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# Religiosity/Spirituality Association on Oral Diseases: A Systematic Review

**Viviane Borges Alves da Costa[1], Wantuil Rodrigues Araújo Filho[2], Ludmila Guimarães[3] Leonardo Santos Antunes[2], Lívia Azeredo Antunes[2] & Andréa Videira Assaf* [2]**

**Abstract**

Aim: This systematic review evaluates the effect of religiosity/spirituality (R/S) on oral manifestations. Method: An electronic search was performed in MEDLINE via PubMed, Scopus, Virtual Health Library, Web of Science, and Grey Literature databases, and specific indexers were used in the manual search. Case-control, cross-sectional and cohort studies published in any language were included. The studies that met the inclusion criteria were analyzed for quality and risk of bias, according to the Fowkes and Fulton instrument. The Grading of Recommendations, Assessment, Development and Evaluation (GRADE) was used to assess the level of evidence. The electronic search produced a total of 691 abstracts, of which seven were selected. Although, 6 studies presented moderate and high methodological qualities, suggesting R/S as a protective factor to oral health, GRADE classification showed a very low level of evidence for periodontitis and dental caries outcomes. Conclusion: Despite the results suggested that R/S is a protective factor to oral health, the evidence in general is inconsistent and imprecise, which shows the need for further studies. PROSPERO: CRD42020182480.

**Keywords:** Oral health; oral manifestations; spirituality and religiosity.

## 1. Introduction

The health-disease process has been understood, not as a mere biological view, but from the influence of social determinants of health, that is, social, economic, cultural, ethnic/racial, psychological, and behavioural factors that act interdependently and favour the occurrence of health problems and their risk factors in the population (Bueno et al., 2014; Buss & Pellegrini Filho, 2007).

The spiritual dimension was included in the multidimensional concept of health by the World Health Organization (WHO) in 1988, referring to issues such as meaning and sense of life, and not limited to any specific type of religious belief or practice (World Health Assembly, 1988). In this sense, religiosity/spirituality (R/S) has been an investigative construct in recent decades, resulting in growing public and academic awareness of this dimension for health issues (Moreira-Almeida et al., 2006).

Although R/E is generally seen with the same meaning by lay people, there is a conceptual differentiation that can reflect on the relationships and role of individuals in society (Zini et al., 2012; Page et al., 2018), in their internal processes of self-knowledge (Page et al., 2018), as well as in the physical (Lucchese & Koenig, 2013; Pargament et al., 2004) and emotional (Koenig, 2009; Lucchetti et al., 2011; Moreira-Almeida et al., 2014; Schnell et al., 2020) healing. Religiosity comprehensively understands how much an individual believes in a religion, following and adhering to practices such as participation in a religious place, reading religious books, practising prayer through programmes, or religious lectures on social networks.

[1] Postgraduate Program in Dentistry, Fluminense Federal University, Nova Friburgo, Rio de Janeiro, Brazil.
[2] Department of Specific Formation, School of Dentistry, Fluminense Federal University, Nova Friburgo, Rio de Janeiro, Brazil.
[3] Postgraduate Program in Dentistry, Fluminense Federal University, Niterói, Rio de Janeiro, Brazil.
* Corresponding author: Andréa Videira Assaf, Fluminense Federal University, Nova Friburgo, RJ, Brazil.
e-mail: avassaf@gmail.com. Phone: 55-22-98141-4848 ; 55-22-25287168 ORCID ID: https://orcid.org/0000-0001-7071-7988

Spirituality, on the other hand, encompasses a broader dimension, as it comprises the relationship with the sacred and the search for the transcendent, in addition to the personal search for understanding existential issues related to the end of life, to its meaning, which may or may not lead to the development of religious practices or be linked to organised religion (Koenig et al., 2012; Lucchetti et al., 2010).

R/S and health has been increasingly investigated and evidence has pointed to a habitually positive association between indicators of religious involvement and those of physical and mental health (Chida et al., 2009; Gillum & Ingram, 2006; Hummer et al., 1999; Koenig et al., 1998, Moreira-Almeida et al., 2014). For example, there is an association between religious beliefs and practices with better mental well-being (Koenig et al., 1998; Moreira-Almeida et al., 2006; Moreira-Almeida et al., 2014), lower blood pressure levels (Gillum & Ingram, 2006), lower rates of mortality from cardiovascular causes (Hummer et al., 1999), lower rates of mortality in general (Chida et al., 2009), decreasing numbers of lower birth weight newborn (Burdette et al., 2012) and better quality of life (Koenig, 2009;Lucchetti et al., 2011).

Some studies have reported an association between religiosity and oral health in children and adults (Zini et al., 2011; Zini et al., 2012; Menegazzo et al., 2018), showing evidence that families with religious beliefs have lower levels of caries (Zini et al., 2012) and periodontal diseases (Zini et al., 2011). Thus, it seems that the R/S experience may be positively associated with improved oral health behaviours, such as the importance given to dental care and its standard for dental exams (Jordão et al., 2014). However, it is also clear that despite this association, the experience of R/S and oral health is the focus of contemporary study and there is still a premise for further investigative research on the subject.

Therefore, given the growing interest in the possible benefits related to R/S in the health of individuals and the insufficient information on this subject in the area of oral health, this narrative systematic review aimed to assess its association on oral diseases.

## 2. Materials And Methods

### 2.1 Question

This systematic review was designed based on the following question structured by PEOS (Population; Exposure of interest; Outcome and Study design): "Is R/S associated with the development of oral diseases?"

### 2.2 Elegibility criteria

The inclusion criteria for selecting articles were based on PEOS (Population, Exposure of interest, Outcome and Study design). All age groups, from children to elderly, were included as population investigated. The main exposure variable was religiosity and spirituality. The main outcome measures were oral diseases (caries, periodontal disease, and oral cancer). The study designs included case-control, cross-sectional, or cohort studies (retrospective or prospective), published without a search deadline. Articles that included clinical/community trials, case reports or narrative reviews of literature and other types of publications, such as book chapters, theses and guidelines in scientific journals and duplicate articles were excluded. Additionally, studies evaluating populations with physical and/or cognitive disabilities were also excluded.

### 2.3 Research strategy and bibliographic sources

The literature search included MEDLINE via PubMed, Scopus, Virtual Health Library (VHL), Web of Science, and Grey Literature databases (http://www.opengrey.eu/) (Table 1- Search Strategy). The following Medical Subject Headings (MeSH) terms were used in the research: "oral manifestations", "oral diseases", "oral health", "spirituality", "religion" and "spiritualism". Additionally, other MeSH synonyms, DeCS (subject descriptors) and free terms were also used for the research such as 'oral manifestations', 'oral diseases', 'oral health', 'spirituality', 'religion' and 'spiritualism', 'spiritual therapy *', 'religion and science', 'humanities', 'religious beliefs', 'religious ethics and 'prayer'. All descriptors were connected using Boolean operators 'AND' and 'OR' (Table 1). There was no language restriction for the search that was carried out for articles published before 17 July 2021. The electronic search was complemented by a manual search of the reference lists of the included papers.

Table 1. Search strategy used in the electronic database.

| Database | Search strategy |
|---|---|
| PubMed | #1- (((((Mouth Disease*[MeSH Terms]) OR (Oral Health[MeSH Terms])) OR (Oral Manifestations[MeSH Terms])) OR (Mouth Disease*[MeSH Terms])) OR (Diseases, Mouth[MeSH Terms])) OR (Health, Oral[MeSH Terms])<br>#2- ((((((((((Spirituality[MeSH Terms]) AND (Religion*[MeSH Terms])) OR (Spiritualism[MeSH Terms])) OR (Spiritual Therapies[MeSH Terms])) OR (Religion and Science[MeSH Terms])) OR (Humanities[MeSH Terms])) AND (Religious Beliefs[Title/Abstract])) OR (Beliefs, Religious[Title/Abstract])) OR (Religious Belief[Title/Abstract])) OR (Religious Ethics[Title/Abstract])) OR (Ethic, Religious[Title/Abstract])) OR (Prayer*[Title/Abstract])<br>#1 and #2 |
| Scopus | (mouth AND disease OR oral AND health OR oral AND manifestations OR disease, AND mouth OR diseases, AND mouth OR health, AND oral OR oral AND disease OR disease, AND oral OR diseases, AND oral ) AND ( spirituality OR religion* OR spiritualism OR spiritual AND therapies OR religion AND science OR humanities OR religious AND beliefs OR beliefs, AND religious OR religious AND belief OR religious AND ethics OR ethic, AND religious OR prayer*) |
| Web of Science | #1-TÓPICO: (MouthDisease*) *OR* TÓPICO: (Oral Health) *OR* TÓPICO: (Oral Manifestations) *OR* TÓPICO: (Disease,Mouth) *OR* TÓPICO: (Diseases,Mouth) *OR* TÓPICO: (Health, Oral)<br>*Índices=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Tempo estipulado=Todos os anos*<br>#2-<br>TÓPICO: (Spirituality) *OR* TÓPICO: (Religion*) *OR* TÓPICO: (Spiritualism) *OR* TÓPICO: (Spiritual Therapies) *OR* TÓPICO: (Religion and Science) *OR* TÓPICO: (Humanities) *OR* TÓPICO: (Religious Beliefs) *OR* TÓPICO: (Beliefs, Religious) *OR* TÓPICO: (Religious Belief) *OR* TÓPICO: (Religious Ethics) *OR* TÓPICO: (Ethic, Religious) *OR* TÓPICO: (Prayer*)<br>*Índices=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Tempo estipulado=Todos os anos*<br>#1 and #2 |
| VHL | (tw:(Spirituality OR Religion* OR Spiritualism OR "Spiritual Therapies" OR Religion)) AND (tw:( Science OR Spirituality OR Religion* OR Spiritualism OR "Spiritual Therapies" OR Religion)) AND (tw:(Science OR "Religious Belief*" OR "Beliefs, Religious" OR "Religious Ethics" OR "Ethic, Religious" OR Prayer)) AND (tw:("Mouth Disease*" OR "Oral Health" OR "Oral Manifestations" OR "Mouth Disease*" OR "Oral Health" OR "Oral Manifestations" OR "Disease, Mouth" OR "Diseases, Mouth" OR "Health, Oral" OR 'Oral disease*") |
| GreyLiterature | (Mouth Disease* OR Oral Health OR Oral Manifestations OR Disease, Mouth OR Diseases, Mouth OR Health, Oral AND Spirituality OR Religion* OR Spiritualism OR Spiritual Therapies OR Religion AND Science or Humanities OR Religious Beliefs OR Beliefs, Religious OR Religious Belief OR Religious Ethics OR Ethic, Religious OR Prayer*) |

2.4 Study selection

First, a systematic search for titles and abstracts was carried out independently by two trained reviewers (AVA and VC), according to the inclusion criteria (PEOS), to select articles potentially eligible for the analysis of the full text for systematic review. Mendeley Desktop software was used to save and organize all references and remove duplicates. Therefore, all abstracts were analyzed and, when eligible, full texts were selected. In addition, the corresponding author was contacted when abstracts or full-text articles provided insufficient information for data analysis and extraction. Any discrepancies between them were resolved with a trained and experienced third reviewer (L.A.A) to establish the final consensus. All selected eligible studies were used to determine the agreement between reviewers, and a kappa value was obtained for this phase ($K = 0.75$).

2.5 Evaluation of the quality of studies

During this phase, two trained and independent reviewers (AVA and VC) evaluated and qualified the articles using the Fowkes and Fulton Instrument (Fowkes & Fulton, 1991), appropriate for assessing the quality of cross-sectional, cohort, case-control studies (retrospective and prospective).

The instrument comprises six general questions with sub-items, scored as follows: major problem (++), minor problem (+), without problem (0) and not applicable (NA).

The classification of the quality of the articles was mainly based on the number of items that presented the greatest problems (++), followed by those classified as the least methodological problems (+). Low-quality methodological studies were those that received more than three items classified as major problems (++). Moderate quality was classified as major problems (++) in two to three items, followed by a maximum of three items classified as minor problems (+). For the high-quality classification, only those studies that did not present problems or those that presented a maximum of three items classified as minor problems (+) were included (Table 2) (Lattanzi et al., 2020). At this stage, the inter-examiner agreement was calculated, obtaining a high kappa value among the researchers ($K = 0.96$).

Table 2. Evaluation of methodological quality and risk of bias according to Fowkes and Fulton.

| Questions | Items | | Bragamian et al. 1994 | Yeole et al., 2000 | Tellez et al., 2006 | Wong et al., 2006 | Zini et al., 2011 | Zini et al.,2012 | Rana et al., 2015 |
|---|---|---|---|---|---|---|---|---|---|
| **Study design appropriate to objectives?** | Objective | Common design | NA | NA | NA | NA | NA | NA | NA |
| | Prevalence | Cross sectional | NA | NA | NA | NA | NA | NA | NA |
| | Prognosis | Cohort | NA | NA | NA | NA | NA | NA | NA |
| | Treatment | Controlled trial | NA | NA | NA | NA | NA | NA | NA |
| | Cause | Cohort, case-control, Cross-sectional | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Study sample representative?** | Source of sample | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Sampling method | | + | 0 | 0 | 0 | 0 | 0 | ++ |
| | Sample size | | 0 | 0 | 0 | 0 | 0 | 0 | + |
| | Entry criteria/exclusions | | ++ | NA | 0 | 0 | 0 | 0 | 0 |
| | Non-respondents | | 0 | NA | 0 | NA | 0 | 0 | 0 |
| **Control group acceptable?** | Definition of controls | | + | NA | NA | NA | NA | NA | NA |
| | Source of controls | | ++ | NA | NA | NA | NA | NA | NA |
| | Matching/randomisation | | NA | NA | NA | NA | NA | NA | NA |
| | Comparable characteristics | | + | NA | NA | NA | NA | NA | NA |
| **Quality of measurements and outcomes?** | Validity | | + | NA | + | + | + | + | ++ |
| | Reproducibility | | 0 | NA | 0 | + | 0 | 0 | NA |
| | Blindness | | NA | NA | NA | NA | NA | NA | NA |
| | Quality control | | + | 0 | 0 | ++ | 0 | 0 | + |
| **Completeness?** | Compliance | | + | 0 | 0 | + | 0 | 0 | + |
| | Drop outs | | NA | 0 | NA | 0 | NA | NA | NA |
| | Deaths | | NA | NA | NA | NA | NA | NA | NA |
| | Missing data | | NA | 0 | 0 | NA | NA | NA | NA |
| **Distortions influences?** | Extraneous treatments | | NA | NA | NA | NA | NA | NA | NA |
| | Contamination | | NA | NA | NA | NA | NA | NA | NA |
| | Changes over time | | NA | NA | NA | NA | NA | NA | NA |
| | Confounding factors | | ++ | + | 0 | + | 0 | 0 | 0 |
| | Distortion reduced by analysis | | + | + | 0 | 0 | 0 | 0 | 0 |
| **Summary of Issues** | Bias - Are the results erroneously biased in a certain direction? | | ++ | + | 0 | + | 0 | 0 | 0 |
| | Confounding - Are there any serious confounding or other distorting influences? | | ++ | + | 0 | + | 0 | 0 | 0 |
| | Chance - Is it likely that the results occurred by chance? | | + | + | 0 | + | 0 | 0 | 0 |
| **Scientific evidence** | Methodological quality | | L | M | H | M | H | H | M |

2.6 Data extraction

After evaluating the quality of the studies, two independent reviewers (AVA and VC) extracted the data and organized them in a spreadsheet, according to the following information: author, year of publication, state/country, type of study, sample (age of the participants, number, criteria for inclusion/exclusion, comparison groups), oral diseases, effect size and crude or adjusted association results with a 95% confidence interval (CI) (Table 3). Any variability in the collected information between the reviewers were resolved with a trained and experienced third reviewer (L.A.A) to establish the final consensus.

2.7 Effect measures

The main results were related to the impact of exposure - R/S - on oral clinical outcomes, such as caries, periodontal disease, oral cancer, and other oral diseases in the investigated population and the size of the effect and the result of the crude or adjusted association with 95% CI.

2.8 Level of evidence: GRADE tool

The certainty in evidence was evaluated by using the Grading of recommendations, assessment, development, and evaluation (GRADE) approach, with data being summarized narratively, following four steps: risk of bias, inconsistency, indirectness, imprecision (Murad et al., 2017) (Table 4). The certainty in evidence was not assessed for oral cancer because the evaluated outcomes for the three selected studies (Yeole et al., 2000; Wong et al., 2006; Rana et al., 2015) were quite different from each other.

Table 3. Characteristics of studies included in Systematic Review.

| Author, Year of publication | State, Country | Study type | Age of partici-pants (years-old) | Number (final sample) | | |
|---|---|---|---|---|---|---|
| | | | | | Inclusion/Exclusion criteria | Groups of comparison |
| Bagramian et al. 1994[29] | Michigan, EUA. | Cross-sectional study | ≥ 18. | 545 | Inclusion criteria: Amish and non-Amish adults, aged 18 or over. | Comparison of explanatory variables such as sociodemographic, oral behavior, periodontal disease in Amish and non-Amish. |
| Yeole et al. 2000[26] | Bombay, Índia. | Retrospective observational survey. | Not defined | 5345 | Inclusion criteria: head and neck cancer patients registered in the Bombay Population-Based Cancer Registry (BPBCR) for the period 1987–1991.<br>Exclusion criteria: cases (where date of incidence and date of death are assumed to be the same day, thus 0 survival) and other cases with incomplete information from the BPBCR. | Results' comparison of this study with those for other populations by the age-standardized relative survival (ASRS) thorough calculating for the entire group of patients and for the age group 0–74 years only, by directly standardizing ASRS to the specific age distributions of the estimated global incidence of major cancers in 1985. |
| | | | | | | |
| Tellez et al. 2006[30] | Detroit, EUA. | Cross-sectional survey. | ≥ 14 | 1021 | Inclusion criteria: caregivers of low-income African-American children under age six who resided in Detroit, Michigan. | Not applicable |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wong et al. 2006[27] | Taichung, Taiwan. | Retrospective observational survey. | Not defined | 1010 | Inclusion criteria: all patients who were admitted under the diagnosis of oral cancer in Taichung Veterans General Hospital from March 1995 to December 2002. Exclusion criteria: those who had no pathological report, had been treated at other institutes, did not complete therapeutic protocol in the studied hospital, or had inadequate chart records. | Not applicable |
| Zini et. al. 2012[21] | Jerusalem, Israel. | Cross-sectional survey. | 35-44 | 248 | Inclusion criteria: married adult Jewish people aged 35-44 years living in Jerusalem. | Sample divided into three distinct groups based on their religiosity (secular, religious non-orthodox or religious orthodox). |
| Zini et. al. 2012[5] | Jerusalem, Israel | Cross-sectional survey. | 35-44 | 254 | Inclusion criteria: married adult Jewish people aged 35–44 years living in Jerusalem. | Sample divided into three distinctive groups based on their religiosity (secular, religious non-orthodox or religious orthodox). |
| Rana et. al. 2015 [28] | --- | Prospective comparative study. | 24–89 | 155 | Inclusion criteria: participants with oral lichen planus and oral squamous cell carcinoma. Exclusion criteria: participants with recurrence of malignant disease, those treated with radiotherapy or chemotherapy, those pregnant or nursing, submitted recently to an operation, or with specific coexisting conditions including heart disease and circulatory, infective, or immune-related diseases. | Participants with oral lichen planus. |

| Author, year of publication | Instrument for measuring spirituality / religiosity | Outcome | Evaluation of other outcome measures | Effect size and/or crude or adjusted association results with 95% CI |
|---|---|---|---|---|
| Bagramian et al.,1994[29] | Not applicable (comparison between populations with different religions). | Periodontal Disease. | -- | Logistic regression showed a high risk for attachment loss of ≥ 4 mm for respondents who were Amish (OR= 2.27; p= 0.0009) and for other variables such as male, older, calculus presence, and little knowledge about gum disease ($p<0.05$). For pocket depth of ≥ 5 mm, the best-fitting model includes Amish (OR=1.72; p=0.01), older, male, having calculus, and having gingivitis as significant risk factors. Amish presented more chance to have gingivitis (OR=13.46; p=0.002) and plaque (OR=7.1; p=0.02) compared to non-Amish. |
| Yeole et al., 2000[26] | There was no specific instrument for measuring spirituality / religiosity. This information was obtained from the Bombay vital statistics registration system, postal/telephone enquiries, home visits, and scrutiny of medical records. | Survival experience from head and neck cancers. | --. | In multivariate analysis (Cox regression model), age, religion, marital status, site and clinical extent of disease emerged as independent predictors of survival. Thirty percent more Christian patients died than Hindu patients (Hazard Ratio= 1.3; 95% CI [Confident Interval] =1.1–1.5). |
| Tellez et al., 2006[30] | There was no use of a specific instrument to assess religiosity or other sociodemographic and behavioral characteristics. In addition to individual assessment, neighborhood characteristics (number of dentists, grocery, stores, churches, residential mobility and vacant housing) were also assessed. | Dental caries severity. | -- | Multilevel analyses focused on a combination of individual (Level-I) and neighborhood (Level-II) data including census and geocoded information. There was significant variation in the severity of caries between low-income neighborhood clusters and caries severity decreased with a higher number of churches, while it increased with a higher number of grocery stores in the clusters after accounting for individual characteristics. Only 14% of the interindividual variability was explained by individual risk factors. |
| | | | | |
| Wong et. al., 2006[27] | There was no use of a specific instrument to assess religiosity or other sociodemographic characteristics. | Survival rate of oral cancer | -- | Survival was analyzed by the Kaplan–Meier method and Cox proportional hazard model was used for investigating the relationship between socio-demographic factors and survival. |

| | | | | |
|---|---|---|---|---|
| | | treated patients. | | Multivariate analysis revealed that those without religious belief tended to have higher probability of death than those who had religious belief (relative risk (RR): 2.057, $p < 0.001$). Besides, other socio-demographic factors also significantly influenced the survival of oral cancer patients. |
| Zini et. al., 2012[21] | Religiosity determined by the type of schools that their children attended (secular, religious non-orthodox or religious orthodox schools) and validated by self-definition of the participants. SpREUK 1.1: adopted to assess spirituality. | Periodontal disease. | -- | Multiple logistic regression showed that higher levels of religiosity (Odds Ratio [OR] = 0.20; 95% Confidence Interval [CI]= 0.05 - 0.71; p= 0.013), support of internal life through spirituality (OR=0.31; 95%CI = 0.10- 0.89; p= 0.030) were protective factors for periodontitis. Besides, higher family social support ($p = 0.02$) and low levels of plaque ($p = 0.05$) were also related to lower levels of disease. |
| Zini et. al., 2012[5] | Religiosity determined by the type of schools that their children attended (secular, religious non-orthodox or religious orthodox schools) and validated by self-definition of the participants. The SpREUK 1.1 process was adopted to assess spirituality. | Dental caries (decayed, missing and filled teeth). | -- | A conceptual multiple logistic regression model identified a strong statistical association between caries experience and religiosity. (Religious non-orthodox: OR=0.28, 95% CI=0.12 - 0.68, $p <0.01$; orthodox: OR= 0.24, 95%CI=0.09-0.62, $p<0.01$). Higher levels of religiosity were related to higher social support and higher spirituality levels (search for meaningful support), which were related to health behaviours, and these in turn were a strong determinant of caries experience. High levels of spirituality ($p = 0.01$) and social support ($p = 0.01$) were also significantly directly related to lower levels of caries experience. |
| Rana et. al., 2015[28] | Freiburg Questionnaire on Coping with Illness (FKV-LIS). | Oral squamouscell carcinoma. | -- | Between-group comparison of the results through the use of multivariate analysis of covariance (MANCOVA) showed that, when comparing participants with oral squamous cell carcinoma and participants with oral lichen planus, these last ones had better scores in the social support and spirituality categories ($p<0.05$), indicating that these factors were protective for the cancer occurence. |

Table 3. Continuation

Table 4: Evidence summaries (The Grading of Recommendations Assessment, Development and Evaluation - GRADE).

| Certainty assessment | | | | | | |
|---|---|---|---|---|---|---|
| Number of studies (observational)<br><br>Periodontitis | Risk of bias | Inconsistency | Indirectness | Imprecision | Publication bias | Overall certainty of evidence |
| 2 | serious[a] | very serious[b] | not serious | serious[c] | none | ⨁◯◯◯<br>VERY LOW |
| Dental caries | | | | | | |
| 2 | not serious | serious[d] | not serious | serious[e] | none | ⨁◯◯◯<br>VERY LOW |

CI: Confidence interval

Explanations

a. A serious risk was considered because of relevant methodological biases, especially in the Bagramian et al. (1994)' study.

b. A very serious inconsistency was considered due to the direction of effect varied across the studies.

c. Although the number of participants is adequate (>400), there is no information about the CI in the study by Bagramian et al. (1994), which makes this analysis impossible.

d. The direction of effect did not vary between the studies. However, differences associated with the exposition and the outcome indicate heterogeneity between them.

e. Although the number of participants is adequate, different statistical analyzes made it impossible to assess the behavior of the CI (multilevel model in Tellez et al. (2006) and multiple logistic regression in Zini et al., (2012)).

## 3. RESULTS

### 3.1 Selection of studies

The results of the search process are presented in the flowchart (Figure), which presents an overview of the literature search. A total of 691 abstracts were identified in the electronic databases, of which 377 were from the MEDLINE database via PubMed, 257 from the Web of Science, 56 from Scopus and 1 from the VHL-Lilacs. No study was selected from the Gray Literature or manual search. The studies were reduced to 610 articles after the removal of duplicates. After evaluating the title and abstracts, 17 were selected for full-text analysis, according to the exclusion and inclusion criteria. Of these, eight articles were excluded because the R/S exposure measure was not directly related to the investigated clinical outcome, and two others were excluded because the R/S variable was used as a population matching criterion. Henceforth, full-text analyses resulted in the selection of seven studies eligible for quality analysis and data extraction (Bagramian et al., 1994; Yeole et al., 2000; Tellez et al., 2006; Wong et al., 2006; Zini et al., 2011; Zini et al., 2012; Rana et al., 2015). No selected articles were included in the quantitative analysis by meta-analysis due to the heterogeneity of the studies regarding some factors, such as different clinical outcomes, variability in the adoption of criteria to assess exposure and outcome, comparison of groups and statistical treatment of the data.

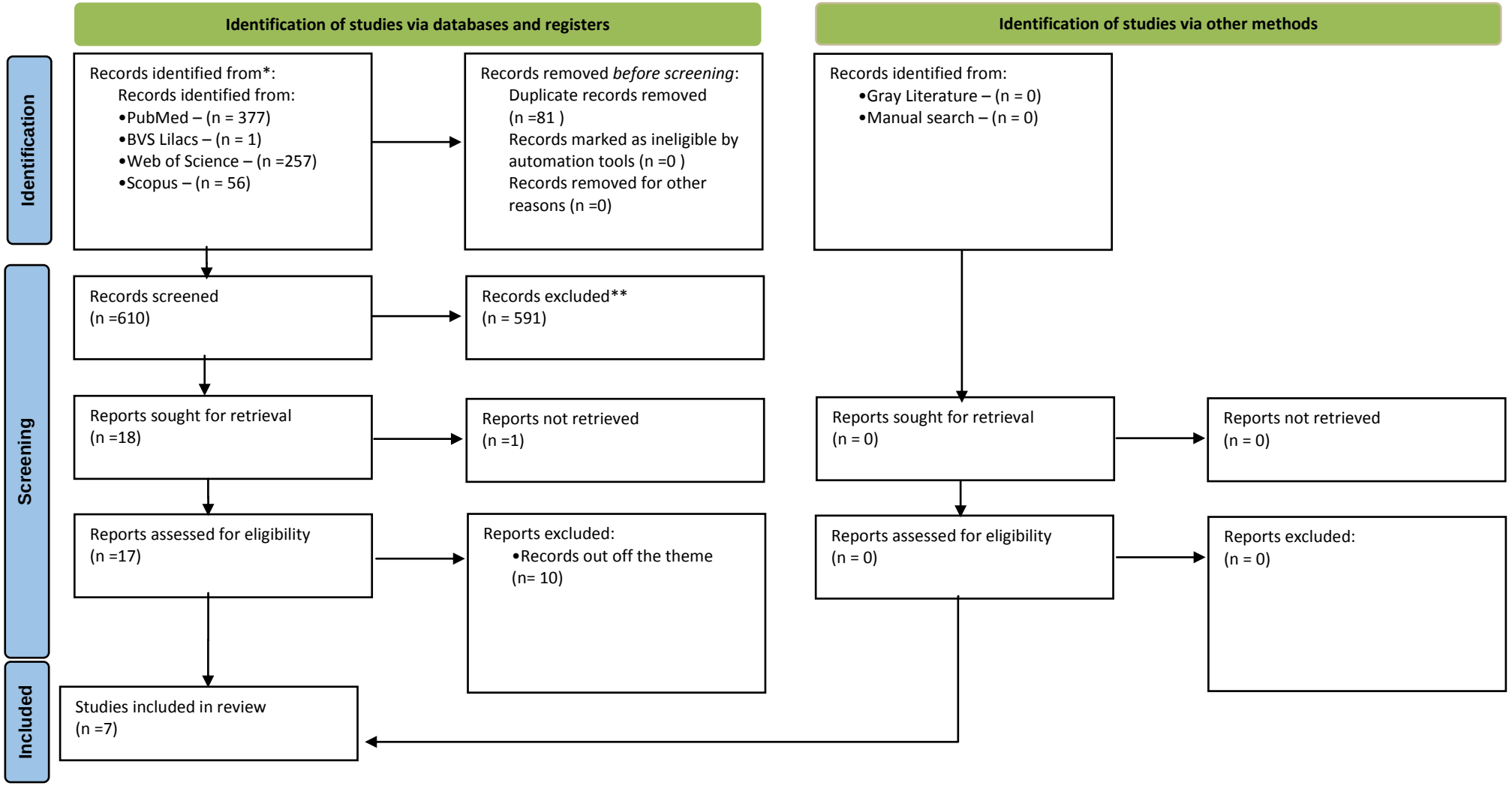


**Figure1.PRISMA 2020 flow diagram template for systematic reviews** (PRISMA 2020 statement. MetaArXiv preprint (September 2020)). (http://www.prisma-statement.org).

3.2 Study Features

All selected studies were in English, and the exposure of R/S was measured using validated instruments, in some studies (Zini et al., 2011; Zini et al., 2012; Rana et al., 2015) and not in others (Bagramian et al., 1994; Yeole et al., 2000; Tellez et al., 2006; Wong et al., 2006). Table 3 describes the data extraction process, which provides the main information from the seven selected studies. The sample size ranged from 155 to 5,345 participants. The extracted data revealed that two studies used the instrument SpREUK 1.1 (German acronym for Spiritual and Religious Attitudes to Deal with Disease - Spirituelle und religiose Einstellungenzum Umgangmit Krankheiten) to assess spirituality (Zini et al., 2011; Zini et al., 2012); another used the instrument "Freiburg Questionnaire on Coping with Illness" (FKV-LIS) to assess the effect of spirituality and social support in facing oral cancer (Rana et al., 2015); another investigation carried out only a comparison between two different populations, one of which was isolated according to their religion(Bagramian et al., 1994), and the other three studies evaluated the experience of R/S through questions included in sociodemographic questionnaires (Yeole et al., 2000; Tellez et al., 2006; Wong et al., 2006). Of the seven studies, four were cross-sectional (Bagramian et al., 1994; Tellez et al., 2006; Zini et al., 2011; Zini et al., 2012), two were retrospective cohort studies (Yeole et al., 2000; Wong et al., 2006) and one prospective study (Rana et al., 2015).

3.3 Bias risk assessment

The qualitative synthesis (Table 2), performed using the Fowkes and Fulton Instrument (Fowkes & Fulton, 1991), showed an eligible study (Bagramian et al., 1994) classified as low, three as moderate (Yeole et al., 2000; Wong et al., 2006; Rana et al., 2015), and three with high methodological quality (Tellez et al., 2006; Zini et al., 2011; Zini et al., 2012). In all selected studies, the greatest bias was observed due to the lack of validity measures, when this gap was observed in six of the seven studies (Bagramian et al., 1994; Tellez et al., 2006; Wong et al., 2006; Zini et al., 2011; Zini et al., 2012; Rana et al., 2015). Deficiencies in the sampling method were observed in two studies (Bagramian et al., 1994; Rana et al., 2015), including in Bagramian et al.' study; major problems were also found in the inclusion and exclusion criteria, in the acceptability of the control group, as well as in confounding factors and bias risk, in addition to minor problems in quality control (Bagramian et al., 1994). Minor problems were also found, especially with confounding factors and risk of bias in the studies of Yeole et al. (2000) and Wong et al. (2006) where minor problems were also observed regarding the calculation of reproducibility measures and quality control.

3.4 Results and trends of individual studies

It was found that religiosity and the presence of churches in some neighbourhoods led to a decrease in the levels of dental caries (Tellez et al., 2006). According to Zini et al. (2011) and Zini et al. (2012), the studies identified a strong statistical association between caries experience and periodontitis with religiosity. Thus, the direction of the association suggested that religiosity had a protective effect against caries and periodontitis, since higher levels of religiosity, associated with social support and spirituality, were also related to health behaviours, such as decreased sugar intake and in the accumulation of dental biofilm, which was a strong determinant in the experience of these diseases.

Religious beliefs also significantly influenced the survival of patients with oral cancer (Wong et al., 2006). Additionally, the study of Rana et al. (2015), who compared groups of participants with oral squamous cell carcinoma and oral lichen planus, demonstrated higher scores for social support and spirituality for the latter clinical outcome, signalling such variables as protective against the occurrence of cancer.

Other social variables such as age, sex, marital status, social support, and healthy habits were also considered in the analysis of the studies by Yeole et al. (2000), in addition to clinical variables such as the presence of dental biofilm, gingivitis, dental calculus, lesion site and extent. Bagramian et al. (1994), Zini et al. (2011; 2012), and Rana et al. (2015) also indicated a significant association with the investigated clinical outcomes.

It is noteworthy that 86% of the studies showed positive effects of R/S on oral diseases (Table 3), indicating that this exposure variable might be a protective factor for them.

3.5 Certainty assessment of level of evidence by GRADE tool

A very low level of evidence was observed for periodontitis and dental caries outcomes. Generally, those classifications were especially due to heterogeneity of the studies, for instance when measuring exposition and outcomes (Inconsistency), relevant methodological biases (Risk of Bias), problems to get confident intervals of studies (Imprecision) (Table 4).

## 4. Discussion

It has been observed that there is still a scarcity of studies on R/S in oral health, in addition to concluding controversial answers about such an association ((Menegazzo et al., 2018; Soares et al., 2020). Due to the evident investigative gap in this association, the development of this systematic review was prompted.

Of the 691 articles initially selected, only seven met the inclusion and exclusion criteria previously established in this review. Because this subject has not been explored in the dental field, it was decided not to specify the studied population, including studies with subjects belonging to any age group.

Regarding the types of clinical outcomes, two studies emphasized the association between religiosity and periodontal disease (Bagramian et al., 1994; Zini et al., 2011). In Zini et al. (2011)'study, with high methodological quality, it was found that religiosity was a protective factor for periodontitis and that spirituality leads to significant support for personal life. Adversely, in Bagramian et al. (1994), religious isolation of Amish population was considered a significant risk factor for periodontitis and gingivitis in those individuals. In addition to the fact that this study has low methodological quality, its data does not directly discuss the interpretive distortion of religion as a risk factor for periodontitis, since the social arrangement of isolation can result in low educational levels, with deficient knowledge and behavioural patterns that are not consistent with the control and prevention of oral diseases, such as periodontitis, compared to the non-Amish population (McKusick, 1980).

Two other studies investigated the influence of R/S in decreasing dental caries (Tellez et al., 2006; Zini et al., 2012). After considering the collective characteristics, the severity of the disease decreased with a greater number of churches, while it increased with a greater number of grocery stores in the neighbourhoods(Tellez et al., 2006). In the study by Zini et al. (2012), a strong statistical association was identified between caries experience and religiosity, relating this to lower levels of oral disease.

The survival rate for head and neck cancer (Yeole et al., 2000) and oral cancer in treated patients (Wong et al., 2006) were related to religion and religious beliefs. According to Yeole et al. (2000), the socioeconomic factors associated with personal habits and comorbidity had a greater influence on survival rates than marriage status and religion. Contrastingly, Wong et al. (2006) stated that in addition to clinical characteristics, sociodemographic factors, such as religious beliefs and marital status, also significantly influenced the survival of patients with oral cancer. Additionally, it was observed that the group of individuals who had better scores for social support and spirituality had lower rates of disease aggravation (Rana et al., 2015).

Considering the individual methodological quality of the studies selected in this systematic review, it was observed that in two of the three studies of moderate quality, the result was mainly due to the presence of confounding factors (Yeole et al., 2000; Wong et al., 2006). In Rana et al. (2015), also of moderate methodological quality, the biggest problems were related to the selection bias because of the lack of sample representativeness due to the method and sample size. The study classified with low methodological quality presented several problems, especially in the sampling method, the inclusion and exclusion criteria, the quality of measurements and results, and the risk of bias due to confounding effects (Bagramian et al., 1994).

There was variability between studies on how oral diseases, spirituality and religiosity were measured. It was also possible to verify that the studies presented heterogeneous methodological designs, with four of them being cross-sectional (Bagramian et al., 1994; Tellez et al., 2006; Zini et al., 2011; Zini et al., 2012), two of them had a retrospective cohort design (Yeole et al., 2000; Wong et al., 2006) and a prospective cohort (Rana et al., 2015), in addition to investigating different clinical outcomes. Furthermore, consistency varied across different samples, problems of internal validity, providing the presence of confounding factors imply important conclusive limitations of such evidence between spirituality, religiosity and oral diseases.

It is relevant to point out that, this review was limited to the narrative analysis of published studies on the effect of the association between spirituality, religiosity and oral diseases. Proceeding to a meta-analysis was not possible because of difficulty in combining the results and analyzing them in terms of the magnitude of the effects of the said exposure on the variables of interest, considering that in the included studies, the sample of adults was heterogeneous, and the procedures performed were not uniform, in addition to different study designs.

Another limitation was that the data could not be extrapolated to the world population, given the small number of countries where this type of investigation was conducted: Thailand, India, the United States and Israel.

Regarding GRADE, the certainty of evidence taken together for caries and periodontitis were considered very low, especially due to very serious problems about inconsistency and imprecision. It demonstrates that it is still early to confirm the positive association of R/S as a protective factor for oral health. Thus, this study shows that this investigated theme is scarce, and, for this reason, it contributes to signal the need for developing future research that provides better scientific evidence about the effectiveness of this association, enabling the R/S to be used as an important strategic resource for health promotion in a near future.

Subsequently, it is necessary to consider the potential of this systematic review as the originality of the theme, which is the first to evaluate the association between the experience of R/S and oral diseases and the relevance of the question to assist oral health professionals and trainers' opinions to take a critical look at such issues. From the perspective of comprehensiveness, the spiritual dimension must be considered as one of the factors that contribute to the health-disease process, along with the physical, psychological, and social dimensions (Oliveira et al., 2018), since many patients are religious, and their beliefs help them deal with many aspects of life (Koenig, 2000).

This systematic review was registered in the PROSPERO database (CRD42020182480) and was conducted in several stages, including the definition of the inclusion and exclusion criteria of the studies from the electronic and manual search and quality evaluation. The article was written according to the PRISMA statement ("Updating Guidance for Reporting Systematic Reviews: Development of the PRISMA 2020 Statement.")(Page et al., 2021).

## 5. Conclusion

Despite the results suggested that R/S is a protective factor to oral health, the evidence in general is inconsistent and imprecise, which shows the need for further studies.

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