene exams at the place most convenient to them. All participants who had completed the questionnaire had their child participate in the oral hygiene examinations. To assess their child's oral hygiene, we used a basic dental diagnostic kit comprising two dental mirrors, one dental explorer, and one dental cotton tweezer. The principal researcher performed the child's oral hygiene examinations using the oral hygiene index simplified (OHI-S).^{9,10} As only one examiner (the first author) performed dental exams, there was no any training and calibration exercises. The examiner also had a great number of experiences in performing dental exams in DS children. So, the inter-examiner reliability score was not applicable in this study. We consider the child's comfort, the clinical examination was conducted based on the parents' preferred places, mostly at the school and home, under the natural light.

There were six tooth surfaces examined: the buccal surface of the upper right first molar (16), the labial surface of the upper right central incisor (11), the buccal surface of the upper left first molar (26), the lingual surface of the lower left first molar (36), the labial surface of the lower left central incisor (31), and the lingual surface of the lower right first molar (46). The OHI-S score consists of the Debris Index (DI) scores and the Calculus Index (CI) scores. The DI and CI scores represent the amount of debris and calculus, respectively, on the six tooth surfaces. To calculate the OHI-S score for each individual, the DI and CI scores were totalled and divided by six (the number of tooth surfaces examined). During the oral hygiene examination, the challenge we faced was the child's resistant behaviors, such as pushing the hand or the dental instrument away, moving the head, and refusing to open their mouth. With the help of the parents, we made a few distractions to comfort the child and gain their cooperation.

Data were compiled in Excel 2016 before being added to SPSS v25.0 for analysis.

Assessing children with down syndrome's debris score via OHI-S

The debris score was assessed through the existence of debris found by using OHI-S. The score 0 was chosen if there was not any debris or stain, score 1 was chosen if soft debris or extrinsic stains were found covering one-third of a tooth surface, score 2 was chosen if soft debris was found covering more than one-third of a tooth surface but not more than two-thirds of a tooth surface, and score 3 was chosen if soft debris were found covering more than two-thirds of a tooth surface.

Assessing children with down syndrome's calculus score via OHI-S

The calculus score was assessed through the existence of calculus by using OHI-S. Score 0 was chosen if no calculus was found, score 1 was chosen if supragingival calculus were found covering not more than one-third of a tooth surface, score 2 was chosen if supragingival calculus or individual subgingival calculus spots were found to cover one-third but not more than two-thirds of a tooth surface, and score 3 was chosen if supragingival calculus was found covering more than two-thirds of a tooth surface. The good category of OHI-S Score level was chosen between 0-1.2, the moderate category of OHI-S Score level was chosen between 1.3-3.0, and the poor category of OHI-S Score level was chosen between 3.1-6.0.

Assessing parents' knowledge

Parents' knowledge was assessed through questionnaires that contained 25 questions (see extended data) and were distributed via social media. The ordinal scale was used to measure the parents' knowledge and was categorized as low and high. The low category was chosen if parents' knowledge levels were between 0-71.5, and the high category was chosen if parents' knowledge levels were between 72-100. We decided to use this level based on the median score as the cut-off point to categorize parents' knowledge. We developed questions for the questionnaire aiming at testing the hypothesis. As we have written in the manuscript, the questionnaire had been tested for its validity and reliability. We also used the median score as the cut-off point to categorize parents' knowledge.

15 Statistical analysis

The collected data was analyzed using Statistical Package for the Social Science Software or SPSS (IBM SPSS Statistics 25.0). The questionnaire validity test searched for the correlation between individual questionnaire scores and the total score (bivariate). The reliability test was conducted using a reliability re-test, and the normality test was conducted using the Shapiro-Wilk method. The linear regression method was chosen if the data distribution was standard, and the ordinal regression method was chosen if the data distribution was not expected.

STROBE cross sectional guidelines

We used STROBE's cross-sectional reporting guidelines to ensure research meets international standards for peer-reviewed articles. The checklist is completed by entering the page number of the manuscript where the reader can easily find each item listed. If we believe that an item is not valid, we will write "N/A" and provide a brief explanation in the STROBE cross-sectional reporting guidelines.¹¹

Results

The characteristics of the samples were reported collectively with the findings of every factor, respectively (debris and calculus score via OHI-S and parents' knowledge level).

Study subject characteristics

Study subject characteristics consisted of the gender, age, education, and profession of study participants. The subject characteristics are shown in Table 1.

Based on Table 1, the parent participants were mostly female (80%). Respondents who participated in the study were mostly 30-39 and 50-59 years old (30% and 40% each respectively). The respondents of the study were primarily high school graduates (70%). Most of the respondents were housewives (55%).

Relationship aspects of parents' knowledge level and calculus-debris score of children with down syndrome via OHI-S

Based on Table 2, it could be seen that 55.6% of all respondents possessed enough knowledge in maintaining children's oral hygiene, with a median score of ≥ 72 . Scores below 72 are classed as low, meaning that the parents' knowledge in maintaining children's oral hygiene is low. Scores above 72 from the questionnaire are high, meaning that the parents' knowledge is high.

In Table 3, the frequency of OHI-S score of children with Down Syndrome (7-9 years old) in POTADS Surabaya could be seen. Children with Down Syndrome were mainly found to have good oral hygiene (65% of the total respondents). The average respondents were rated ≤ 1.2 on the OHI-S score.

Based on Table 4, the average parents' knowledge and children with Down Syndrome's OHI-S score could be seen (67.64 and 1.3683, respectively).

Table 5 exhibits the results of the simple regression analysis test. The test was conducted after the data significance ($p > 0.05$) was found by using the data normality test of Shapiro-Wilk. Furthermore, linearity, heteroscedasticity, and

Table 1. Gender, age, education, and profession of study participants.

Respondent characteristics		Frequency	Percentage
Gender	Male	20	20%
	Female	80	80%
Age	20-29 years old	20	20%
	30-39 years old	30	30%
	40-49 years old	10	10%
	50-59 years old	40	40%
Education	Elementary	10	10%
	Middle school	10	10%
	High school	70	70%
	College (diploma/bachelor)	10	10%
Profession	Entrepreneur	10	10%
	Teacher	25	25%
	Private sector employee	10	10%
	Housewife	55	55%

Table 2. Parents; knowledge in maintaining children's oral hygiene frequency.

Variable	Category	F	%
Knowledge	Low (0-71.5)	45	44.4%
	High (72-100)	55	55.6%
Total		100	100%

Table 3. OHI-S score of children with down syndrome (7-9 years old) in POTADS Surabaya.

Variable	Category	F	%
OHI-S score	Good (0-1.2)	65	65%
	Moderate (1.3-3.0)	35	35%
	Poor (3.1-6.0)	0	0%
Total		100	100%

Table 4. The average parents' knowledge level and children with down syndrome's (7-9 years old) OHI-S score in POTADS.

Category	N	Mean
Parents' Knowledge score	100	67.64
Children OHI-S score	100	1.3683

Table 5. Linear regression analysis on parents' knowledge towards children's OHI-S score.

Variable	Regression coefficient	T	Sig.
	77.734	148.321	0.000
Total	-7.377	-20.001	0.000

Table 6. Coefficient of determination.

R	R Square
0.896 ^a	0.803

autocorrelation tests were also conducted, resulting in the simple regression analysis. The simple regression result between parents' knowledge toward OHI-S score was as follows:

$$Y = a + bx$$

$$Y = 77.734 + (-7.377) X$$

The interpretation of the linear equation above is as follows:

- The A constant of 77.734 means that if the OHI-s score is equal to zero or constant, the value of knowledge consistency to the OHI-s score is 77.734.
- The knowledge variable regression coefficient is -20.001, meaning that if parents' knowledge increases by 1%, the OHI-S score will decrease by 20.001.
- The significance value in Table 5 is 0.000 ($p < 0.05$), meaning that parental knowledge significantly affects children's OHI-S score.

Table 6 shows the data analysis value of $R = 0.896^a$. In the results of the linear regression analysis between parents' knowledge and children's oral hygiene score. We got the significance value of 0.000. The value indicates that the relationship between the dependent and independent variables is strong, as $R > 0.5$. The number of R square or the coefficient of determination is 0.803, which means that the independent variable could explain 0.803 or 80.3% of the variation of the dependent variable. At the same time, the remaining 19.7% is the result of other unexamined causes.

Discussion

More than a half of the parents of the DS children had high level of oral hygiene knowledge. This result also concurrent with the DS children's oral hygiene status findings that shows 65% of the DS children having good oral hygiene. This study was conducted to understand the influence of parents' knowledge in maintaining children with special care's oral hygiene in POTADS Surabaya. Parents' knowledge levels were obtained through an online survey which consisted of 25 questions about basic knowledge of oral hygiene for children with special care. The study's data found that the average parents' knowledge value was 67.64. Furthermore, the average OHI-S score of 7-9 years old children was 1.3683. This score indicates that they have well-maintained oral hygiene.¹²

OHI-S measures a person's oral hygiene based on Debris Index (DI) and Calculus Index (CI). A person's oral hygiene could be measured by valuing the calculus and plaques.¹³ The Sig. value of 0.000 was found as the result of this study. This value suggests that the parents' knowledge has significantly influenced children with special care's oral hygiene in POTADS Surabaya. The hypothetical test was conducted by comparing the value of t-count with t-table, and the result was -20.001 of the t-table values. The value is greater than the t-count value, which is 2.365 (a negative value). If the value of t-count is more significant than t-table and is negative, it would be concluded that a contradictive influence existed in the relationship between parents' knowledge and children with special need's hygiene in POTADS Surabaya. The study conducted by Guswan and Yandi (2017) has proven that a higher level of parents' knowledge would mean a lower children's OHI-S score.¹⁴

Knowledge is the foundation for the creation of action. A person is said to lack knowledge if he/she cannot recognize, explain, and analyze a situation. Proper knowledge could affect someone's action in improving health, especially in maintaining oral hygiene. On the other hand, a lack of knowledge could cause problems in maintaining oral hygiene, such as caries.¹⁴ Parents are obligated to have a proper education in maintaining oral hygiene and should exhibit more concern in children's oral hygiene, especially if they need special care. Therefore, information regarding the significance of oral hygiene for parents is necessary.¹⁵ Special training and adaptations for children with Down Syndrome are necessary to ensure that they brush their teeth effectively. This is due to their lack of motor skills compared to other children, and parents play a role in supervising and training children to brush their teeth effectively.¹⁶

Moreover, as the response of Down Syndrome children to a given stimulus is much different from children without Down Syndrome in general, parents are required to be more creative and active when providing learning activities.¹⁷ Based on the determinative coefficient data analysis result, it could be understood that the relationship between children with special needs' OHI-S score and parents' knowledge level in maintaining oral hygiene is strong ($R = 0.896^a$). The R square value of 0.803 or 80.3% means that the variation of the dependent variable, the OHI-S score of children with special needs, could be explained by the independent variable, namely the value of parents' knowledge about children's oral hygiene. Meanwhile, the rest were not investigated because we only focused on parents' knowledge and the child's oral hygiene.

The oral hygiene of children with Down Syndrome could be affected by various factors such as predisposing factors, enabling factors, and reinforcing factors. Predisposing factors are triggering factors or antecedents of behavior that provide reasons or motivation for the said behavior.^{18,19} Enabling factors are factors that could facilitate behavior or actions conducted by individuals in pain. Furthermore, other factors included infrastructure and health facilities.²⁰ Resources were gathered from promotional media (booklet, leaflet, flyer, flipchart, and posters), electronic media (television, radio, video, slide, and filmstrip), and billboards.^{20,21}

In this study, we only assess the relationship between parents' oral hygiene knowledge and DS children's oral hygiene. We acknowledge that based on one of the theories of health behaviours, parents' oral hygiene knowledge is just one of the factors influencing child's oral hygiene behaviours that in turn affect child's oral hygiene status. There are other factors influencing the child's oral hygiene behaviours and oral hygiene. However, we did not assess those factors in this study. We focus on parents' knowledge because we consider it as the foundation of behaviours. Therefore, the absence of other factors may become one of the limitations of this study that should be addressed in the future studies.

Reinforcing factors could strengthen a person's motivation to change his/her action based on a rule or policy.²² A family is one of many examples of reinforcing factors. In a family, various factors could influence health behavior in addition to parents' knowledge, such as parents' age, occupation, education, attitudes, and family support.²³ Parents whose children are diagnosed with Down Syndrome should have sufficient oral hygiene knowledge, such as appropriate usage of a toothbrush, appropriate nutritional provision, and appropriate methods in elevating children's psychomotor ability. Moreover, the effort to lift children with Down Syndrome's life quality through oral hygiene could avoid malnutrition and improve their nutritional intake and growth speed.¹³ Therefore, it is important that parents' have sufficient oral hygiene knowledge as it could significantly influence their children's oral hygiene. Nevertheless, other factors could also affect children with Down Syndrome's oral hygiene.

One of the limitations of the study was that the self-administered questionnaire may cause bias in the participants' responses. The sample size may reduce the power of the study and increase the margin of error. Furthermore, the small sample size may not be representative of the population. The small sample size may also lead to bias, particularly as a result of non-response. We compelled to limit the sampling size because of the limited access to the DS children population. Another drawback was related to the selection of a place for the oral hygiene examination that was based on the parent's preference. Some of them did not have a good light to perform oral hygiene examination causing the potential bias during the examination.

Conclusions

Contradictive influences were significant in the relationship between parents' knowledge about oral hygiene and children with special needs' oral hygiene in POTADS Surabaya. Inverse relationship to show the decrease in the OHI score following the increase in the parents' oral hygiene knowledge score. In the other word, the higher the level of the parents' oral hygiene knowledge, the better the DS children's oral hygiene status. Further studies could be conducted to determine other factors that could affect children with special needs' oral hygiene.

Data availability

Underlying data

Mendeley: The Relationship Between Parents' Oral Hygiene Knowledge and Children with Down Syndrome's Oral Hygiene via OHI-S. <https://doi.org/10.17632/329zrbpkc8.4>.²⁴

This project contains the following files:

- Gender Age and Profession 100 Sampels.xlsx
- Raw Data Responses (Before and After COVID-19).xlsx

Extended data

Mendeley: The Relationship Between Parents' Oral Hygiene Knowledge and Children with Down Syndrome's Oral Hygiene via OHI-S. <https://doi.org/10.17632/329zrbpkc8.4>.²⁴

This project contains the following files:

- List questionnaires.docx
- Table 1. xlsx
- Table 2. xlsx
- Table 3. xlsx
- Table 4. xlsx
- Table 5. xlsx
- Table 6. xlsx
- STROBE-checklist-v4-cross-sectional.doc

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/) (CC-BY 4.0).

Author contributions

AS: designed, wrote, and made the first design of manuscript, DAW: checked and involved in the correction of the manuscript, MS, NWA, TPM: helped AS in analyzing, conducting, and counting, the data DS: checked and helped AS in making, designing, and writing the whole manuscript, FS: helped AS in writing the manuscript, AMP: helped in submitting the manuscript.

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Nor Azlida Mohd Nor 

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Authors have addressed my previous comments.

3

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: dental public health

3

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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Nor Azlida Mohd Nor 

Department of Community Oral Health & Clinical Prevention, Faculty of Dentistry, University of Malaya, Kuala Lumpur, Malaysia

Abstract:

- Background section is too long, suggest to shorten it and make it concise. If word count

permits, authors may want to expand the results and conclusion sections.

Methods:

Page 3:

- Sample size calculation is not very clear. Authors can add explanation on sample size calculation, and how they get (n=100).

Page 4:

- For a clinical examiner, is there any training and calibration exercise conducted? What is the examiner reliability score? Where is the clinical examination conducted? Is it at the dental school or at the children's school? Is the examination performed under natural light or portable light?
- The principal researcher performed the child's oral hygiene examinations using the oral hygiene index simplified (OHI-S) - please add reference.
- Sentences related to description about the index for clinical examination require reference.
- Parental questionnaire - how did you develop the questionnaire? Was the questionnaire validated? There is a lack of clear explanation on the survey instrument used. Authors need to add this information to make it clearer to reader.
- Parents' knowledge score - how do you assign a score for each question. Is there any reference for the cut-off category for high and low knowledge score?

Results:

Page 5:

- Table 1 caption: suggest change the word "each subject" to "study participants"
- Table 3: The categorisation of good, moderate and poor OHI-S score should also be explained in the methods section.

Discussion:

Page 6:

- Last paragraph - in statistics, the p value is not 0.00 but can be written as (p<0.001) instead.

Page 7:

- First paragraph - authors can interpret the findings and provide clearer explanation, rather than using statistical jargon.
- Paragraph 4 & 5- how can the authors relate the factors stated in paragraph 4 with the demographic characteristics of the participants in your study?

Limitation:

- Do you think the small sample size is part of the study limitation?

Conclusion:

- I found the term "contradictory relationship" is rather confusing. Do you mean inverse relationship?

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: dental public health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

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