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| ORIGINAL

Relationship between social capital and the experience of dental carie: systematic review and meta-analysis

Relação entre o capital social e a experiência da cárie dentária: revisão sistemática e meta-análise

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ABSTRACT

Objective: Understanding the individual and collective behavior of individuals about their oral health conditions is important to prevent and control of dental caries. This study aimed to seek evidence of the relationship between social capital and caries experience. **Methods**: Using a systematic review with meta-analysis, we searched articles in PubMed, ISI Web of Knowledge, LILACS, IBECS, BBO, SCIELO, The Cochrane Library and MEDLINE databases. Studies with humans, of all ages and languages, published until July 2019, which related social capital to the caries experience, were included in this review. **Results**: We identified 1163 articles evaluated considering inclusion and exclusion criteria, leaving 5 articles selected to compose the study sample, and only 3 included in the meta-analysis. In the final analysis p value was significant (p <0.001), showing that both social cohesion and neighborhood empowerment are associated with the caries experience. In the random model, the individual has 2.39 chances of not having the caries disease. The results reinforce the importance of community social capital in the caries experience of individuals. **Conclusion**: The high level of community social capital is directly related to lower caries experience rates.

Indexing terms: Social Capital. Dental caries. Social cohesion. Oral Health. Inequalities in health.

RESUMO

***Objetivo**: A compreensão do o padrão de comportamento dos indivíduos no nível individual e coletivo frente às suas condições de saúde bucal é de importância inequívoca para prevenção e controle da cárie dentária. Nesta perspectiva o objetivo deste estudo foi buscar evidências da relação entre o capital social e a experiência de cárie. **Métodos**: Utilizando como método revisão sistemática com*

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meta-análise, foram pesquisados artigos nas bases de dados PubMed, ISI Web of Knowledge, LILACS, IBECS, BBO, SciELO, The Cochrane Library e MEDLINE. Estudos com humanos, de todas as idades e línguas, publicados até julho de 2019, que relacionaram o capital social com a experiência de cárie, foram incluídos nesta revisão. ***Resultados****: Foram identificados 1163 artigos, que passaram por avaliação sob critérios de inclusão e exclusão, restando 5 artigos selecionados para compor a amostra do estudo, sendo apenas 3 incluídos na meta-análise. Na análise final o p-valor foi significativo (<0,001), mostrando que tanto a coesão social como o empoderamento de vizinhança estão associados com a experiência de cárie. No modelo randômico foi constatado que o indivíduo tem 2,39 chances de não ter a doença cárie. Os resultados do estudo reforçam a importância do capital social comunitário na experiência de cárie dos indivíduos.* ***Conclusão****: O alto nível de capital social comunitário tem relação direta com menores índices de experiência de cárie nos indivíduos.*

Termos de indexação: *Capital social. Cárie dentária. Coesão social. Saúde Bucal. Iniquidades em saúde.*

INTRODUCTION

To develop scientific research in oral health has elucidated the etiology, preventive factors, ideal conditions for diagnosis and treatment of caries disease, providing a significant decrease in the rates of involvement of this pathology in the world population; however, this was not enough to avoid the so-called polarization of the disease process, of which populations at risk and socioeconomic vulnerability have become the carriers of the largest number of cases [1].

One of the main objectives of scientific research on caries is to promote a change in inequalities among populations.

Health promotion measures restricted to individuals are ineffective in modifying their health-related behaviors, which showed a new perspective about it: the adoption of healthy behaviors is linked to environmental changes where people live and work. This is essential considering the need to create conditions so that healthy choices are easier to be made [2,3].

The number of studies that explore the interaction of social determinants of health (SDH) with the population's caries experience have increased in the 21st century with positive results regarding socioeconomic and demographic components [4-7]. For the outcome of dental caries [8,9], in a multilevel study conducted in the Federal District, Brazil, we found negative association between neighborhood empowerment and caries experience in adolescents.

In this sense, expecting a better understanding in the behavior pattern at the individual and collective level and considering their oral health, the use of social capital have increasing relevance in studies on public health. Consequently, social capital comprises the set of individual and collective solidarity relations of the subjects in their social context, implying quantity and quality of accessible social resources and the ability to mobilize for the improvement of these resources [10].

Social Capital can be separated into two dimensions: the vertical, which includes the relationships between the different levels of society; and the horizontal, which contemplates the individual and collective relationships of the subjects in their living environment. There is still a strand that divides it considering categories of approach: the community, which quantifies and qualifies the associative movements of individuals; social networks, which evaluates social capital considering the resources available in these networks; and the synergy approach, which focus on the reciprocal interactions of social networks with and in institutions [11].

Still aiming to measure social capital at the individual and collective levels, the definitions of empowerment and social cohesion emerge. Empowerment stems from the capacity of the individual or a community for social development [12] and social cohesion, based on trust, reciprocity and intimate social networks, facilitating certain actions by those who participate in this social structure [13].

The concept of Social Capital has been widely used in scientific studies with consolidated evidence of its relation with the population's general health and well-being [14-17]. In scientific research on oral health, this assessment is more recent, and, consequently, the evidence is less developed. However, social capital appears as a potential social determinant of oral health and especially caries experience [18-22].

The fight against inequalities in oral health, as a priority of public policies, requires theoretical deepening, understanding and discussion of all its causes and, specifically, of the "causes of causes". Considering the importance of social capital in determining health and the fact that its study is relatively recent, there is still no consensus on its definition and

measurement, as a consequence epidemiology has sought in sociology concepts and theories for its explanation. However, it is known that it influences oral health and is especially associated with dental caries. To systematize and analyze searches in the literature bring us closer to consensus on this subject and allow us to elaborate evidence, which can foster public policies on oral health fighting against inequalities. These inequalities bring a much more serious problem that we have to face: dental caries, which have been taking part on the polarization of the disease and on the involvement of the most vulnerable.

This study was structured as a systematic review article with meta-analysis aiming to answer the research question based on the PICOstrategy [23]: does social capital influence the caries experience in individuals of all age groups? Therefore, the authors admit the following hypothesis (H1): social capital influences the caries experience in individuals of all ages.

METHODS

Protocol and registration

This systematic review was carried out in accordance with the PRISMA list of recommendations (Preferred Reporting Items for Systematic Reviews and Meta-Analyzes) [24] and with the Cochrane guidelines [25]. The systematic review protocol was registered in the PROSPERO database under the identity: 146159 (https://www.crd.york.ac.uk/PROSPERO/).

The Meta-analysis Of Observational Studies in Epidemiology (MOOSE) checklist was used [26]; and as this is a systematic review, the study was approved by the Ethics Committee. The articles that composed the study's sample were searched in two stages: the first one considered the selection of abstracts and titles, and the second, the acquisition and full reading of the selected articles.

Research strategy

The PubMed Central, ISI Web of Knowledge, Latin American and Caribbean Center on Health Sciences Information (LILACS), Spanish Bibliographic Index of the Health Sciences (IBECS), Brazilian Bibliography of Dentistry (BBO), Scientific Electronic Library Online (SciELO), The Cochrane Library and Medical Literature Analysis and Retrieval System Online (MEDLINE) were used to search for articles.

The research strategy developed to identify the studies included and evaluated for this review was based on the keywords from the Health Sciences Descriptors (DeCS), the Medical Subject Headings (MeSH) and their combinations, through Boolean operators, in English, Portuguese and Spanish [((Social Capital OR Social Cohesion OR Social Participation)) AND (Dental Caries OR Oral Health OR Health Inequalities OR Survey OR Tooth Diseases)]. The following keywords were used: Social capital; Dental caries; Social cohesion; Oral Health; Social Participation; Health inequalities; Inquiry; Diseases of the teeth; Capital Social; Cárie dentária; Coesão social; Saúde Bucal; Participação Social; Iniquidades em saúde; Inquérito; Doenças dos dentes; Capital social; La caries dental; cohesión social; Salud bucal; La participación social; Las desigualdades en materia de salud; encuesta; Enfermedades de los dientes.

Inclusion and exclusion criteria

The following criteria were used to select and include articles: studies with humans; observational studies; all age groups; all languages; period: all publications on the subject until July 2019, that dealt with the relationship between the concepts of social capital (individual and community), empowerment, cohesion and social support, with the indications of deft and DMFT caries experience, recommended by the WHO [27].

Articles that did not meet the inclusion criteria were excluded. If there was not enough information in the title of the article that allowed it to be selected or deleted, reading the abstract became the inclusion or exclusion criterion. Repeated jobs had their copies deleted.

Study Selection

The initial research was carried out by two independent researchers, who found and selected the articles. As a calibration exercise, the reviewers discussed the eligibility criteria and applied them to a sample of 20% of the retrieved studies to determine inter-examiner agreement. After obtaining an adequate level of agreement (Kappa: 0.81-0.85), the reviewers read all titles independently. The articles were selected based on the title and abstract, which was carried

out independently. The selection or not of the articles for the systematic review was performed from the reading of the title by the researchers.

The first consensus meeting to correct disagreements and resolve doubts was held after the systematic search and selection of articles, with the presence of both researchers and a third researcher, with experience in systematic reviews.

Data Collection

In the methodological sequence, the search and complete reading of the pre-selected studies were carried out, which were then evaluated for inclusion in the sample. Each researcher filled out a standardized form in Microsoft Excel (2008), to tabulate the following data extracted from the articles: authors, year of publication, country, age/age group, sample, measure of social capital, measures of dental caries. The two researchers, separately, evaluated the reference lists of the selected articles and kept looking for studies that were not initially identified.

A second meeting between the three researchers took place to establish consensus, resolve doubts and any types of disagreements that could have arisen in the evaluation of the articles. Thus, the selection of the articles suitable for the study was accomplished.

Quality and Bias Risk Assessment

We used the Downs and Black checklist instrument, developed and validated to assess the methodological quality of randomized and observational studies [28]. This instrument consists of 27 questions, which, grouped together, comprise five evaluation domains: Report, 10 questions; External validity, 3 questions; Bias, 7 questions; confusion variable/selection bias, 6 questions; Power, 1 question. One point was provided for each positive question, with a maximum score of 27 points. Thus, the quality of the article was considered good when it reached a score between 15 and 19, and excellent when above 20. If the scores were lower than 14, the article would be classified with low methodological quality. However, this assessment was not used as an exclusion criterion.

Statistical analysis – meta-analysis

Social capital was grouped into community and individual, then each group was subdivided into two subgroups, neighborhood empowerment and social cohesion. To perform the meta-analysis, all data collected – of dental caries and social capital – were adjusted by the Odds ratio and a standard error estimator for the R programming language (version 3.3.1, GNU General Public License, 2011). All statistical tests were bilateral with a significance level of 0.05. The forest plot graph was designed for the list of caries groups and subgroups of social capital. The heterogeneity between the studies was assessed using the I2 statistic and classified as low (I2 < 25%), moderate (I2 = 50%) and high (I2> 75%) [29], which represents the percentage of total variation in studies attributable to heterogeneity rather than chance.

RESULTS

The search strategy in the databases resulted in 1163 works, of which 169 were duplicated with two or more indexes. After reading and analyzing the title and abstracts of the remaining articles, another 938 were excluded. Thus, 56 articles were fully read, and based on the inclusion criteria 5 articles were selected to compose this study (figure 1). Of the articles included (chart 1), one was from Japan [30] and the other 4 were Brazilian [31-34], being published between 2001 and 2015. All works fell into the methodological category of observational study [30-34].

The studied population was predominantly urban, of both sexes. According to the age groups, two studies evaluated children, one of them sampled 3-year-old children [30], the other studied children between 6 and 12 [32] years old, then two others composed their sample with adolescents between 12 and 14 [31] and 14 to15 years old [33]. There was also a study with two age groups, adolescents aged 15 to 19, and adults aged 35 to 44 years old [34].

A study carried out the evaluation of the caries experience of individuals from their samples using the deft [30] (number of primary decayed (d), indicated for extraction (e) and filled (f) teeth. The four other studies used the DMFT index [31-34], which quantifies the number of decayed (D), missing (M) and filled (F) teeth. The individual demographic characteristics were verified through questionnaires applied to the parents or guardians of the children [30-33], interviews [34] and also secondary data, used by one of the studies [32].

Table 1. Summary of the characteristics of the dental caries sample and social capital

REF.	Author, Year	Journal	Country	Type of study	Age (years)	Initial sample	Final sample	Instrument to measure dental caries	Social capital measures	Evaluation of BIAS - score[1]
1	Aida et al. [30]	Community Dent Oral Epidemiol	Japan	Cross-sectional	3	3301	3086	deft	Community Level (Social Cohesion)	20
2	Fontanini et al. [31]	Community Dent Oral Epidemiol	Brazil	Cross-sectional	12 to 14	569	542	DMFT	Individual Level (Social network - social support)	18
3	Patussi et al. [32]	Social Science & Medicine	Brazil	Cross-sectional	6 to 12	7296	5909	DMFT	Community Level (Social Cohesion)	21
4	Patussi et al. [33]	Community Dent Oral Epidemiol	Brazil	Cross-sectional	14 and 15	1500	1302	DMFT	Community Level (Neighborhood-Empowerment)	20
5	Santiago et al. [34]	Rev Bras Epidemiol	Brazil	Cross-sectional	15 to 19; 35 to 44	685	573	DMFT	Community Level (Neighborhood-Empowerment)	19

Note: [1]Guidelines methodological: elaboration of revision systematic and meta-analysis. Brazil. Ministry of Health (2014).

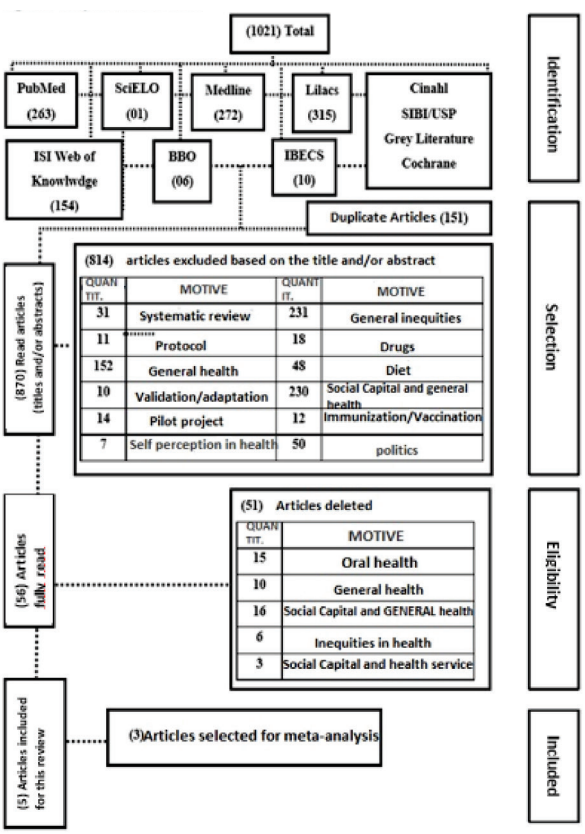

Figure 1. Study selection flowchart.

The assessment of the social capital context for each study was given by the responses to the questions related to the theme of the questionnaires used [30-34] and also by the analysis of secondary data [32]. Two studies considered the concept of empowerment [21,33], and the others, the concepts of cohesion and social support [30-32].

Of the five selected articles, three presented data to be analyzed in the meta-analysis [32-34] (figure 2). All of them resulted in contextual/community social capital and were divided into two subgroups: social cohesion and neighborhood empowerment.

In the final analysis, p-value was significant (p <0.001), showing that both social cohesion and neighborhood empowerment are associated with caries experience. In the random model, the individual had 2.39 chances of not having caries disease.

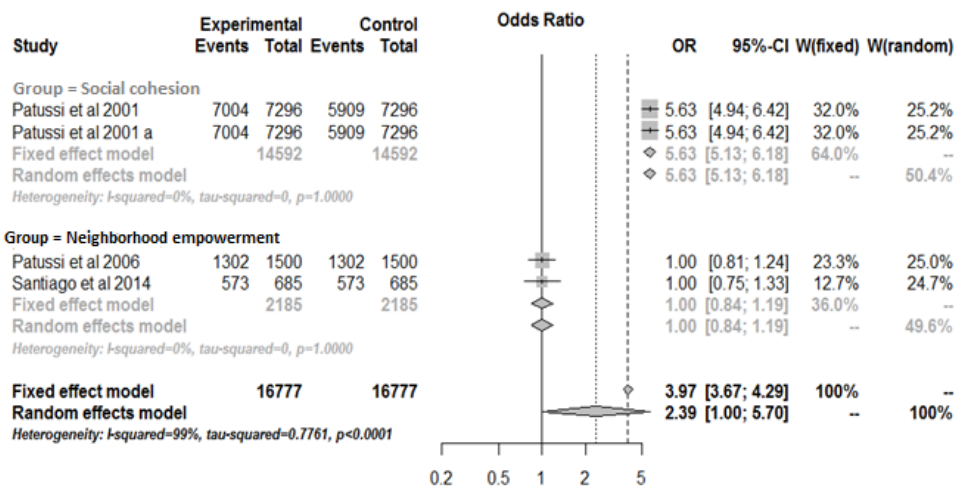

Figure 2. Forest plot of dental caries on subgroups of contextual social capital.

DISCUSSION

The methodological evaluation of our study showed that composed of observational studies, the data provided enabled the understanding of the relationship between community social capital and caries experience. Social capital appears as a social determinant of the caries experience; however, studies and evidence about it are still scarce [20-22].

Empowerment, a dimension of community social capital, is based on the process of social interaction that allows subjects to improve their individual and collective skills for social development. Thus, a low level of empowerment, assessed by mobilization and social participation indices, combined with socioeconomic indicators, was related to worse caries indices in adolescents [33]. The result cited is consistent with another study showing that changes in oral health have negative impacts on social relationships of adolescents and points out that the population with worse caries rates is the one with worse socioeconomic indicators [35]. High rates of caries prevalence and its consequences, such as toothache, result from worse socioeconomic conditions, which limit access to preventive health services, increase the demand for emergency care, and reveal a difficulty for these individuals in solving their problems through social insertion [36].

The dimension of individual social capital, as a concept of social network, is part of the study methodology, where adolescents from 12 to 14 years old with caries had lower levels of social support from friends and a more cariogenic diet [31]. The direct influence of individual social capital, considering social relations, on the health of adolescents is ratified, concluding that having an obese friend, brother or partner increases the likelihood of obesity in adolescents due to environment influence on non-ideal nutritional pattern and lack of healthy eating habits [37]. The consequences of these habits influence worse rates of caries experience in these individuals.

Living in areas with low social cohesion, another dimension of social capital, was associated with worse caries rates in 3-year-old children [30]. In this context, and understanding that part of children's oral health depends

on their caregivers, we can explore the inferences that mothers with low social capital were more likely to have children with unmet oral health needs, as well as missing their children's preventive appointments [21].

Social capital with low level of social cohesion indicated higher levels of caries experience in 12-year-old children in a neighborhood with high number of homicides or attempted homicides [31]. Still considering contextual (called neighborhood empowerment) and individual (based on network and social support) social capital, we found that adolescents and adults living in areas with intermediate empowerment had less caries experience than those living in low empowerment neighborhoods [34]. The area of residence is identified as one of many manifestations of inequalities in oral health and should be considered for health promotion and prevention [38]. Being part of a higher social context implies a better self-assessment of oral health, indicating the potential relationship of social capital, at individual and community levels, in the oral health conditions of this population [39].

A possible methodological limitation is because its sample consisted of five observational studies, a deficient category to establish causal relationships from a cross-sectional perspective [40]. Considering methodological practice, the articles showed important differences between their tools, from sample constitution, age group, area of residence and conceptualization factors, as well as assessment of individual and community social capital, which directly influences possible agreement or disagreement with its results. Methodological differences limit comparisons between studies, especially the ones with individuals from different geographic regions, and yet the impact of variables are susceptible to cultural differences [28]. The results of the meta-analysis reinforce the importance of community social capital in the caries experience of individuals. The scarce data on social capital in the individual dimension found in the articles were insufficient to evaluate its influence on caries experience.

CONCLUSION

Our study reinforces the importance of community social capital in caries experience of similar socioeconomic context. Thus, a high level of community social capital is directly ~~related to lower rates of~~ caries experience in individuals.

The lack of data in the studies hinder the assessment of social capital relationship in the individual dimension.

Collaborators

AA DAMASCENO, carried out the dissertation, which provided the basis for the article. She supported the research planning and data collection, as well as data analysis, as well as the writing of the article. AMLB SOUZA, supported the review of the study, as well as supported the writing of the article. BVC GONDINHO, participated in the review, interpretation and analysis of the data obtained and writing of the article. LM GUERRA, participated in the review, interpretation and analysis of the data obtained and writing of the article. DFB CAVALCANTE, participated in the review, interpretation and analysis of the data obtained and writing of the article. JV BULGARELI, work advisor, supported the study planning, guided data collection as well as supported data analysis and article writing.

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