UNIVERSIDADE DE SÃO PAULO
FACULDADE DE ODONTOLOGIA DE BAURU

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Prevalence of erosive tooth wear in risk group patients: systematic review

Prevalência do desgaste dentário erosivo em indivíduos de grupos de risco: revisão sistemática

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DEDICATÓRIA

Dedico este trabalho a todas as pessoas que,
ao longo da minha caminhada,
me incentivaram e me ajudaram a tornar esta aventura possível.

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“A curiosidade é a chave que abre as portas do conhecimento”.

Richard Feynman

RESUMO

Esta revisão sistemática investiga a prevalência do desgaste dentário erosivo em indivíduos classificados como grupos de risco que são: aqueles que possuem doença do refluxo gastroesofágico ou transtornos alimentares, que fazem dietas especiais ou consomem bebidas ácidas, que consomem excessivamente drogas e álcool, consumo de drogas legais e medicações ou por exposição a ácidos de forma ocupacional. O trabalho foi registrado no prospero sob numero de protocolo CRD42021270150. Duas pesquisas bibliográficas abrangentes foram realizadas utilizando PubMed/MEDLINE, Embase, Cochrane Library, LILACS/BVS, SciELO, Scopus, Science Direct, Open grey e Web of Science na data 12/04/2024. Também foi empregada a literatura cinza, que se baseou em busca manual das listas de referência de estudos relevantes, bem como na utilização da Biblioteca Digital Brasileira de Teses e Dissertações, Google Scholar e ProQuest. Foram incluídos estudos observacionais realizados em crianças e adultos que se enquadram nos grupos de risco mencionados anteriormente que fornecessem os dados de prevalência necessários sem limite de datas e idiomas. Foi realizada uma síntese narrativa dos dados dos resultados incluídos no presente estudo estruturado em torno da condição investigada (desgaste dentário erosivo) e características da população-alvo (refluxo gastroesofágico, desordens alimentares, bebidas ácidas, dietas especiais, drogas e abuso alcoólico, drogas legais ou medicações e ocupacional ou esportes). A avaliação da qualidade metodológica dos estudos incluídos foi feita utilizando a ferramenta de Joanna Briggs Institute's (JBI). Os dados foram metanalizados por meio de modelo de efeito randômico adotando-se um nível de significância de 5%. Os resultados obtidos para cada grupo de risco mostraram maiores prevalências para o desgaste dentário erosivo nestes pacientes de forma geral. Não foi possível realizar análise de subgrupos para todos os grupos de risco devido a heterogeneidade de índices encontrados, porém, para os grupos em que foram possíveis, a análise de subgrupo corroborou os resultados obtidos na prevalência geral. Em suma, o grupo de risco “drogas legais e medicamentos” apresentou valores gerais de prevalência mais baixos (30,3%), enquanto o grupo de risco de “transtornos alimentares” obteve valores mais altos (68,8%). Isso destaca que os grupos estão realmente em risco significativo para o DDE e que cuidados preventivos e monitoramento odontológico mais intensos são necessários.

Palavras-chave: Desgaste dentário erosivo; Grupos de risco; Revisão Sistemática; Meta-análise; Erosão Dentária; Estudos de Prevalência.

ABSTRACT

Prevalence of erosive tooth wear in risk group patients: systematic review

This systematic review investigates the prevalence of erosive tooth wear in individuals classified as risk groups, including those with gastroesophageal reflux disease, eating disorders, those on special diets or consuming acidic beverages, those who excessively use drugs and alcohol, consume legal drugs and medications, or are exposed to acids in an occupational context. Registration in the PROSPERO protocol CRD42021270150. Two comprehensive literature searches were conducted using PubMed/MEDLINE, Embase, Cochrane Library, LILACS/BVS, SciELO, Scopus, Science Direct, Open Grey, and Web of Science on April 12, 2024. Grey literature was also employed, based on a manual search of relevant study reference lists and the use of the Brazilian Digital Library of Theses and Dissertations, Google Scholar, and ProQuest. Observational studies conducted in children and adults falling into the previously mentioned high-risk groups that provided the necessary prevalence data were included, with no date or language restrictions. A narrative synthesis of the included study results was conducted, structured around the investigated condition (erosive tooth wear) and characteristics of the target population (gastroesophageal reflux, eating disorders, acidic beverages, special diets, drug and alcohol abuse, legal drugs or medications, and occupational or sports exposure). The methodological quality of the included studies was assessed using the Joanna Briggs Institute's (JBI) Prevalence Data Critical Appraisal Tool. Data were meta-analyzed using a random-effects model, with a significance level of 5%. The results for each at-risk group showed higher prevalences of erosive tooth wear in these patients in general. Subgroup analysis was not possible for all at-risk groups due to the heterogeneity of the indices found; however, for the groups where it was possible, subgroup analysis supported the results obtained in the overall prevalence. In conclusion, the Legal drugs and Medications risk group showed lower overall prevalence values (30.3%), while the Eating Disorder risk group obtained higher values (68.8%), which highlights that risk groups are indeed at significant risk for the development of ETW and greater preventive care and dental monitoring are needed.

Keywords: erosive tooth wear; risk groups; systematic review; meta-analysis; dental erosion; prevalence studies.

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LISTA DE ABREVIATURA E SIGLAS

ETW	Erosive Tooth Wear
GERD	Gastroesophaeal reflux disease
AN	Anorexia Nervosa
BN	Bulimia Nervosa
EDNOS	Eating Disorders Not Otherwise Specified
ED	Eating Disorders
JBI	Joanna Briggs Institute's
AEP	Acquired enamel pellicle
TWI	Tooth Wear Index

SUMÁRIO

1. INTRODUCTION

Dental erosion is characterized as the mineral dissolution on the tooth surface by the action of extrinsic or intrinsic acids, without the involvement of microorganisms [1,2], leading to irreversible loss of dental tissues. Prolonged acid exposure not only results in clinically visible defects but also alters the physical properties of the remaining dental structure, significantly reducing its microhardness and making the softened surface more susceptible to mechanical impacts, such as attrition and abrasion [2]. Therefore, concerning the terminology, when hard tissue loss is caused exclusively by a chemical process due to acid exposure, the condition is referred to as dental erosion. When dental erosion is associated with mechanical forces (attrition and abrasion), the wear process advances with irreversible tissue loss, and at this stage, it is known as erosive tooth wear [3-5].

According to the etiology of erosive tooth wear, which refers to acid exposure, risk groups for lesion development can be identified. The term "risk factor" is any aspect of personal lifestyle, habit, behavior, medical condition, environmental exposure, or an inborn or inherited characteristic, that is evidentially associated with an increased probability of developing erosive tooth wear [5]. Not every individual exposed to these acids will develop erosive tooth wear, mainly due to the presence of individual factors that can modulate the demineralization-remineralization process, such as saliva and acquired pellicle [6,7]. Martini et al. [7] exemplifies this factor, in this study, the acquired pellicle of patients with gastroesophageal reflux disease (GERD) and erosive tooth wear was compared to the pellicle of patients with GERD but without erosive tooth wear. The results revealed differences in the protein profile of the acquired pellicle between these groups, suggesting that the structure of the acquired pellicle is an individual characteristic that can either reduce or increase the protective capacity against demineralization [7]. However, regular exposure to different types of acids increases an individual's risk of developing erosive defects [8]. Therefore, determining the main risk groups for the development and prevalence of erosive tooth wear is important for the appropriate management of this condition.

In erosive tooth wear, gastric juice (pH 1-3) is the only intrinsic acid source, which can reach the oral cavity during vomiting or reflux episodes [7,8] and is frequently associated with erosive defects. A single episode of acid reflux into the oral cavity does not lead to a pathological condition. However, if reflux episodes occur regularly over a long period, it is defined as gastroesophageal reflux disease

(GERD), and the risk of developing erosive tooth wear increases [8]. Additionally, eating disorders such as anorexia nervosa (AN), bulimia nervosa (BN), and eating disorders not otherwise specified (EDNOS), including restrictive food choice and induced vomiting, can also potentiate erosive tooth wear [2,8]. For these reasons, individuals with conditions such as gastroesophageal reflux disease and eating disorders (AN, BN, EDNOS) are examples of risk groups for erosive tooth wear [2].
On the other hand, there are various sources of extrinsic acids [2]. Dietary habits such as regular consumption of acidic beverages and foods (sports drinks, sodas, juices), special diets (vegetarian, vegan, or raw food diets), or regular intake of medications (such as asthma patients), dietary supplements, substance abuse, and alcohol can also increase the risk of developing erosive tooth wear [2,8]. Furthermore, the same applies to individuals with regular occupational acid exposure, such as battery factory workers, professional swimmers, and wine tasters [2,8].

In the literature, several reviews can be found on erosive tooth wear focusing on the general population, including children, adolescents, and adults without a specific risk factor [9,10], in which the ETW estimated prevalence was 30.4% and 39.64% respectivaly. However, no systematic reviews that emphasize the prevalence of this issue in specific high-risk groups have been found. Therefore, the relevance of this study lies in conducting a systematic literature review with the primary objective of determining the prevalence of erosive tooth wear in their respective risk groups. This research aims to provide essential information for the development of targeted prevention and intervention strategies for these specific groups. Therefore, this systematic review determined the prevalence of erosive tooth wear among individuals from different risk groups for this condition, including those with gastroesophageal reflux disease, eating disorders, dietary habits, special diets, drugs and alcohol disorders, legal drugs and medication and occupational predisposing factors.

2 **ARTICLE**

The article presented in this Dissertation was written according to Clinical Oral Investigations instructions and guidelines for article submission.

Prevalence of erosive tooth wear in risk group patients: systematic review

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ABSTRACT

This systematic review investigates the prevalence of erosive tooth wear in individuals classified as risk groups, including those with gastroesophageal reflux disease, eating disorders, those on special diets or consuming acidic beverages, those who excessively use drugs and alcohol, consume legal drugs and medications, or are exposed to acids in an occupational context. Registration in the PROSPERO protocol CRD42021270150. A comprehensive literature searches were conducted on May 6, 2022, using PubMed/MEDLINE, Embase, Cochrane Library, LILACS/BVS, SciELO, Scopus, Science Direct, Open Grey, and Web of Science. Grey literature was also employed, based on a manual search of relevant study reference lists and the use of the Brazilian Digital Library of Theses and Dissertations, Google Scholar, and ProQuest. Observational studies conducted in children and adults falling into the previously mentioned high-risk groups that provided the necessary prevalence data were included, with no date or language restrictions. A narrative synthesis of the included study results was conducted, structured around the investigated condition (erosive tooth wear) and characteristics of the target population (gastroesophageal reflux, eating disorders, acidic beverages, special diets, drug and alcohol abuse, legal drugs or medications, and occupational or sports exposure). The methodological quality of the included studies was assessed using the Joanna Briggs Institute's (JBI) Prevalence Data Critical Appraisal Tool. Data were meta-analyzed using a random-effects model, with a significance level of 5%. The results for each at-risk group showed higher prevalences of erosive tooth wear in these patients in general. Subgroup analysis was not possible for all at-risk groups due to the heterogeneity of the indices found; however, for the groups where it was possible, subgroup analysis supported the results obtained in the overall prevalence. In conclusion, the Legal drugs and Medications risk group showed lower overall prevalence values (30.3%), while the Eating Disorder risk group obtained higher values (68.8%), which highlights that risk groups are indeed at significant risk for the development of ETW and greater preventive care and dental monitoring are needed.

INTRODUCTION

Erosive tooth wear is a terminology used to refer to the irreversible tissue loss caused by the association of dental erosion with mechanical forces (attrition and abrasion) [3-5]. Dental erosion is characterized as the mineral dissolution on the tooth surface by the action of extrinsic or intrinsic acids, without the involvement of microorganisms [1,2], leading to irreversible loss of dental tissues. Prolonged acid exposure not only results in clinically visible defects but also alters the physical properties of the remaining dental structure, significantly reducing its microhardness and making the softened surface more susceptible to mechanical impacts, such as attrition and abrasion [2].

According to the etiology of erosive tooth wear, which refers to acid exposure, risk groups for lesion development can be identified. Determining the main risk groups for the development and prevalence of erosive tooth wear is important for the appropriate management of this condition. Gastric juice (pH 1-3) is the only intrinsic acid source, which can reach the oral cavity during vomiting or reflux episodes [7,8] and is frequently associated with erosive defects. A single episode of acid reflux into the oral cavity does not lead to a pathological condition. However, if reflux episodes occur regularly over a long period, it is defined as gastroesophageal reflux disease (GERD), and the risk of developing erosive tooth wear increases [8]. Additionally, eating disorders such as anorexia nervosa (AN), bulimia nervosa (BN), and eating disorders not otherwise specified (EDNOS), including restrictive food choice and induced vomiting, can also potentiate erosive tooth wear [2,8]. For these reasons, individuals with conditions such as gastroesophageal reflux disease and eating disorders (AN, BN, EDNOS) are examples of risk groups for erosive tooth wear [2].

On the other hand, there are various sources of extrinsic acids [2]. Dietary habits such as regular consumption of acidic beverages and foods (sports drinks, sodas, juices), special diets (vegetarian, vegan, or raw food diets), or regular intake of medications (such as asthma patients), dietary supplements, substance abuse, and alcohol can also increase the risk of developing erosive tooth wear [2,8]. Furthermore, the same applies to individuals with regular occupational acid exposure, such as battery factory workers, professional swimmers, and wine tasters [2,8].

In the literature, several reviews can be found on erosive tooth wear focusing on the general population, including children, adolescents, and adults without a specific risk factor [9,10], in which the prevalence was 30.4% and 39.64% respectivaly. However, no systematic reviews that emphasize the prevalence of this issue in specific high-risk groups have been found. Therefore, the relevance of this study lies in conducting a systematic literature review with the primary objective of determining the prevalence of erosive tooth wear among individuals from different risk groups, including: individuals with gastroesophageal reflux disease, eating disorders, acidic beverages, special diets, drugs and alcohol disorders, legal drugs and medication, occupational and sports predisposing factors [1,2,8].

2. MATERIAL AND METHODS

2.1. Study Design

The protocol for this systematic review was written and registered on PROSPERO (registration number: CRD42021270150) and is available at the following link: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42021270150. The review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Guidelines (Appendix 1).

2.2. Review Question

The search was conducted based on the clinical question of "In human patients, what is the prevalence of erosive dental wear in erosive-risk groups?" formulated using the PECO strategy. This research question is classified as a cross-sectional study design, where the patients or target population (P) was Human patients, exposure (E) was erosive-risk and the outcome of the study (O) was the prevalence of erosive tooth wear. In this case, control (C) does not apply.

2.3. Search Strategy

The literature was systematically searched to identify studies examining the prevalence of erosive tooth wear in risk group patients, such as gastroesophageal reflux, eating disorders, consumption of acidic beverages, special diets, drugs and alcohol disorders, legal drugs and medication and occupational or sports-related factors. The following databases were searched: PubMed/MEDLINE, LILACS/BVS,

EMBASE, SciELO, Web of Science, Scopus, Cochrane Library, Science Direct, Open Grey, Ibict/BDTD, Google Scholar, ProQuest, as well as theses and dissertations. The search terms were combined using the Boolean operators "OR" and "AND," as outlined in Appendix 2 and adapted for each specific database. The search was conducted on April 12, 2024.

2.4. Eligibility Criteria

The criteria for including a paper in this systematic review were original observational studies performed in children and adults from the high-risk groups (gastroesophageal reflux, eating disorders, alimentary habits, special diets, drugs and alcohol disorders, legal drugs or medications, and occupational or sports-related factors) and provide data on prevalence rates or data that could be used to calculate the prevalence of erosive dental wear, regardless of the index used. Studies published until April 2024 will be included and no language limits were set.

2.5. Selection of Studies

After performing the search strategy in each database, the records were imported into the EndNote Web (2024 Clarivate) reference manager for organization and duplicate removal. Two reviewers (Reviewer GGD and Reviewer DSM) independently and separately conducted the study selection in two phases. In the first phase, titles and abstracts were screened (Phase 1). Potentially eligible studies that met the inclusion criteria were taken to the next step of full-text reading (Phase 2). Any disagreements were discussed with a third reviewer (Reviewer DRH) until a consensus was reached. Kappa (κ) statistics was used to evaluate the degree of agreement between both reviewers yielding a result of 0.68 (percentage agreement 93.79%).

2.6. Data Extraction

Both reviewers extracted relevant data from the selected articles and organized them into tables. Only the information provided in the articles was considered. The extracted information include prevalence (%) data of erosive tooth wear, the index used for diagnosing erosive tooth wear, classification of the high-risk group, number of patients evaluated in the study, population characteristics (age, gender), author's information, and year of publication.

Data extraction from the studies is available in Appendix 3.

2.7 Assessment of Quality

For the risk of bias analysis of the included primary studies, the Joanna Briggs Institute's (JBI) Prevalence Data Critical Appraisal Tool was employed and analysed by reviewer GGD. The JBI quality assessment instruments aim to evaluate the methodology used in the included study and determine the potential for bias in its design, conduct, and analysis [11].

The tool consists of nine questions that assess the study sample's structure, how it was calculated and selected, outcome description and evaluation, whether the assessment was conducted in a standardized manner, and participant response rate. Responses should then be assigned for each item in each study, regardless of its design, to judge the methodological quality [11].

2.8 Data analysis

A narrative synthesis of the included study's data was conducted in the present study. It was structured around the investigated condition (erosive tooth wear) and characteristics of the target population (reflux gastroesophageal, eating disorders, acidic beverages, special diets, drugs and alcohol disorders, legal drugs or medications, and occupational or sports-related factors). A meta-analysis was performed using the Comprehensive Meta-Analysis software. A random-effects model and a significance level of 5% were considered. In case of significant heterogeneity among the studies, subgroup analyses were performed based on the diagnostic index by mixed-effects models and were conducted for each high-risk group and the methodological variable: gastroesophageal reflux disease, eating disorders, acidic beverages, special diets, legal drugs or medications, and occupational or sports-related factors.

3. RESULTS

It was found 4403 articles in the search, of which 749 were duplicates. Therefore, 3654 articles were selected for Phase 1. After Phase 1 of reading titles and abstracts, 319 articles were selected for Phase 2 of full-text Reading. During Phase 2, 148 articles were selected for data extraction (Figure 1 - PRISMA Flowchart). The characteristics of the studies were mentioned in Appendix 3.

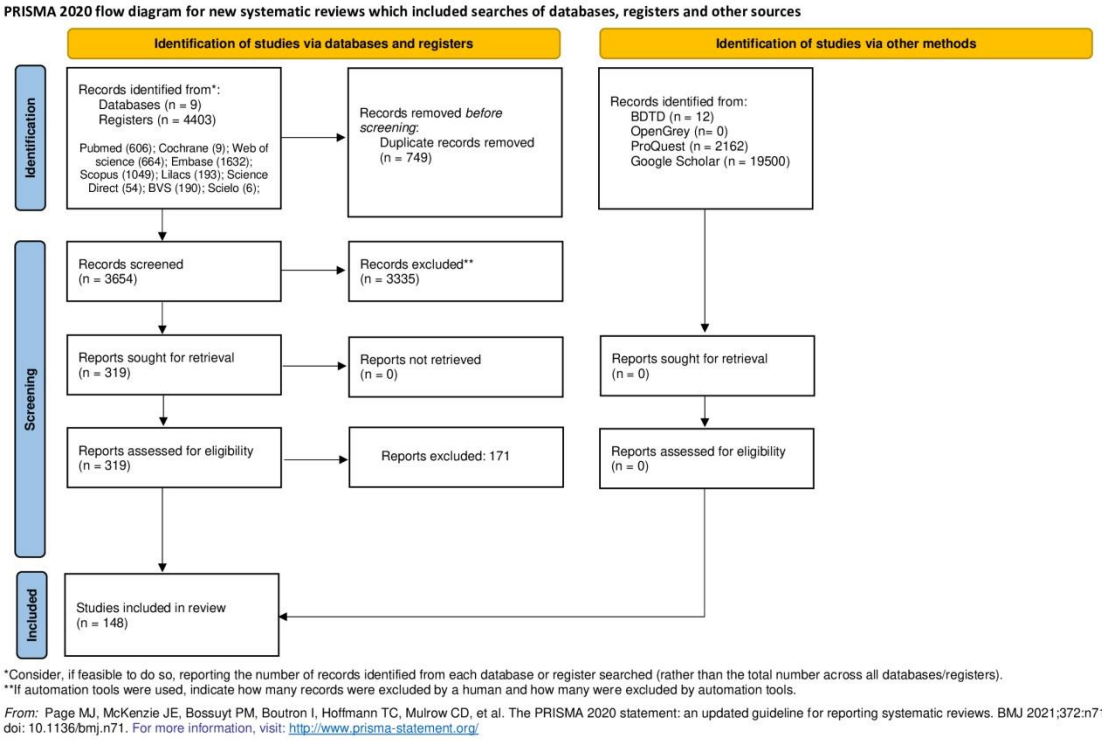

Figure 1 – PRISMA flowchart

3.1. Gastroesophageal Reflux Disease

A total of 36 articles were selected to assess the prevalence of erosive tooth wear in the GERD group (Fig. 3), revealing an overall prevalence of 54.1% in the random model [CI 95% = 0,43 a 0,64; heterogeneity: I^2 = 95,71%; TAU = 1,22; Q test = 815,96 (p<0,000) (Table 1)]. In the subgroup analysis based on the indices used, we obtained a value of 82% for the BEWE index; 59% for the Eccles and Jenkins Index; 63% for Lussi's Index; 21% for the O'Sullivan Index; 49% for the Smith and Knight TWI; 35% for WHO (Fig. 4).

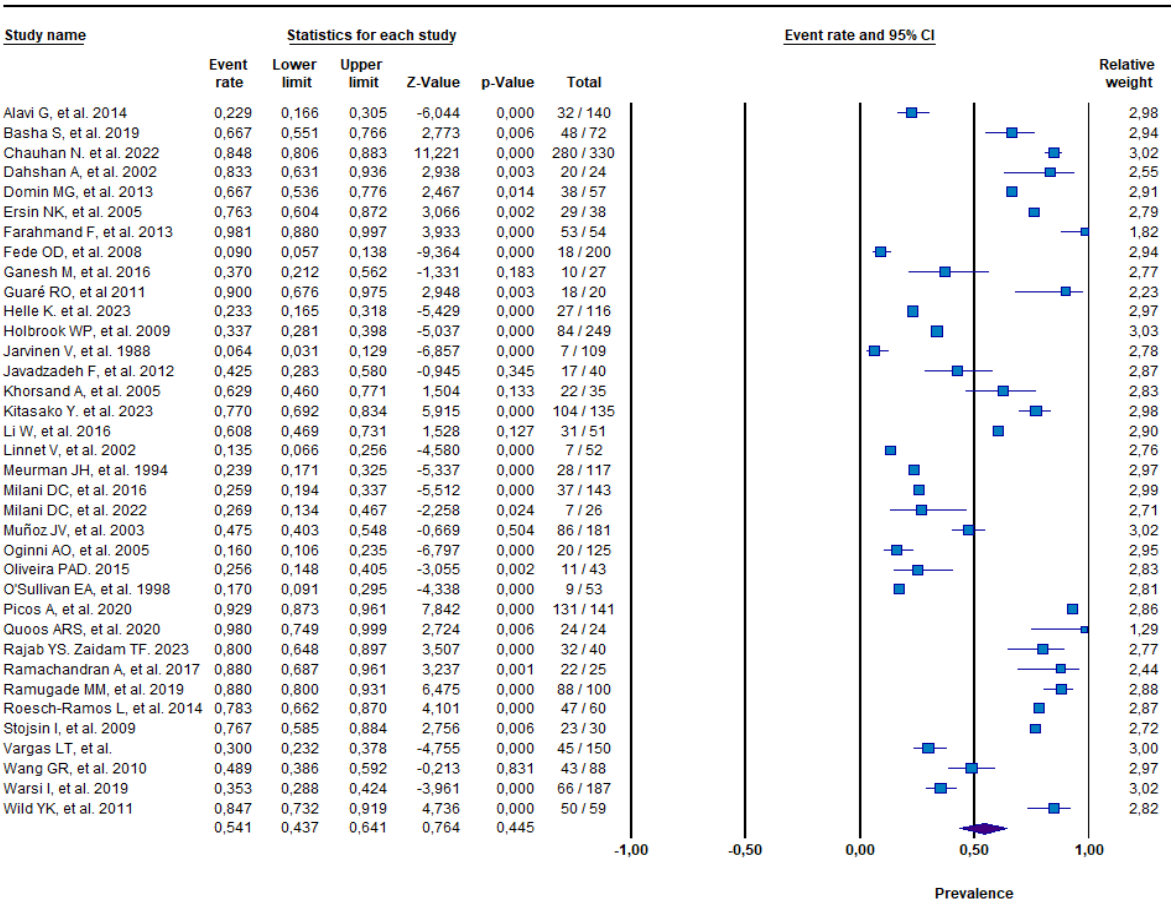

Figure 2 – GERD risk-group meta-analysis and forest plot in general analysis.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Model	Number studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Random	36	0,54	0,44	0,64	0,76	0,45	815,96	35	0	95,71	1,48	0,48	0,23	1,22

Table 1 – GERD summary of findings in general analysis.

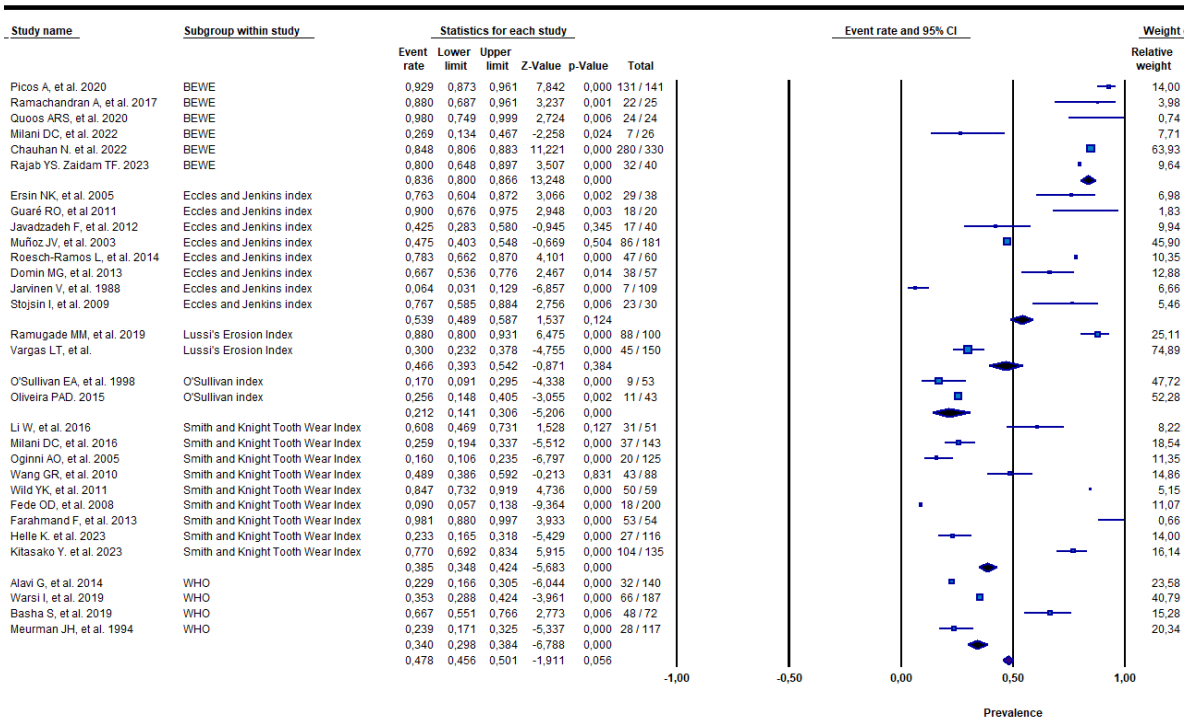

Figure 3 – GERD risk-group meta-analysis and forest plot in subgroup analysis.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Group	Number studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed effect analysis														
BEWE	6	0,83	0,8	0,86	13,24	0	47,19	5	0	89,4	1,14	1,04	1,09	1,07
Eccles and Jenkins	8	0,53	0,39	0,58	1,53	0,12	94,585	7	0	92,60	1,20	0,86	0,73	1,09
Lussi's	2	0,466	0,39	0,54	-0,87	0,38	63,776	1	0	98,43	3,97	5,70	32,51	1,99
O'Sullivan	2	0,21	14	0,3	-5,2	0	1,053	1	0,3	5,01	0,01	0,19	0,04	0,08
Smith and Knight	9	0,38	0,34	0,42	-5,68	0	236,708	8	0	96,62	1,17	1,19	1,41	1,34
WHO	4	0,34	0,29	0,38	-6,78	0	42,31	3	0	92,91	0,53	0,48	0,23	0,73
Total within							485,628	25	0					
Total between							280,445	5	0					
Overall	31	0,47	0,45	0,5	-1,91	0,05	766,073	30	0	96,08	1,64	0,55	0,30	1,28
Mixed effects analysis														
BEWE	6	0,82	0,64	0,92	3,13	0								
Eccles and Jenkins	8	0,59	0,39	0,76	0,91	0,36								
Lussi's	2	0,63	0,09	0,96	0,39	0,69								
O'Sullivan	2	0,21	0,13	0,3	-5,07	0								
Smith and Knight	9	0,49	0,27	0,7	-0,09	0,92								
WHO	4	0,35	0,21	0,53	-1,54	0,12								
Total between							32,89	5	0,103					
Overall	31	0,4	0,32	0,47	-2,46	0,01								

Table 2 – GERD summary of findings in subgroup analysis.

3.2. Eating Disorders

For this risk group, we found a total of 18 articles and a prevalence of 65% in the random model (Fig. 5), [CI 95% = 0,51 a 0,77; heterogeneity: I^2 = 93,65%; TAU =

1,18; Q test = 267,91 (p<,000) (Table 3)]. For the subgroup analysis, we obtained a value of 61% for the BEWE index; and 36% for the O'Sullivan index (Fig. 6).

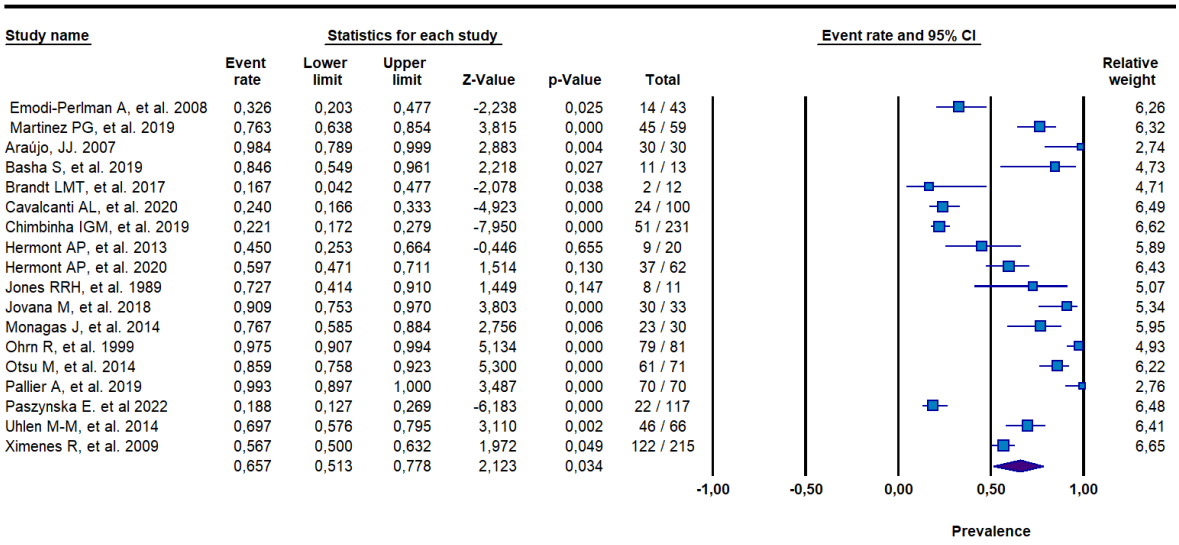

Figure 4 – ED risk-group meta-analysis and forest plot in general analisys.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Model	Number studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Random	18	0,65	0,51	0,77	2,12	0,03	267,91	17	0	93,65	1,39	0,74	0,55	1,18

Table 3 – ED summary of findings in general analysis.

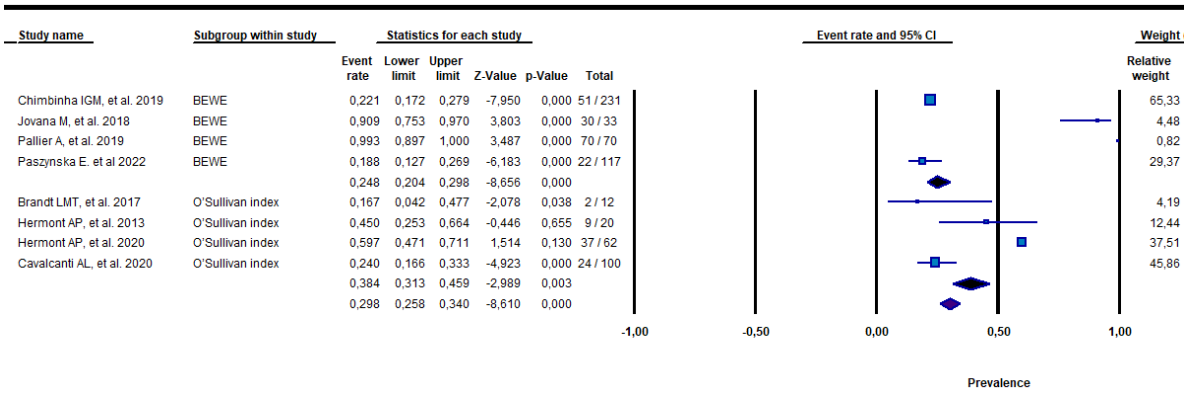

Figure 5 – ED risk-group meta-analysis and forest plot in subgroup analysis.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Group	Number studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed effect analysis														
BEWE	4	0,24	0,2	0,29	-8,65	0	53,11	3	0	94,35	1,69	2,11	4,46	1,30
O'Sullivan	4	0,38	0,31	0,46	-2,99	0	22,11	3	0	86,43	0,76	0,85	0,71	0,87
Total within							75,22	6	0					
Total between							9,72	1	0					
Overall	8	0,29	0,25	0,34	-8,61	0	84,95	7	0	91,76	1,02	0,79	0,62	1,01
Mixed effects analysis														
BEWE	4	0,61	0,27	0,86	0,64	0,52								
O'Sullivan	4	0,36	0,18	0,59	-1,13	0,25								
Total between							1,35	1	0,24					
Overall	8	0,44	0,26	0,63	-0,58	0,055								

Table 4 – ED summary of findings in subgroup analysis.

3.3. Special Diet

In this group, we selected 7 articles and found a prevalence of 65.9% in the random model (Fig. 7) [CI 95% = 0,44 a 0,82; heterogeneity: I^2 = 96,88%; TAU = 1,089; Q test = 192,31 (p<,000) (Table 5)]. Due to the absence of standardized indices used in the found studies, a subgroup analysis could not be conducted.

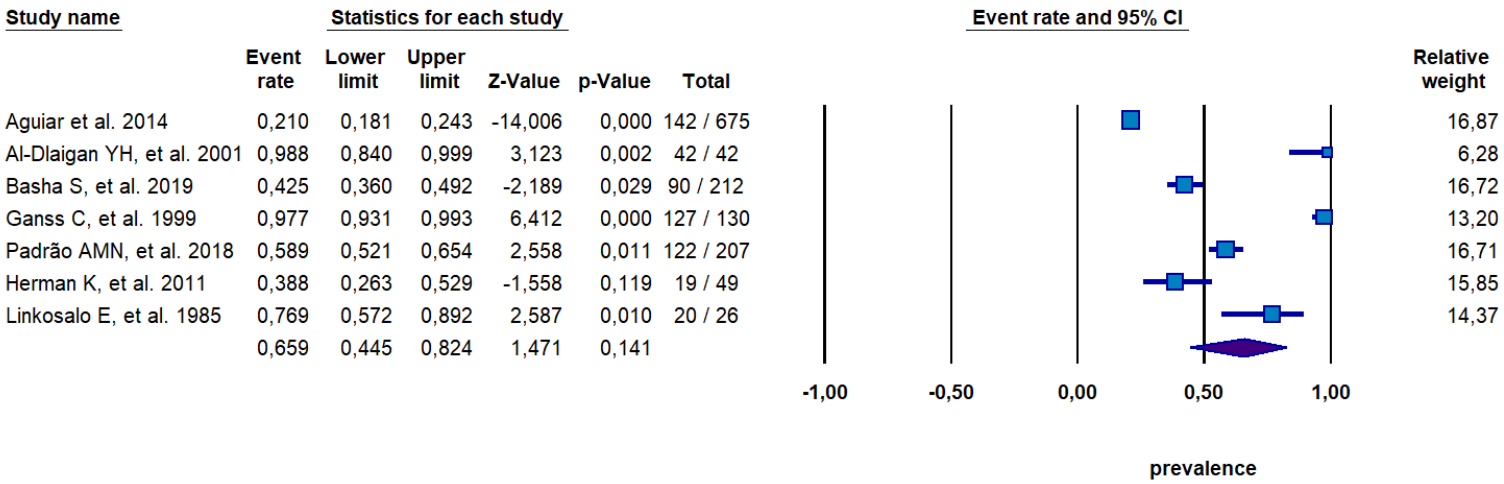

Figure 6 – Special Diet risk-group meta-analysis and forest plot in general analysis.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Model	Number studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Random	7	0,65	0,44	0,82	1,47	0,14	192,31	6	0	96,88	1,18	1,05	1,11	1,08

Table 5 – Special Diet summary of findings in general analysis.

3.4. Acidic Beverages

We found a total of 60 articles and a prevalence of 40% in the random model (Fig. 8) [CI 95% = 0,34 a 0,46; heterogeneity: I^2 = 98,93%; TAU = 1; Q test = 5531,359 (p<,000) (Table 6)]. In the subgroup analysis, the index most used was BEWE with 17 studies and a value of 51%, followed by Smith and Knight TWI 48% with 7 studies and Lussi's index 32% with 6 studies, O'Brien 21% and Eccles and Jenckins 33% with 4 studies, O'Sullivan 40% with 3 studies.

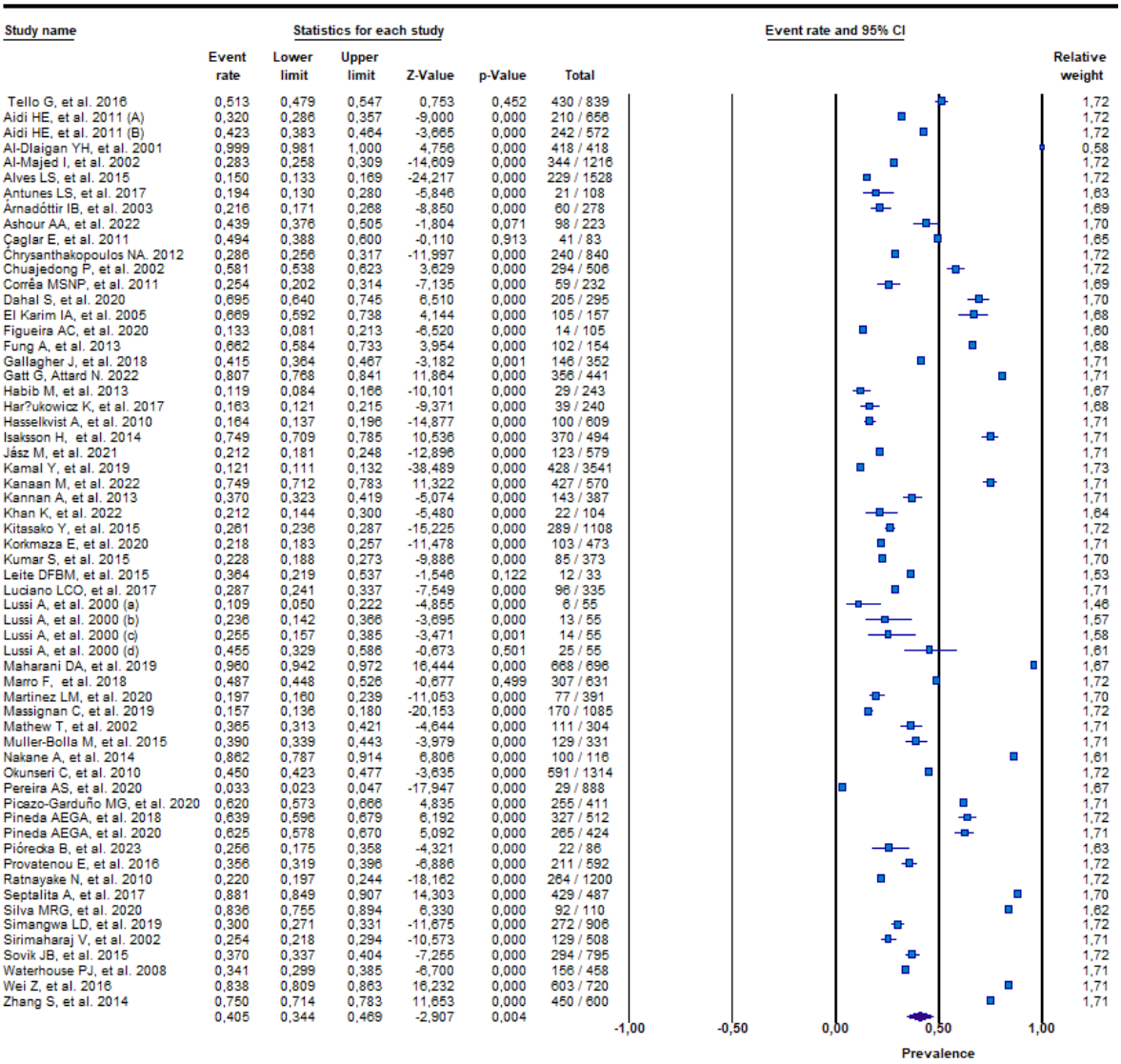

Figure 7 – Acidic Beverages risk-group meta-analysis and forest plot in general analysis.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Model	Number studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Random	60	0,4	0,34	0,46	-2,9	0	5531,359	59	0	98,93	1,01	0,24	0,06	1

Table 6 – Acidic Beverages summary of findings in general analysis.

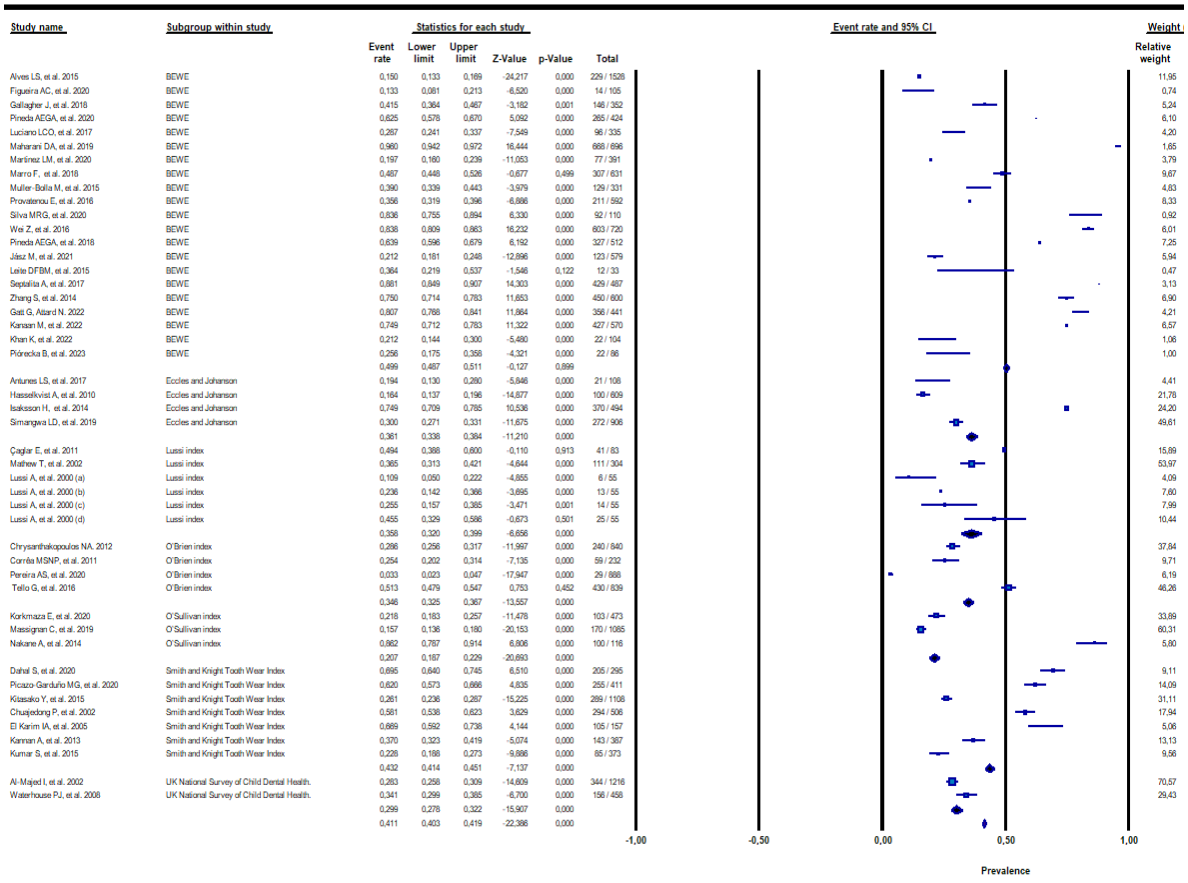

Figure 8 – Acidic Beverages risk-group meta-analysis and forest plot in subgroup analysis.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Group	Number studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed effect analysis														
BEWE	21	0,49	0,48	0,51	-0,12	0,89	2346,86	20	0	99,14	1,53	0,57	0,33	1,23
Eccles and Jenkins	4	0,36	0,34	0,38	-11,21	0	377,13	3	0	99,21	1,51	1,43	2,06	1,23
Lussi's	6	0,36	0,32	0,40	-6,66	0	27,01	5	0	81,49	0,26	0,23	0,05	0,51
O'Brien	4	0,35	0,33	0,37	-13,56	0	333,72	3	0	99,10	1,16	1,17	1,37	1,08
O'Sullivan	3	0,21	0,19	0,23	-20,69	0	156,01	2	0	98,72	1,25	1,53	2,34	1,12
Smith and Knight	7	0,43	0,41	0,45	-7,14	0	400,43	6	0	98,50	0,71	0,46	0,21	0,84
UK National	2	0,29	0,27	0,32	-15,90	0	5,27	1	0,02	81,04	0,02	0,05	0,00	0,17
Total within							3646,43	40	0					
Total between							584,81	6	0					
Mixed effects analysis														
BEWE	21	0,51	0,38	0,64	0,28	0,77								
Eccles and Jenkins	4	0,33	0,13	0,63	-1,12	0,26								
Lussi's	6	0,32	0,23	0,42	-3,25	0,00								
O'Brien	4	0,21	0,08	0,44	-2,43	0,02								
O'Sullivan	3	0,40	0,16	0,70	-0,63	0,53								
Smith and Knight	7	0,48	0,33	0,64	-0,21	0,83								
Total between							13,6	6	0,03					
Overall	47	0,34	0,3	0,39	-6,37	0								

Table 7 – Acidic Beverages summary of findings in subgroup analysis.

3.5. Drugs and Alcohol Disorders

A total of 11 articles were selected and it was found a prevalence of 67% in the random model (Fig. 10) [CI 95% = 0,54 a 0,77; heterogeneity: I^2 = 93,73 %; TAU

=0,71; Q test = 159,53 (p<,000) (Table 8)]. In the subgroup analysis we have found 71% for the Eccles and Jenkins index; and 72% for Smith & Knight Tooth Wear index (Fig. 11).

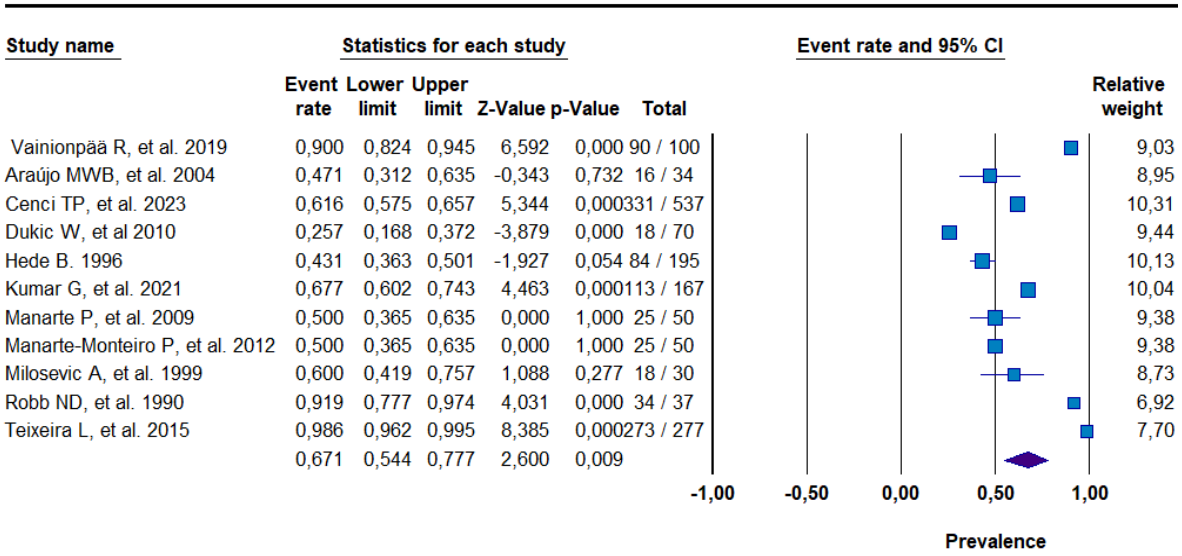

Figure 9 – Drugs and Alcohol Disorders risk-group meta-analysis and forest plot in general analysis.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Model	Number studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Random	11	0,67	0,54	0,77	2,6	0	159,53	10	0	93,73	0,71	0,5	0,25	0,84

Table 8 – Drugs and Alcohol Disorders summary of findings in general analysis.

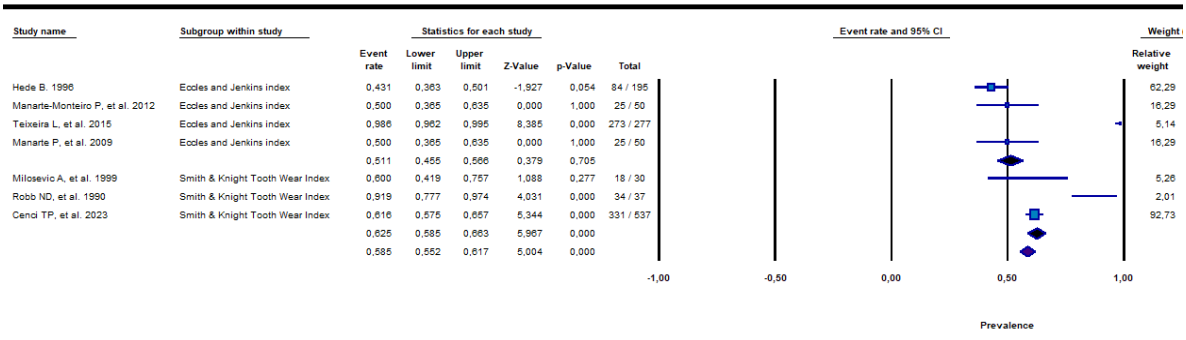

Figure 10 – Drugs and Alcohol Disorders risk-group meta-analysis and forest plot in subgroup analysis.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Group	Number studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed effect analysis														
Eccles and Jenkins	4	51,00	0,45	0,56	0,37	0,70	73,88	3	0	95,93	1,66	1,62	2,64	1,28
Smith and Knight	3	0,62	0,59	0,66	5,96	0,00	10,38	2	0	80,73	0,44	0,61	0,38	0,66
Total within							84,26	5	0					
Total between							10,71	1	0					
Overall	7	0,58	0,55	0,61	5,00	0,00	94,97	6	0	93,68	0,7	0,65	0,42	0,84
Mixed effects analysis														
Eccles and Jenkins	4	0,71	0,40	0,90	1,36	0,18								
Smith and Knight	3	0,72	0,51	0,85	2,08	0,03								
Total between							0	1	0,98					
Overall	7	0,71	0,54	0,83	2,48	0,01								

Table 9 – Drugs and Alcohol Disorders summary of findings in subgroup analysis.

3.6. Legal Drugs and Medications

For this group we have found 11 articles, the prevalence was 30% (Fig 12) [CI 95% = 0,16 a 0,48; heterogeneity: I^2 = 99,22%; TAU = 1,31; Q test = 1289,4 (p<,000) (Table 10)]. The subgroup analysis showed 28% for BEWE; 52% for Children's Dental Health in the UK Survey 1990 index; 24% for Smith and Knight TWI (Fig 13).

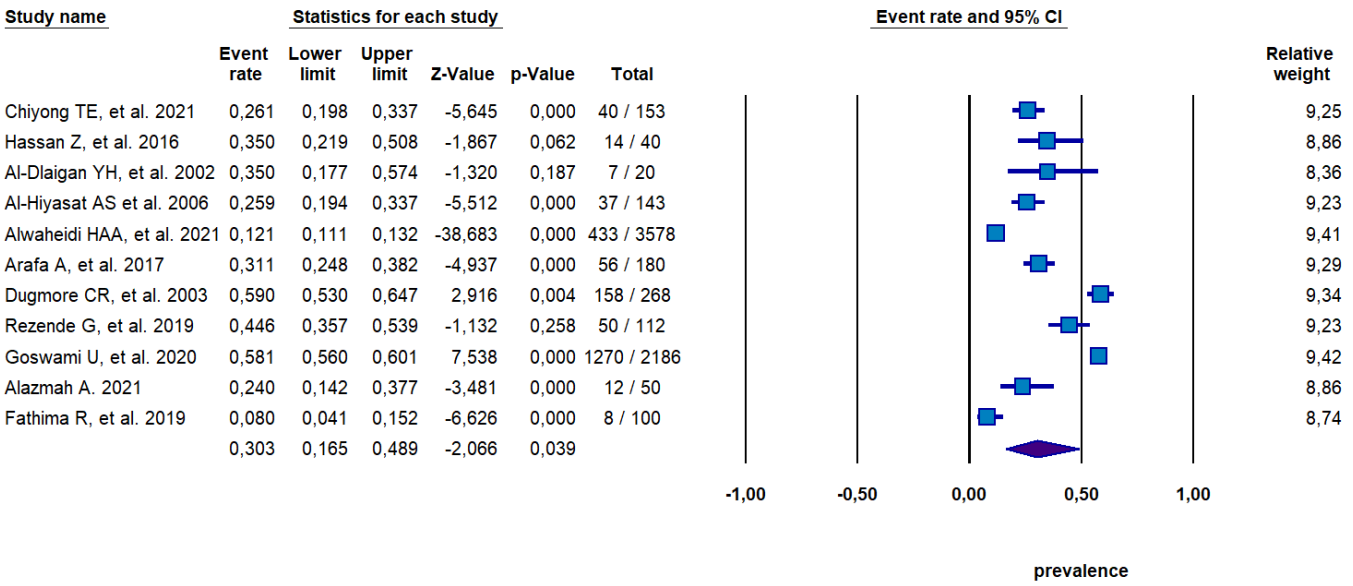

Figure 11 – Legal drugs and Medications risk-group meta-analysis and forest plot in general analysis.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Model	Number studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Random	11	0,30	0,16	0,48	-2,06	0,03	1289,4	10	0	99,22	1,71	1,53	2,35	1,31

Table 10 – Legal drugs and Medications summary of findings in general analysis.

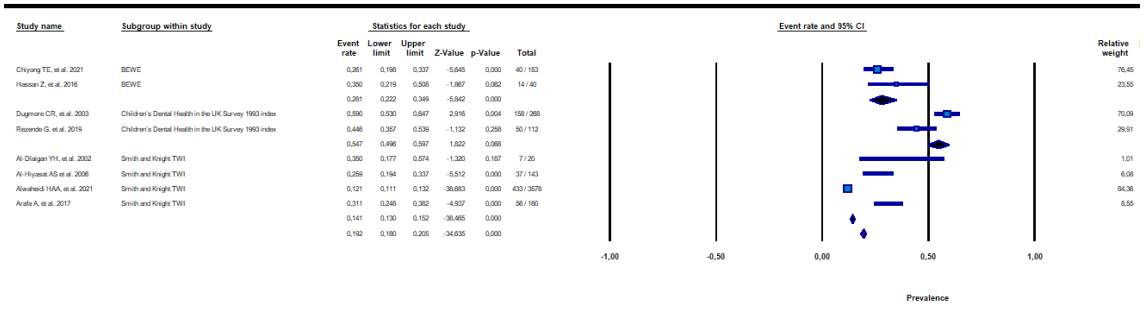

Figure 12 – Legal drugs and Medications risk-group meta-analysis and forest plot in subgroup analysis.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Group	Number studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed effect analysis														
BEWE	2	0,28	0,22	0,34	-5,84	0	1,22	1	0,269	18,30	0,01	0,12	0,01	0,12
Children's UK	2	0,54	0,49	0,59	1,82	0,06	6,46	1	0,011	84,52	0,14	0,23	0,05	0,37
Smith and Knight	4	0,14	0,13	0,15	-38,46	0	73,30	3	0	95,90	0,56	0,60	0,37	0,75
Total within							80,99	5	0					
Total between							317,41	2	0					
Overall	8	0,19	0,18	0,20	-34,63	0	398,40	7	0	98,24	1,22	0,96	0,93	1,10
Mixed effects analysis														
BEWE	2	0,28	0,21	0,36	-4,86	0								
Children's UK	2	0,52	0,38	0,65	0,31	0,75								
Smith and Knight	4	0,24	0,12	0,40	-2,92	0,00								
Total between							10,21	2	0,00					
Overall	8	0,33	0,27	0,40	-4,69	0								

Table 11 – Legal drugs and Medications summary of findings in subgroup analysis.

3.7. Occupacional and Sports

We have selected 9 articles for this risk group, the prevalence found was 51% (Fig 13) [CI 95% = 0,37 a 0,65; heterogeneity: I^2 = 93,38 %; TAU = 0,84; Q test = 120,92 (p<,000) (Table 12)]. For the subgroup analysis we have found 32% for Lussi's index; 41% for WHO (Fig 14).

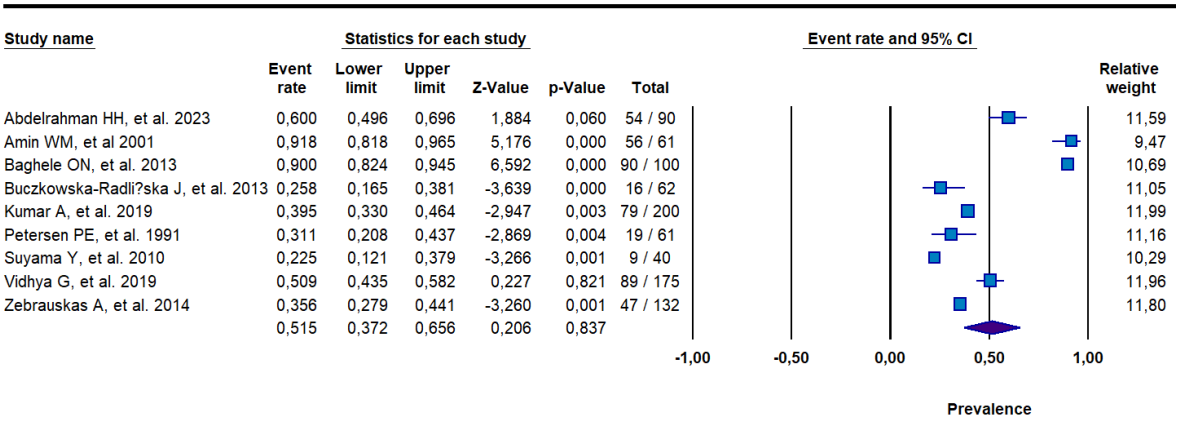

Figure 13 – Occupacional and Sports risk-group meta-analysis and forest plot in general analysis.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Model	Number studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Random	9	0,51	0,37	0,65	0,2	0,83	120,92	8	0	93,38	0,72	0,46	0,21	0,84

Table 12 – Occupacional and Sports summary of findings in general analysis.

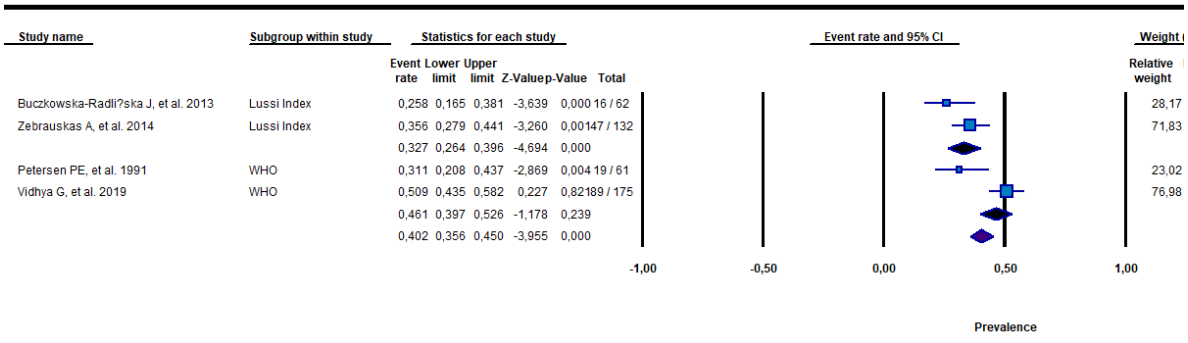

Figure 14 – Occupacional and Sports risk-group meta-analysis and forest plot in subgroup analisys.

Model		Effect size and 95% interval			Test of null (2-Tail)		Heterogeneity				Tau-squared			
Group	Number studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed effect analysis														
Lussi's	2	0,32	0,26	0,39	-4,69	0,00	1,83	1	0,17	45,42	0,04	0,15	0,02	0,22
WHO	2	0,46	0,40	0,53	-1,18	0,24	6,90	1	0,01	85,50	0,29	0,48	0,23	0,54
Total within							8,72	2	0,01					
Total between							7,77	1	0,01					
Overall	4	0,40	0,36	0,45	-3,96	0,00	16,50	3	0,00	81,82	0,20	0,21	0,05	0,45
Mixed effects analysis														
Lussi's	2	0,32	0,23	0,42	-3,42	0,00								
WHO	2	0,41	0,24	0,61	-0,84	0,40								
Total between							0,806	1	0,37					
Overall	4	0,34	0,26	0,43	-3,40	0,00								

Table 13 – Ocupacional and Sports summary of findings in subgroup analysis.

3.8. Risk of bias

Figure 15 summarizes the assessment of bias risk by item using the Prevalence Data Critical Appraisal Tool, respectively, which can be analyzed by study in Appendix 4.

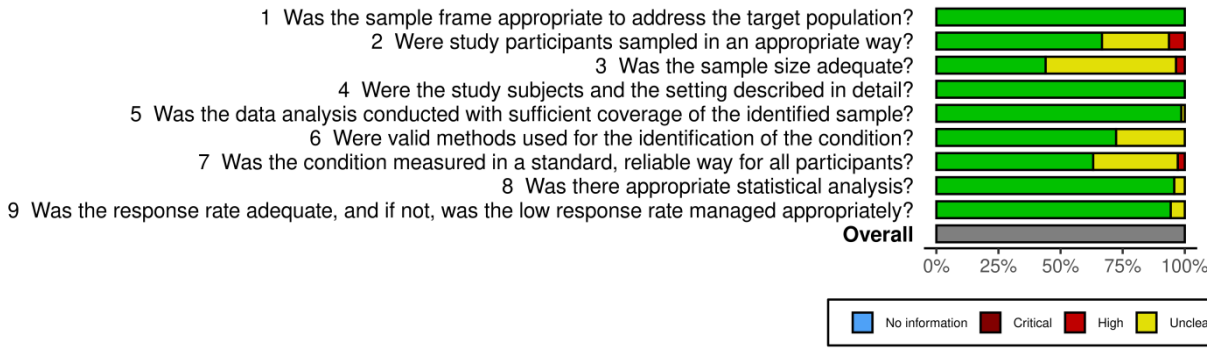

Figure 15 – Weighted bar plots of the distribution of risk-of-bias judgments within each bias domain.

The first item of the tool is "Was the sample frame appropriate to address the target population?". To answer this item, the general characteristics of the population fitting into the risk groups were used as parameters. This item had a low risk of bias, as all included studies fell within one of the studied risk groups.

For item two, "Were study participants sampled appropriately?", the criterion used for evaluation was the type of sampling chosen by the authors, as well as its detailed description. Accordingly, 9 included studies used convenience sampling, posing a high risk of bias in participant selection. Additionally, 38 studies were unclear regarding sample selection.

Concerning item three, "Was the sample size adequate?", the parameter for low bias risk was a description of the sample size calculation for the study. Five studies were considered to have a high risk of bias, and 74 studies did not provide information on the item.

The fourth item, "Were the study subjects and the setting described in detail?", was assessed as low risk of bias when the sample was described in sufficient detail to characterize the target population. Therefore, all studies had a low risk of bias.

The evaluation criterion for item five, "Was the data analysis conducted with sufficient coverage of the identified sample?", was the participant dropout or refusal rate, along with whether the reasons were described by the authors and if the lack of response could have altered prevalence. Taking this into consideration, 2 studies inadequately explained the dropout rate.

In item six, "Were valid methods used for the identification of the condition?", studies were assessed as "yes" when validated diagnostic methods were used to assess outcomes. Among the included works, 39 rarely employed indices or modifications that did not allow for direct comparability between studies.

To address item seven, "Was the condition measured in a standard, reliable way for all participants?", the evaluation considered whether the study described the method used to measure the condition, if the method was validated, and if there was calibration or training of assessors. In this case, 4 studies did not present a calibration method and were therefore selected with a high risk of bias, while 48 studies were unclear about whether there was a calibration method.

The criterion applied to answer "yes" to item eight, "Was there appropriate statistical analysis?", was the detailed description of the statistics used to extract data

for percentage calculations and confidence interval estimation. Six studies inadequately presented this section.

The last item in the tool is "Was the response rate adequate, and if not, was the low response rate managed appropriately?". In this item, the dropout rate, how it was described, the reasons, and whether there were reasons unrelated to the outcome were considered. Of the included studies, 8 did not provide a detailed description of the response rate.

4. DISCUSSION

Dental tissue is exposed to a combination of chemical and mechanical factors throughout life, which can lead to tooth wear [2,5]. Some degree of physiological tooth wear is expected throughout one's life, however, dental wear can be considered pathological when it goes beyond the physiological level relative to the individual's age and interferes with their well-being [5]. In this context, erosive tooth wear (ETW) is identified as a form of tooth wear in which dental erosion serves as the principal etiological factor [5]. Although this condition is multifactorial, the frequency of acid exposure plays a crucial role in increasing the risk of erosion development [2].

On the other hand, individual protective factors can also have an impact on ETW. Saliva is an important biological protective agent for diluting and buffering erosive substances and for the formation of the acquired enamel pellicle (AEP) [7,162,163]. During erosive challenges, the AEP is not entirely removed from the enamel surface, thus inhibiting the acidic effects on dental tissue [6]. This protective ability against acid dissolution is attributed to the protein composition of the AEP [164], which exhibits individual characteristics [7] and could explain why a group of individuals exposed to the same risk factor exhibits varying degrees or none of erosive tooth wear.

The main challenge of this systematic review was the compilation of epidemiological studies covering all these risk groups. The assessment and interpretation of ETW and its diagnosis proved to be highly heterogeneous processes on a global scale, resulting in a lack of direct comparability between the prevalences reported in different studies. This discrepancy emerged as the central issue in this review, as the included studies employed distinct indices for diagnosing ETW. Another important consideration is that in most cases, an individual may belong to more than one risk group. The association of multiple risk factors is quite common,

making it challenging to conduct a precise analysis of each risk group in isolation. Additionally, substantial variations were observed among the studies regarding the selection of the studied populations, age ranges involved, the number of examiners, and the diagnostic criteria used, adding further complexity to the analysis of the data obtained.

The age factor may have also contributed to the significant heterogeneity of the included data. Many studies provided data analyzed across a wide age range, spanning from children to elderly individuals, and, as previously mentioned, it is expected that older individuals exhibit a certain degree of physiological ETW. Consequently, they may have been included in these studies as pathological ETW, thus influencing the final outcome.

It is essential to mention about differences between indices used in primary studies and their implications for the outcomes. Various índices are available in the literature for evaluating ETW. Each index has unique characteristics and assessment methods, contributing to diverse severity patterns and resulting in variability in ETW prevalence estimates. In Bardsley PF [162] literature review, he details the characteristics of various indices, addressing their qualitative and quantitative natures. In his article, he highlights that the Eccles index, was one of the pioneers, initially classifying lesions broadly without rigid criteria, allowing for a comprehensive interpretation of erosive wear. The O'Sullivan index, on the other hand, also assesses the prevalence of dental erosion by considering criteria such as location, severity, and affected surface area [9,162], but specifically in children. The Smith and Knight TWI index, introduced with a more comprehensive concept, measures not only dental erosion but encompasses multifactorial conditions, including different types of dental wear such as abrasion and attrition. In Salas MMS [9] study, a meta-regression analysis was conducted, revealing that the TWI index has the highest prevalence rates, being 100% greater than those observed with the O'Sullivan index, this was attributed to its comprehensive evaluation of overall wear. Among other proposed indices to measure dental wear, the Lussi index stands out, widely used in European studies to score the facial, lingual, and occlusal surfaces of all teeth except third molars, originating from the modification of the Linkosalo and Markkanen index [162]. The BEWE is one of the latest proposed indices recording multifactorial conditions as ETW with a score of dental wear, among four levels of scoring, in each evaluated sextant. There is no ideal index that can be used for all types of studies;

each has its strengths and weaknesses. However, the adoption of standardized research methods is important to minimize heterogeneity in results, enabling a more direct analysis and comparison between studies. Thus, BEWE index may be an excellent choice for standardization as its aims to be a simple, reproducible, and transferable scoring system.

Considering strategies to enhance future research and generate strong scientific evidence, the BEWE index may represent an outstanding option for standardization as its objective is to serve as a straightforward, replicable, and universally applicable scoring system. Furthermore, it underscores the importance of conducting studies with narrower age ranges to mitigate the risk of overestimating DDE prevalence data.

4.1. Risk of bias.

Using the JBI critical appraisal checklist for prevalence studies, the risk of bias in each included study was evaluated and reported in Appendix 4. Studies with a score of 70% and above were considered to have a low risk of bias, while studies with a score of 50–69% and below 50% were considered to have moderate and high risk of bias, respectively. The majority of ítems showed low risk; however, some deserve special attention.

The second item presented a moderate risk of bias with a score of 65.7% and, the third, a high risk of 42.34%. Both items are related to the sample size, if the participants were sampled appropriately and had an adequate size respectively, a factor that might have negatively influenced the representativeness of the population and directly affected the prevalence rate of the studies.

In concerns about valid methods used for the identification of ETW (item 6), it presented a low risk of bias at 71.5%, however, nearly at the borderline between low and moderate risk, reinforcing the variability of indices found in the literature that did not exhibit compatibility with each other for study comparison. In addition, item 7 evaluated the standardization of measures and whether it was reliably executed in the studies and showed a moderate risk of bias with a 62.1% rate. This is very important because a study without training and calibration may raise doubts about the reliability of the results.

4.2. Gastroesophageal reflux disease

Gastroesophageal reflux disease (GERD) is characterized by the regular backflow of gastroduodenal contents into the esophagus, occasionally reaching the oral cavity [7,8]. The isolated occurrence of episodes of acid reflux in the oral cavity does not constitute a pathological condition; however, the regular and prolonged presence of these episodes is indicative of GERD. Chronic reflux, when accompanied by symptoms, is easily diagnosed in the general population, but silent (asymptomatic) reflux often goes unnoticed, carrying a high potential risk for dental erosion [2,8].

Martini T [7] observed changes in the proteomic profile of the acquired enamel pellicle in patients with gastroesophageal reflux disease, whether or not they had ETW. Consequently, some individuals showed these protective factors reduced or absent and, as a result, it was concluded that the increased presence of certain proteins in the AEP acted as a protective factor against ETW, leading to varying levels of risk for enamel lesions among individuals within the same ETW risk group.The meta-analysis of the studies included in this review revealed a prevalence of dental erosion of 54% in the general population diagnosed with GERD. Most studies showed that the presence of GERD contributed to ETW, increasing the risk of oral disease in affected individuals. The most commonly used index in the studies selected for this group the Smith and Knight TWI index (9 studies included) with a prevalence of 49% prevalence in the subgroup analysis, followed by Eccles and Jenkins' index (8 studies included), which obtained a 59% in the subgroup analysis.

Biologically plausible explanations for the increased risk of erosive dental wear in individuals with GERD found in the literature involve repeated exposure to gastric acid over an extended period, which can dissolve dental enamel [7,166,167]. It is important to emphasize the mechanical association, such as tooth brushing, with ETW in this risk group, as gastric acid has an unpleasant taste, prompting individuals to brush their teeth immediately after reflux or vomiting episodes [7]. Furthermore, the association of these patients with sleep bruxism exacerbates erosive defects, confirming the understanding that dental wear is a multifaceted condition involving multiple mechanisms, as mechanical wear is potentiated by chemical wear caused by extrinsic or intrinsic acids [164].

4.3. Eating Disorders

Eating disorders are psychiatric illnesses with a multifactorial etiology characterized by disruptions in eating behavior and associated with significant psychosocial impairment and systemic complications. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) [168], eating disorders are categorized as anorexia nervosa (AN), bulimia nervosa (BN), and eating disorders not otherwise specified (EDNOS). These conditions have the potential to increase the risk of dental erosion, as they impact food intake regulation through restrictive dietary choices and self-induced vomiting practices [2,8,169].

Previous research, such as that by Lourenço M [169], highlighted that patients with eating disorders exhibited elevated levels of xerostomia and hyposalivation. Recurrent episodes of self-induced vomiting, improper use of laxatives, diuretics, and/or appetite suppressants, coupled with excessive physical activity, could lead to prolonged dehydration and negatively affect saliva production and secretion. The association between reduced salivary flow rate diminished buffering capacity, and, consequently, a more acidic salivary pH in the oral microenvironment may further contribute to the risk of dental demineralization.

A meta-analysis of the studies included in this review revealed a prevalence of dental erosion of 65% in the general population. Subgroup analysis showed O'Sullivan's index (4 studies) with a prevalence of 36%, and BEWE index (4 studies) with a prevalence of 61%. This difference between prevalence rates may be explained by the different characteristics and assessment methods, O’Sullivan's index measures erosive wear, while the BEWE index is more comprehensive, assessing multifunctional wear (ETW) [162]. In addition, the age heterogeneity also may influence, the studies assessed using the O'Sullivan index, participants aged between 15-18 years, while in the BEWE index, the age ranged from 13 to 35 years.

It is important to note that the existing literature on the prevalence of ETW in individuals with eating disorders is limited, with most publications being case reports. The majority of prevalence studies only address a small number of cases, which may affect the validity of the conclusions. Nevertheless, these studies continue to emphasize a significant correlation between eating disorders and an increased risk of dental erosion compared to control groups.

4.4. Special Diets

Special diets such as vegetarianism and veganism are strongly associated with the consumption of fruits and raw foods [2, 170]. The literature indicates that a high frequency of fruit intake is a risk factor for dental erosion development [2]. Therefore, individuals practicing such diets, with high consumption of fruits and other acidic foods like raw foods, may increase the risk of ETW.

Ganss C [171] conducted a study on individuals following a raw food-based diet, in which the main dietary factors influencing the occurrence of ETW were the consumption of vinegar and pickled foods, citrus fruits, and acidic fruits, as also found in the work of Linkosalo E, Markkanen H. [170], who examined lacto-vegetarian diets.

In the literature, there is a lack of studies for this risk group, with only 7 studies found, and a prevalence of erosive dental wear of 65.9% in the general population was obtained. Subgroup analysis was not possible because there weren't studies with the same index matching for analysis. Each of the seven studies used a different index, preventing the grouping into subgroups.

The studies in the literature show a positive correlation between individuals on special diets and erosive dental wear. However, the lack of standardization in the collected data and the indices used hinders a precise analysis of this risk group.

4.5. Acidic Beverages

Acidic beverages are considered one of the most significant factors leading to erosive tooth wear, especially considering that the consumption of such beverages has increased significantly in recent decades, particularly among adolescents and young adults [2]. Furthermore, the frequency and duration of acid attacks, as well as the manner of consuming these beverages, influence the severity of erosive lesions, indicating a dose-response relationship (higher consumption puts dentition at greater risk) [2]. Thus, habits such as high frequency of consumption, rinsing, sipping, holding, or swishing the beverages in the mouth increase the risk of erosion development [8].

In the study by Maharani DA et al. [172] conducted in a group of 12-year-old children, there was a relationship between erosive tooth wear, consumption of acidic beverages, and the level of parental education and dental knowledge, which can affect their dietary acid intake decisions for the child. Therefore, less knowledge and lack of education can increase the risk of children suffering from erosive dental wear.

The study by Chrysanthakopoulos NA. [173] investigated erosive tooth wear associated with the consumption of acidic beverages in adults and concluded that the habit of holding and ingesting beverages in the mouth before swallowing, carbonated beverages, consumption of fruit juices, and vomiting were the most important factors associated with dental erosion in their study.

Our systematic review gathered 60 studies found in the literature and obtained an overall prevalence of 40% of erosive dental wear for this risk group. The most commonly used index in the literature was the BEWE index with 21 included studies and a prevalence of 49%, followed by the Smith and Knight TWI index with 7 included studies and a prevalence of 43%. It is important to note that the study by Lussi A, et al. (2000) was included in the review four times (indicated by letters A, B, C, D) and Aidi HE, et al. (2011) two times (indicated by letters A, B) as it is a longitudinal study and presents four prevalence analyses over the studied period.

For this group, the greatest heterogeneity in the data found in the studies was the sample size and age range of the population, which may result in an uncertain conclusion. Although various indices were found, there are several studies that allow statistical subgroup analysis for each index.

4.6. Drugs and Alcohol Disorders

The World Health Organization's (WHO) approach to psychoactive substance consumption primarily focuses on recognizing disorders related to the use of these substances. The WHO classifies alcoholism as an alcohol use disorder (AUD) characterized by frequent and excessive consumption of this substance, resulting in physical and mental health damage and social impairment. In the case of illicit drug use, the WHO categorizes this condition as a Substance Use Disorder (SUD), encompassing substances such as marijuana, cocaine, heroin, methamphetamines, and others. This classification aims to assess consumption patterns and identify health problems related to substance use, addressing everything from harmful use to more severe disorders, based on clinical, behavioral, and health criteria.

Chronic alcoholism is often associated with a higher prevalence of erosion, either due to the direct effects of alcohol consumption, regular vomiting, or alcohol-induced gastroesophageal reflux [8]. On the other hand, the use of illicit drugs is related to xerostomia and bruxism, in which the influence of friction (grinding and/or clenching) from bruxism activity will be intensified in a poorly lubricated saliva mouth

[174]. Often, dependence on both is associated with regular vomiting or reflux, increasing the risk of erosive defects [8].

Our meta-analysis revealed an overall prevalence of erosive dental wear of 67% in this risk group, with the most commonly used index in the studies being Eccles and Jenkins (4 studies included with a prevalence of 71%), followed by the Smith & Knight TWI index (3 studies included) with 72%.

There are few primary studies in the literature that investigate this subject, and the few found are very heterogeneous in terms of the index used (TWI, Eccles and Jenkins index, yes-no decision maker, BEWE, DMF index, modified WHO) and population (34-277). However, most of them showed a positive correlation between erosive dental wear and the consumption of illicit drugs and alcohol.

4.7. Legal Drugs and Medication

Acidic drugs, medications, and dietary supplements, such as acetylsalicylic acid (ASA), iron tablets, or vitamin supplements, are common substances with erosive potential. However, erosive challenges will only occur when there is prolonged contact between these substances and the teeth, which can occur, for example, when they are consumed in the form of effervescent or chewable tablets [2,8]. Furthermore, some medications can increase the risk of gastric reflux or decrease saliva production, factors that also contribute to the development of ETW [175]. Other long-term inhalable aerosol medications for asthma treatment have also been associated with erosive dental wear, as the content of these inhalers can have an acidic pH resulting in a drop in oral pH after use or due to their bidirectional association with asthma and gastroesophageal reflux disease (GERD) [176].

However, the number of controlled epidemiological studies on this issue is limited. In our systematic review, we obtained an overall prevalence of erosive dental wear of 30% for this risk group, with the most commonly used index being the Smith and Knight TWI (4 articles included) with a prevalence of 24%, followed by the BEWE index with 28%, and the Children’s Dental Health in the UK Survey 1993 index with 52% (both with 2 studies included). In addition to the heterogeneity of the indices found, we observed a significant variation in the studied population, age range, and results obtained in the studies, making the interpretation of the results challenging.

4.8. Occupation and Sports

Industrial workers in battery and galvanization factories are regularly exposed to substances such as sulfuric acid and hydrochloric acid, placing them in a high-risk group for developing ETW [8,177]. Many of the studies found in the literature are outdated and conducted in an uncontrolled manner, primarily in developing countries where workplace safety measures are less stringent, and the limits for allowable maximum acid concentrations in the work environment are often higher. This may have influenced the high prevalence of dental erosion observed in many of these studies [178,8]. However, a recent study by Vidhya G [179] revealed a prevalence of 50.9% of erosive dental wear in soda factory workers exposed to carbon dioxide gas. These studies made associations between employment duration and acid concentration in the air or a short distance between the worker and the acid source and the severity of erosion.

Furthermore, the literature also addresses erosive dental wear related to the occupation of professional swimmers who are exposed to hydrochloric acid in improperly maintained pools with unregulated pH. Studies conducted by Buczkowska-Radlińska J [177] and Zebrauskas A [180] investigated the hypothesis that dental erosion in competitive swimmers may be related to low pH values in pool water due to insufficient monitoring or inadequate buffering. These studies concluded that factors such as swimming duration and training volume play a significant role in the risk of dental erosion in relation to pool water undersaturation. In this risk group, there is a significant association of athletes with the use of sports drinks, falling into the risk category of acidic beverages, highlighting the challenge of analyzing risk groups in isolation, as they are often interconnected.

Also, in occupational terms, professional wine tasting is widespread worldwide, and wine is a potential erosive agent. The acidic characteristics of wine, with a pH ranging from 3 to 4 and low concentrations of P and Ca ions, play a significant role in its erosive effect [8]. Besides its acidity, the tasting habits among tasters represent an additional risk factor for erosive dental wear. The act of holding and savoring each sip of wine in the mouth for an extended period presents a greater challenge to dental enamel compared to conventional consumption habits. Additionally, each tasting session can last several hours and involve evaluating 20 to 40 different wines during a single session. Although professional wine tasting is a widespread practice globally, there are few case reports and studies investigating the

association between wine intake and erosive dental wear, most of them involving a limited number of cases.

Our systematic review obtained an overall prevalence of erosive dental wear in this risk group of 51%, with a prevalence of 41% (WHO index) for industrial workers and 32% (Lussi's index) for professional swimmers. The included studies exhibited significant heterogeneity in sample size, the age range of the population, and the indices used.

5. CONCLUSION

The risk groups showed significant prevalences of erosive dental wear; however, it should be taken into consideration that there is an association of various factors that can contribute to erosive dental wear in a single individual, making the analysis of at-risk groups entirely isolated difficult. Appropriate preventive dental care should be considered for these patients, and a multidisciplinary dental approach is advisable for managing individuals with ETW.

Furthermore, the heterogeneity in the literature regarding the index used, sample size, age range, and study design makes it difficult to analyze and interpret the results, emphasizing the need for methodological standardization.

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Appendix 1: PRISMA 2020 for Abstracts Checklist

Topic	No.	Item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	18
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist	19
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	20
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	21
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	22
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	21-22
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	51-55
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	22-23

Appendix 1: PRISMA 2020 for Abstracts Checklist

Topic	No.	Item	Location where item is reported
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	24
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	24
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	24
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	24-25
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	24-25
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item 5)).	-
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	-
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	24-25

Appendix 1: PRISMA 2020 for Abstracts Checklist

Topic	No.	Item	Location where item is reported
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	24-25
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	24-25
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	-
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	24-25
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	-
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	25-38
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	-
Study characteristics	17	Cite each included study and present its characteristics.	25-38
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	-
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	25-38

Appendix 1: PRISMA 2020 for Abstracts Checklist

Topic	No.	Item	Location where item is reported
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	25-38
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	25-38
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	25-38
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	-
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	24-25
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	-
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	38-45
	23b	Discuss any limitations of the evidence included in the review.	39
	23c	Discuss any limitations of the review processes used.	39
	23d	Discuss implications of the results for practice, policy, and future research.	39
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	21

Appendix 1: PRISMA 2020 for Abstracts Checklist

Topic	No.	Item	Location where item is reported
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	21
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Not applicable
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Not applicable
Competing interests	26	Declare any competing interests of review authors.	Not applicable
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Not applicable

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. MetaArXiv. 2020, September 14. DOI: 10.31222/osf.io/v7gm2. For more information, visit: www.prisma-statement.org

Appendix 2: Search Strategy

First Search Strategy Used
Pubmed/MEDLINE: (“Risk group” OR “Gastroesophageal Reflux” OR “Eating Disorders” OR “Anorexia Nervosa” OR “Anorexia Nervosas” OR “Nervosa, Anorexia” OR “Nervosas, Anorexia” OR “Bulimia Nervosa” OR “ Nervosa, Bulimia” OR “Acidic Beverages” OR “Soft Drink” OR “Sport Drinks” OR “Special Diet” OR “Vegetarian” OR “Raw Food Diet” OR “Legal drugs and medications” OR “Asthma” OR “Drugs and alcohol disorders” OR “Alcoholism” OR “Occupation” OR “Sports” OR “Battery Factory” OR “Swimming pool water”) AND (“Dental Erosion” OR “Erosive Tooth Wear” OR “Tooth Erosion” OR “Erosion, Tooth” OR “Erosions, Tooth” OR “Tooth Erosions”) AND (Prevalence OR “Prevalence Studies” OR “Prevalence Study” OR “Studies, Prevalence” OR “Study, Prevalence”)
Cochrane: (“Risk group” OR “Gastroesophageal Reflux” OR “Eating Disorders” OR “Anorexia Nervosa” OR “Anorexia Nervosas” OR “Nervosa, Anorexia” OR “Nervosas, Anorexia” OR “Bulimia Nervosa” OR “ Nervosa, Bulimia” OR “Acidic Beverages” OR “Soft Drink” OR “Sport Drinks” OR “Special Diet” OR “Vegetarian” OR “Raw Food Diet” OR “Legal drugs and medications” OR “Asthma” OR “Drugs and alcohol disorders” OR “Alcoholism” OR “Occupation” OR “Sports” OR “Battery Factory” OR “Swimming pool water”) AND (“Dental Erosion” OR “Erosive Tooth Wear” OR “Tooth Erosion” OR “Erosion, Tooth” OR “Erosions, Tooth” OR “Tooth Erosions”) AND (Prevalence OR “Prevalence Studies” OR “Prevalence Study” OR “Studies, Prevalence” OR “Study, Prevalence”)
Web of Science: ((ALL=((“Risk group” OR “Gastroesophageal Reflux” OR “Eating Disorders” OR “Anorexia Nervosa” OR “Anorexia Nervosas” OR “Nervosa, Anorexia” OR “Nervosas, Anorexia” OR “Bulimia Nervosa” OR “ Nervosa, Bulimia” OR “Acidic Beverages” OR “Soft Drink” OR “Sport Drinks” OR “Special Diet” OR “Vegetarian” OR “Raw Food Diet” OR “Legal drugs and medications” OR “Asthma” OR “Drugs and alcohol disorders” OR “Alcoholism” OR “Occupation” OR “Sports” OR “Battery Factory” OR “Swimming pool water”))) AND ALL=((“Dental Erosion” OR “Erosive Tooth Wear” OR “Tooth Erosion” OR “Erosion, Tooth” OR “Erosions, Tooth” OR “Tooth Erosions”))) AND ALL=((Prevalence OR “Prevalence Studies” OR “Prevalence Study” OR

Appendix 2: Search Strategy

“Studies, Prevalence” OR “Study, Prevalence”))
Embase: ('risk group'/exp OR 'risk group' OR 'gastroesophageal reflux'/exp OR 'gastroesophageal reflux' OR 'eating disorders'/exp OR 'eating disorders' OR 'anorexia nervosa'/exp OR 'anorexia nervosa' OR 'anorexia nervosas' OR 'nervosa, anorexia' OR 'nervosas, anorexia' OR 'bulimia nervosa'/exp OR 'bulimia nervosa' OR 'nervosa, bulimia' OR 'acidic beverages' OR 'soft drink'/exp OR 'soft drink' OR 'sport drinks' OR 'special diet' OR 'vegetarian'/exp OR 'vegetarian' OR 'raw food diet'/exp OR 'raw food diet' OR 'legal drugs and medications' OR 'asthma'/exp OR 'asthma' OR 'drugs and alcohol disorders' OR 'alcoholism'/exp OR 'alcoholism' OR 'occupation'/exp OR 'occupation' OR 'sports'/exp OR 'sports' OR 'battery factory'/exp OR 'battery factory' OR 'swimming pool water') AND ('dental erosion'/exp OR 'dental erosion' OR 'erosive tooth wear' OR 'tooth erosion'/exp OR 'tooth erosion' OR 'erosion, tooth'/exp OR 'erosion, tooth' OR 'erosions, tooth' OR 'tooth erosions') AND ('prevalence'/exp OR prevalence OR 'prevalence studies' OR 'prevalence study'/exp OR 'prevalence study' OR 'studies, prevalence' OR 'study, prevalence')
Scopus: TITLE-ABS-KEY (("Risk group" OR "Gastroesophageal Reflux" OR "Eating Disorders" OR "Anorexia Nervosa" OR "Anorexia Nervosas" OR "Nervosa, Anorexia" OR "Nervosas, Anorexia" OR "Bulimia Nervosa" OR " Nervosa, Bulimia" OR "Acidic Beverages" OR "Soft Drink" OR "Sport Drinks" OR "Special Diet" OR "Vegetarian" OR "Raw Food Diet" OR "Legal drugs and medications" OR "Asthma" OR "Drugs and alcohol disorders" OR "Alcoholism" OR "Occupation" OR "Sports" OR "Battery Factory" OR "Swimming pool water") AND ("Dental Erosion" OR "Erosive Tooth Wear" OR "Tooth Erosion" OR "Erosion, Tooth" OR "Erosions, Tooth" OR "Tooth Erosions") AND (prevalence OR "Prevalence Studies" OR "Prevalence Study" OR "Studies, Prevalence" OR "Study, Prevalence"))
Science Direct: "Risk group" AND ("dental erosion" OR "Erosive tooth wear" OR "Tooth Erosion" OR "Erosion, Tooth") AND (prevalence OR "Prevalence Studies" OR "Prevalence Study")

Appendix 2: Search Strategy

Open Gray: "Risk group" AND ("dental erosion" OR "Erosive tooth wear") AND prevalence
Lilacs/BVS: ("risk group" OR "Gastroesophageal reflux" OR "Eating disorders" OR "Acidic beverages" OR "Special diets" OR "Legal drugs and medications" OR "Drugs and alcohol disorders" OR "Occupation and disorders") AND ("erosive tooth wear" OR "tooth erosion") AND (prevalence)
Scielo: ("risk group" OR "Gastroesophageal reflux" OR "Eating disorders" OR "Acidic beverages" OR "Special diets" OR "Legal drugs and medications" OR "Drugs and alcohol disorders" OR "Occupation and disorders") AND ("erosive tooth wear" OR "tooth erosion") AND (prevalence)
BDTD: (“Risk group” OR “Gastroesophageal Reflux” OR “Eating Disorders” OR “Anorexia Nervosa” OR “Anorexia Nervosas” OR “Nervosa, Anorexia” OR “Nervosas, Anorexia” OR “Bulimia Nervosa” OR “ Nervosa, Bulimia” OR “Acidic Beverages” OR “Soft Drink” OR “Sport Drinks” OR “Special Diet” OR “Vegetarian” OR “Raw Food Diet” OR “Legal drugs and medications” OR “Asthma” OR “Drugs and alcohol disorders” OR “Alcoholism” OR “Occupation” OR “Sports” OR “Battery Factory” OR “Swimming pool water”) AND (“Dental Erosion” OR “Erosive Tooth Wear” OR “Tooth Erosion” OR “Erosion, Tooth” OR “Erosions, Tooth” OR “Tooth Erosions”) AND (Prevalence OR “Prevalence Studies” OR “Prevalence Study” OR “Studies, Prevalence” OR “Study, Prevalence”)
ProQuest: (“Risk group” OR “Gastroesophageal Reflux” OR “Eating Disorders” OR “Anorexia Nervosa” OR “Anorexia Nervosas” OR “Nervosa, Anorexia” OR “Nervosas, Anorexia” OR “Bulimia Nervosa” OR “ Nervosa, Bulimia” OR “Acidic Beverages” OR “Soft Drink” OR “Sport Drinks” OR “Special Diet” OR “Vegetarian” OR “Raw Food Diet” OR “Legal drugs and medications” OR “Asthma” OR “Drugs and alcohol disorders” OR “Alcoholism” OR “Occupation” OR “Sports” OR “Battery Factory” OR “Swimming pool water”) AND (“Dental Erosion” OR “Erosive Tooth Wear” OR “Tooth Erosion” OR “Erosion, Tooth” OR “Erosions, Tooth” OR “Tooth Erosions”) AND (Prevalence OR “Prevalence Studies” OR “Prevalence Study” OR “Studies, Prevalence” OR “Study, Prevalence”)
Google Scholar: (“Risk group” OR “Gastroesophageal Reflux” OR “Eating

Appendix 2: Search Strategy

Disorders” OR “Anorexia Nervosa” OR “Anorexia Nervosas” OR “Nervosa, Anorexia” OR “Nervosas, Anorexia” OR “Bulimia Nervosa” OR “ Nervosa, Bulimia” OR “Acidic Beverages” OR “Soft Drink” OR “Sport Drinks” OR “Special Diet” OR “Vegetarian” OR “Raw Food Diet” OR “Legal drugs and medications” OR “Asthma” OR “Drugs and alcohol disorders” OR “Alcoholism” OR “Occupation” OR “Sports” OR “Battery Factory” OR “Swimming pool water”) AND (“Dental Erosion” OR “Erosive Tooth Wear” OR “Tooth Erosion” OR “Erosion, Tooth” OR “Erosions, Tooth” OR “Tooth Erosions”) AND (Prevalence OR “Prevalence Studies” OR “Prevalence Study” OR “Studies, Prevalence” OR “Study, Prevalence”)

Appendix 3: Data extraction from the studies.

Gastroesophageal Reflux Disease				
Autors	Index	Age (years)	Size	% Gastroesophageal reflux
	BEWE			
Picos A, Lasserre JF, Chisnoiu AM, Berar AM, d'Incau E, Picos AM, Chira A, Varannes SB, Dumitrascu DL. 2020	BEWE	mean age 43	141	92.9%
Ramachandran A, Khan SIR, Vaitheeswaran N. 2017	BEWE	18-40 y	25	88%
Quoos ARS, Noal FC, Assunção CM, Rodrigues JA, Silva CS, Epifânio M, Casagrande L, Ferreira CT, Araújo FB. 2020	BEWE	5-12 y	24	100%
Milani DC, Borba M, Farré R, Grando LGR, Bertol C, Fornari F. 2022	BEWE	mean age 40	26	27%
Chauhan N, Manjunath BC, Malhotra F, Yadav V, Kumar JS, Muppalla L, Bhukal S. 2022	BEWE	18-78 y	330	84.8%
Rajab YS, Zaidan TF. 2023	BEWE	mean age 34	40	80%
	WHO			
Alavi G, Alavi AA, Saberfiroozi M, Sarbazi AH, Motamedi M, Hamedani Sh. 2014	WHO	30-50 y	140	22,60%
Warsi I, Ahmed J, Younus A, Rasheed A, Akhtar TS, Ain QU, Khurshid Z. 2019	WHO	41-60 y	187	35.3%
Basha S, Enan ET, Mohamed RN, Ashour AA, Alzahrani FS, Almutairi NE. 2019	WHO	mean age 12	72	66.7%
Meurman JH, Toskala J, Nuutinen P, Klemetti E. 1994	WHO	mean age 50	117	23.9%
	Eccles and Jenkins index			
Ersin NK, Onçag O, Tumgor Gokhan, Aydogdu S, Hilmioglu S. 2005	Eccles and Jenkins index	mean age 6	38	76%

Appendix 3: Data extraction from the studies.

Guaré RO, Ferreira MCD, Leite MF, Rodrigues JA, Lussi A, Santos MTBR. 2011	Eccles and Jenkins index	3-13 y	20	90%
Javadzadeh F, Rafeey M. 2012	Eccles and Jenkins index	3-6 y	40	42%
Muñoz JV, Herreros B, Sanchiz V, Amoros C, Hernandez V, Pascual I, Mora F, Minguez M, Bagaz JV, Benages A. 2003	Eccles and Jenkins index modified by Hattab	18-75 y	181	47.5%
Roesch-Ramos L, Roesch-Dietlen F, Remes-Troche JM, Romero-Sierra G, Mata-Tovar CJ, Azamar-Jácome AAA, Barranca-Enríquez AB. 2014	Eccles and Jenkins index	20-78 y	60	78.67%
Correa MCCSF, Lerco MM, Henry MACA. 2008	Eccles and Jenkins index	17-75 y	50	273 faces
Domin MG, Lisiecka K, Rojek R, Mokrzycka, Szymanowicz J, Glura B. 2013	Eccles and Jenkins index	7-18 y	57	66.7%
Jarvinen V, Meurman JH, Hyvarinen H, Rytomaa I, Murtomaa H. 1988	Eccles and Jenkins index		109	6%
Stojsin I, Brkanic T, Zivkovic S. 2009	Eccles and Jenkins	18-80 y	30	76.7%
	Smith and Knight TWI			
Li W, Liu J, Chen S, Wang Y, Zhang Z. 2016	Smith and Knight Tooth Wear Index	18-70 y	51	60.8%
Milani DC, Venturini AP, Jacques SMC, Fornari F. 2016	Smith and Knight Tooth Wear Index	mean age 43	143	25.9%
Oginni AO, Agbakwuru EA,Ndububa DA. 2005	Smith and Knight Tooth Wear Index	18-72 y	125	16%
Wang GR, Zhang H, Wang ZG, Jiang GS, Guo CH. 2010	Smith and Knight Tooth Wear Index	20-73 y	88	48.8%

Appendix 3: Data extraction from the studies.

Wild YK, Heyman MB, Vittinghoff E, Dalal DH, Wojcicki JM, Clark AL, Rechmann B, Rechmann P. 2011	Simplified Tooth Wear Index	9-17 y	59	85%
Fede OD, Liberto CD, Occhipinti G, Vigneri S, Russo LL, Fedele S, Muzio LL, Campisi G. 2008	Smith and Knight Tooth Wear Index	19-78 y	200	9%
Farahmand F, Sabbaghian M, Ghodousi S, Seddighoraee N, Abbasi M. 2013	Smith and Knight Tooth Wear Index	3-12 y	54	98.1%
Helle K, Árok AZ, Ollé G, Antal M, Rosztóczy. 2023	Smith and Knight Tooth Wear Index	mean age 54	116	23.3%
Kitasako Y, Tanabe T, Koeda M, Momma E, Hoshikawa Y, Hoshino S, Kawami N, Ikeda M, Iwakiri K. 2023	Smith and Knight Tooth Wear Index	60-75 y	135	77%
	O'Sullivan index			
O'Sullivan EA, Curzon MEJ, Roberts GJ, Milla PJ, Stringer MD. 1998	O'Sullivan index	2-16 y	53	17%
Oliveira PAD. 2015	O'Sullivan index	2-14 y	43	25.6%
	Lussi's Erosion Index			
Ramugade MM, Sayed A, Sapkale KD, Sonkurla S. 2019	Lussi's Erosion Index	20-60 y	100	88%
Vargas LT, Vargas NT, Cardenas GV. 2012	Lussi's Erosion Index	20-70 y	150	30%
Holbrook WP, Furuholm J, Gudmundsson K, Theodors A, Meurman JH. 2009	modified from the Index of Lussi (1996)	6-65 y	249	33.7%
	index by Aine et al.			
Linnet V, Seow WK, Connor F, Sheperd R. 2002	modified index proposed by Aine et al.	18 months -15 y	52	14%

Appendix 3: Data extraction from the studies.

Dahshan A, Patel H, Delaney J, Wuerth A, Thomas R, Tolia V. 2002	index by Aine et al.	2-18 y	24	83.3%
	Others			
Khorsand A, Farahwash M, Mirmomen S, Razavi S. 2005	Presence or absence of erosion		35	62.9
Ganesh M, Hertzberg A, Nurko S, Needleman H, Rosen R. 2016	Keels-Coffield erosion index	3 y	27	37%

Eating Disorders

Autors	Index	Age (years)	Size	% Eating disorders
	BEWE			
Chimbinha IGM, Jacome NA, Silva GG, Barreto MJR, Costa ICC. 2019	BEWE	13-18 y	231	22,20%
Jovana M, Ivana S, Karolina V, Ohnjenka J. 2018	BEWE	18-35 y	33	90%
Pallier A, Karimova A, Boillot A, Colon P, Ringuenet D, Bouchard P, Rangé H. 2019	BEWE	mean age 31	70	Índice ≤2: (29)41.4%; 3-8: (20)28.6%; 9-13: (8)11.4%; ≥14: (13)18.6%
Paszynska E, Hernik A, Slopien A, Roszak M, Jowik K, Dmitrzak-Weglarz M, Tyszkiewicz-Nwafor M. 2022	BEWE	mean age 15	117	18.9
	O'Sullivan index			
Brandt LMT, Fernandes LHF, Aragão AS, Aguiar YPC, Auad SM, Castro RD, Cavalcanti SDLB, Cavalcanti AL. 2017	O'Sullivan index	15-18 y	12	16.7%

Appendix 3: Data extraction from the studies.

Hermont AP, Pordeus IA, Paiva SM, Abreu MHNG, Auad SM. 2013	O'Sullivan index	15-18 y	20	45%
Hermont AP, Pordeus IA, Ramos-Jorge J, Paiva SM, Auad SM. 2020	O'Sullivan index	15-18 y	62	bulímico leve 5,9%, moderado 8,0% e grave 45,0% (58,9% total)
Cavalcanti AL, Andrade NM, Brandt LMT, Fernandes LHF, Toscano RT, Auad SM, Buldur B, Cavalcanti FC. 2020	O'Sullivan index	15-18 y	100	24%
	Eccles and Jenkins index			
Martinez PG, Gordillo AD, Lapiedra RC, Garcia MB, Ramirez MJM, Candela CG, Carretero JLC, Gomez GE. 2019	technique described by Johansson et al.	19-44 y	59	76.3%
Ohrn R, Enzell K, Angmar-Mansson B. 1999	modification by Lussi et al of Eccles index	17-47 y	81	97.5%
	Others			
Araújo, JJ. 2007 - Dissertação de mestrado	TWI de SMITH e KNIGHT adaptado por SALES PERES	13 a 44 y	30	Todos os pacientes apresentaram desgaste e o grau de severidade foi: Face O/I 66,7% Face V 13,3% Face L 13,4%
Basha S, Enan ET, Mohamed RN, Ashour AA, Alzahrani FS, Almutairi NE. 2019	WHO	mean age 12	13	84.62%
Emodi-Perlman A, Yoffe T, Rosenberg N, Eli I, Alter Z, Winocur E. 2008	Sistema de pontuação 0 a 4	18 - 35 y	43	33.3%

Appendix 3: Data extraction from the studies.

Jones RRH, Cleaton-Jones P. 1989	Erosions were defined as "dished out" areas of enamel, or enamel and dentin, on the buccal or lingual tooth surface and they were graded by depth and by area.	mean age 29	11	69%
Monagas J, Ritwik P, Kolomensky A, Acosta J, Kay D, Clendaniel L, Hyman PE. 2014	System by Taji et al.	4 - 21 y	30	77%
Ximenes R, Couto G, Sougey E. 2009	DMF-T index	12-16 y	215	56.7%
Otsu M, Hamura A, Ishikawa Y, Karibe H, Ichijyo T, Yoshinaga Y. 2014	diagnostic criteria from Japanese Society for Oral Health industrial hygiene section	17-47 y	71	86% vomiting group e 0% non-vomiting group
Uhlen M-M, Tveit AB, Stenhagen KR, Mulic A. 2014	VEDE	mean age 27	66	69.7%

Special Diet				
Autors	Index	Age (years)	Size	% Special Diet
	Others			
Aguiar et al. 2014	O'Sullivan	15-19 y	675	21%
Al-Dlaigan YH, Shaw L, Smith AJ. 2001	TWI of Smith and Knight	14 y	42	52% low dental erosion; 48% moderate dental erosion
Basha S, Enan ET, Mohamed RN, Ashour AA, Alzahrani FS, Almutairi NE. 2019	WHO	mean age 12	212	42.5%
Ganss C, Schlechtriemen M, Klimek J. 1999	Linkosalo e Markkanen modified index	18-63 y	130	97,70%

Appendix 3: Data extraction from the studies.

Pedrão AMN, Portes LA, Gomes EP, Teixeira FCFT, Pereira AC, Oliveira NC. 2018	BEWE	35-74 y	207	58.9%
Herman K, Waszkiewicz AC, Kowalczyk-Zając M, DobrzyńskiG M. 2011	Oral Hygiene Index (OHI) according to Green Vermillion (1960)	17-51 y	46	39.1%
Linkosalo E, Markkanen H. 1985	análise de modelo e fotografias	mean age 39	26	76.9%

Alimentary Habits				
Autors	Index	Age (years)	Size	% Alimentary Habits
	BEWE			
Alves LS, Brusius CD, Damé-Teixeira N, Maltz M, Susin C. 2015	BEWE	12 y	1528	15%
Figueira AC, Bizarra F, Graça SR, Pinto IO. 2020	BEWE	17+ y	105	13,20%
Fung A, Messes LB. 2013	BEWE reanalisado pelo Modified Tooth Wear Index (TWI) of O'Brien	6-12 y	154	66%
Gallagher J, Ashley P, Petrie A, Needleman I. 2018	BEWE	25 y	352	41.4%
Pineda AEGA, Borges-Yañez S, Lussi A, Aguirre-Hernandez R, Garcia-Perez A. 2020	BEWE	11-14 y	424	62.5%
Luciano LCO, Ferreira MC, Paschoal MA. 2017	BEWE	12-30 y	335	28.7%
Maharani DA, Zhang S, Gao SS, Chu CH, Rahardjo A. 2019	BEWE	12 y	696	96%
Martinez LM, Serraga C, Gavara MJ, Garcia CB. 2020	BEWE	5-12 y	391	19.7%

Appendix 3: Data extraction from the studies.

Marro F, Jacquet W, Bottenberg P, Martens L. 2018	BEWE	13 -17 y	613	48.6%
Muller-Bolla M, Courson F, Smail-Faugeron V, Bernardin T, Lupi-Pégurier L. 2015	BEWE	mean age 14	331	39%
Provatenou E, Kaklamanos EG, Kevrekidou A, Kosma I, Kotsanos N. 2016	BEWE	8-14 y	329 e 263	8 anos: 95% em decíduos e 14,6% em permanentes; 14 anos: 21%
Silva MRG, Chetti MA, Neves H, Manso MC. 2020	BEWE	13-62 y	110	83.6%
Wei Z, Du Y, Zhang J, Tai B, Du M, Jiang H. 2016	BEWE	35-49 y and 50-74 y	720	67.5% e 100% respectivamente
Pineda AEGA, Borges-Yánez AS, Camacho MET, Lussi A. 2018	BEWE	11-14 y	512	63.9%
Jász M, Szoke J. 2021	BEWE	12 y	579	21.2%
Leite DFBM, Souza NL, Rocha IM, Siqueira MFG, Buzalaf MAR, Sampaio FC. 2015	BEWE	mean age 10	33	36,36%
Septalita A, Bahar A, Agustanti A, Rahardjo A, Maharani DA, Rosalien R. 2017	BEWE	12 y	487	88%
Zhang S, Chau AMH, Lo ECM, Chu C-H. 2014	BEWE	12 y	600	75%
Gatt G, Attard N. 2022	BEWE	5 y	441	81%
Kanaan M, Brabant A, Eckert GJ, Hara AT, Carvalho JC. 2022	BEWE	18-55 y	570	75%

Appendix 3: Data extraction from the studies.

Khan K, Qadir A, Trakman G, Aziz T, Khattak MI, Nabi G, Alharbi M, Alshammari A, Shahzad M. 2022	BEWE	mean age 18	104	21.2%
Piórecka B, Jamka-Kasprzyk M, Niedźwiadek A, Jagielski P, Jurczak A. 2023	BEWE	6-17y	86	26%
	Smith and Knight Tooth Wear Index			
Dahal S, Poudel P, Megha P, Mainali B. 2020	Smith and Knight Tooth Wear Index	12 y	295	69.4%
Picazo-Garduño MG, Ruiz-Ramos M, Juárez-López MLA. 2020	Smith and Knight Tooth Wear Index	6-12 y	411	62%
Kitasako Y, Sasaki Y, Takagaki T, Sadr A, Tagami J. 2015	Smith and Knight Tooth Wear index.	15-89 y	1108	26.1%
Okunseri C, Okunseri E, Gonzalez C, Visotcky A, Szabo A. 2010	modified Smith and Knight Tooth Wear Index	13-19 y	1314	45%
Al-Dlaigan YH, Shaw L, Smith A. 2001	(TWI) index of Smith and Knight modified by Millward	14 y	418	48% with low erosion, 51% had moderate erosion and only 1% had severe erosion
Chuajedong P, Kedjarune-Leggat U, Kertpon D, Chongsuvivatwong V, Benjakul P. 2002	Tooth Wear Index (TWI)	15+ y	506	Homens 29.8% e mulheres 70.2%
El Karim IA, Sanhouri NM, Hashim NT, Ziada HM. 2005	Smith and Knight Tooth Wear Index	12-14 y	157	66.9%
Kannan A, Ahmed MAA, Duraisamy P, Manipal S, Adusumillil P. 2013	Smith and Knight Tooth Wear Index	18-25 y	387	33,56% mulheres e 45,37% homens

Appendix 3: Data extraction from the studies.

Kumar S, Kumar A, Debnath N, Kumar A, Badiyani BK, Basak D, Ali MAS, Isamil MB. 2015	Smith and Knight Tooth Wear Index	12-14 y	170 boys and 213 girls	22,7% (sendo 25,4 para meninas e 19,4 para meninos)
Ratnayake N, Ekanayake L. 2010	modified version of Smith and Knight's index	17 y	1200	22%
	UK			
Al-Majed I, Maguire A, Murray JJ. 2002	UK National Survey of Child Dental Health.	5-6 and 12-14 y	354 e 862	34% e 26%
Waterhouse PJ, Auad SM, Nunn JH, Steem IN, Moynihan PJ. 2008	index used in the oral health component of the UK National Diet and Nutrition Survey	13-14 y	458	34.1%
Kamal Y, O'Toole S, Bernabé E. 2019	modified tooth wear index (TWI) used in the UK Adult Dental Health Survey	18-75+ y	3541	moderate-to-severe tooth wear was 12.1%, with an average of 3.4
	Lussi et al. [1996]			
Çaglar E, Sandalli n, Panagiotou N, Tonguc K, Kuscu OO. 2011	Lussi et al. [1996]	G1: 7-11 y G2: 12 a 14 y	G1: 47 e G2: 36	G1: 47.4% e G2: 52.6%
Harłukowicz K, Kaczmarek U. 2017	indices by Lussi, O'Sullivan and BEWE	12-18 y	240	16.25%
Mathew T, Casamassimo OS, Hayes JR. 2002	Lussi Index	18-28 y	304	36.5%
Aidi HE, Bronkhorst EM, Huysmans MCDNJM, Truin GJ. 2011	Lussi Index modified by van Rijkom et al., 2002	10-12 y	Inicial 656; Final 572;	Inicial 32%; Final 42,3%;

Appendix 3: Data extraction from the studies.

Lussi A, Schanffner M. 2000	Lussi et al. index	G1: 26–30 y and G2: 46–50 y	55	G1: 10% e 24%; G2: 26% e 46%
	O’Brien index			
Chrysanthakopoulos NA. 2012	O’Brien index	18-30 y	840	28.6%
Corrêa MSNP, Corrêa FNP, Corrêa JPNP, Murakami C, Mendes FM. 2011	O’Brien index	2-20 y	232	25.43%
Pereira AS, Lima LRS, Lima MDM, Lima CCB, Paiva SM, Moura LFAD, Moura MS. 2020	O'Brien Index	5 y	888	3.3%
Tello G, Carvalho P, Costa VS, Abanto J, Oliveira LB, Banecker M. 2016	O'Brien modified Index	3-4 y	839	51.3%
	O’Sullivan index			
Korkmaza E, Kaptanb A. 2020	O’Sullivan index	7-14 y	473	21.8%
Massignan C, Moro J, Moccelini B, Vasconcelos FMT, Cardoso M, Bolan M. 2019	O’Sullivan index	8-10 y	1085	15.67%
Nakane A, Sasaki Y, Miwa Z, Kitasako Y, Tagami J. 2014	O'Sullivan Index	2-6 y	116	86%
	Eccles and Johanson			
Antunes LS, Veiga L, Nery VS, Nery CC, Antunes LA. 2017	Eccles	mean age 34	108	19.4%

Appendix 3: Data extraction from the studies.

Hasselkvist A, Johansson A, Johansson AK. 2010	Johansson index	5-19 y	609	16.4%
Isaksson H, Birkhed D, Wendt LK, Alm A, Nilsson M, Koch G. 2014	Hasselkvist modified was used for erosion on molars. For maxillary incisors modified Eccles and Johansson	20 y	494	75%
Simangwa LD, Astrom NA, Johansson A, Minja IK, Johansson A-K. 2019	Johansson et al 1996	12-17 y	906	30%
	Others			
Árnadóttir IB, Saemundsson SR, Holbrook WP. 2003	Classificado de acordo com a localização e severidade	15 y	278	21.6%
Habib M, Hottel TL, Hong L. 2013	modified from the index of Tooth Surface Loss (TSL) 2003	2-4 y and 12 y	243	12%
Ashour AA, Fahmi MK, Mohamed RN, Basha S, Binmadi N, Enan ET, Basalim A, Qahatani AA. 2022	WHO	19-63 y	223	43.9%
Sirimaharaj V, Messer LB, Morgan MC. 2002	questionary	18-60 y	508	25,40%
Sovik JB, Skudutyte-Rysstad R, Tveit AB, Sandvik L, Mulic A. 2015	Sistema de pontuação Mulic et al., 2010	16-18 y	795	37%

Drugs and alcohol disorders				
Autors	Index	Age (years)	Size	% Drugs and alcohol disorders
	Smith & Knight TWI			

Appendix 3: Data extraction from the studies.

Milosevic A, Agrawal N, Redfearn PJ, Mair LH. 1999	Smith & Knight Tooth Wear Index		30	60%
Robb ND, Smith BGN. 1990	smith & Knight Tooth Wear Index	23-65 y	37	91.9%
Cenci TP, Cademartori MG, Santos LG, Correa MB, Loomans B, Horta BL, Demarco FF. 2023	TWI	31 y	537	61.6%
	Eccles and Jenkind index			
Hede B. 1996	Eccles Index	30-65 y	195	43%
Manarte-Monteiro P, Gavinha S, Manso MC. 2012	Eccles and Jenkins index		50	49.4%
Teixeira L, Manso MC, Monteiro PM. 2015	Eccles and Jenkins Index	mean age 43	277	98.6%
Manarte P, Manso C, Souza D, Frias-Bulhosa J, Gago S. 2009	Eccles e Jenkins index	24-67 y	50	49,40%
	Others			

Appendix 3: Data extraction from the studies.

Araújo MWB, Dermen K, Connors G, Ciancio S. 2004	DMF index	37.1 (9.6)	34	47,10%
Dukic W, Dobrijevic TT, Katunaric M, Milardovic S, Segovic S. 2010	Score 0 ou 1 (não e sim, respectivamente)	mean age 41	70	24.7%
Vainionpää R, Tuulaniemi K, Pesonen P, Laitala ML, Anttonen V. 2019	BEWE	mean age 35	100	90%
Kumar G, Rai S, Sethi AK, Singh AK, Thipathi RM, Jnaneswar A. 2021	modified WHO 2013	18-50 y	167	67.66% em esmalte e 16.17% em dentina

Legal Drugs and Medication				
Autors	Index	Age (years)	Size	% Legal Drugs and Medication
	BEWE			
Chiyong TE, Avila JD, Uscamaita PC, Meza DG, Gutiérrez LC, Reategui CC, Veliz LM. 2021	BEWE	18-65 y	153	26.1%
Hassan Z, Farag A, Awooda EM. 2016	BEWE	18-60 y	40	35.13%
	Smith and Knight TWI			
Al-Dlaigan YH, Show L, Smith J. 2002	Tooth wear index (TWI)	11-18 y	20	35%

Appendix 3: Data extraction from the studies.

Al-Hiyasat AS et al. 2006	Tooth wear index (TWI)	16-25 y 26-35 y 36-45 y 46-55 y	29 54 29 31	20.3% 37.7% 13.3% 21.7%
Alwaheidi HAA, O'Toole S, Bernabé E. 2021	Tooth wear index (TWI)	18+ y	3578	12.1%
Goswami U, O'Toole S, Bernabé E. 2020	Modified version of TWI	12-29 y	2186	58%
Arafa A, Aldahlawi S, Fathi A. 2017	Tooth wear index (TWI)	4-12 y	180	31.11%
	UK survey			
Dugmore CR, Rock WP. 2003	Children's Dental Health in the UK Survey 1993 index	12 y	268	59%
Rezende G, Santos NML, Stein C, Hilgert JB, Fernando-Silva DDF. 2019	index from the 1993 Children's Dental Health Survey in the UK	6-12 y	112	45%
	Others			
Alazmah A. 2021	the American Academy of Pediatrics 2018	3-12 y	50	24%
Fathima R, Shenoy R, Jodalli P S, Sonde L, Mohammed IP. 2019	WHO	18-45 y	100	8%

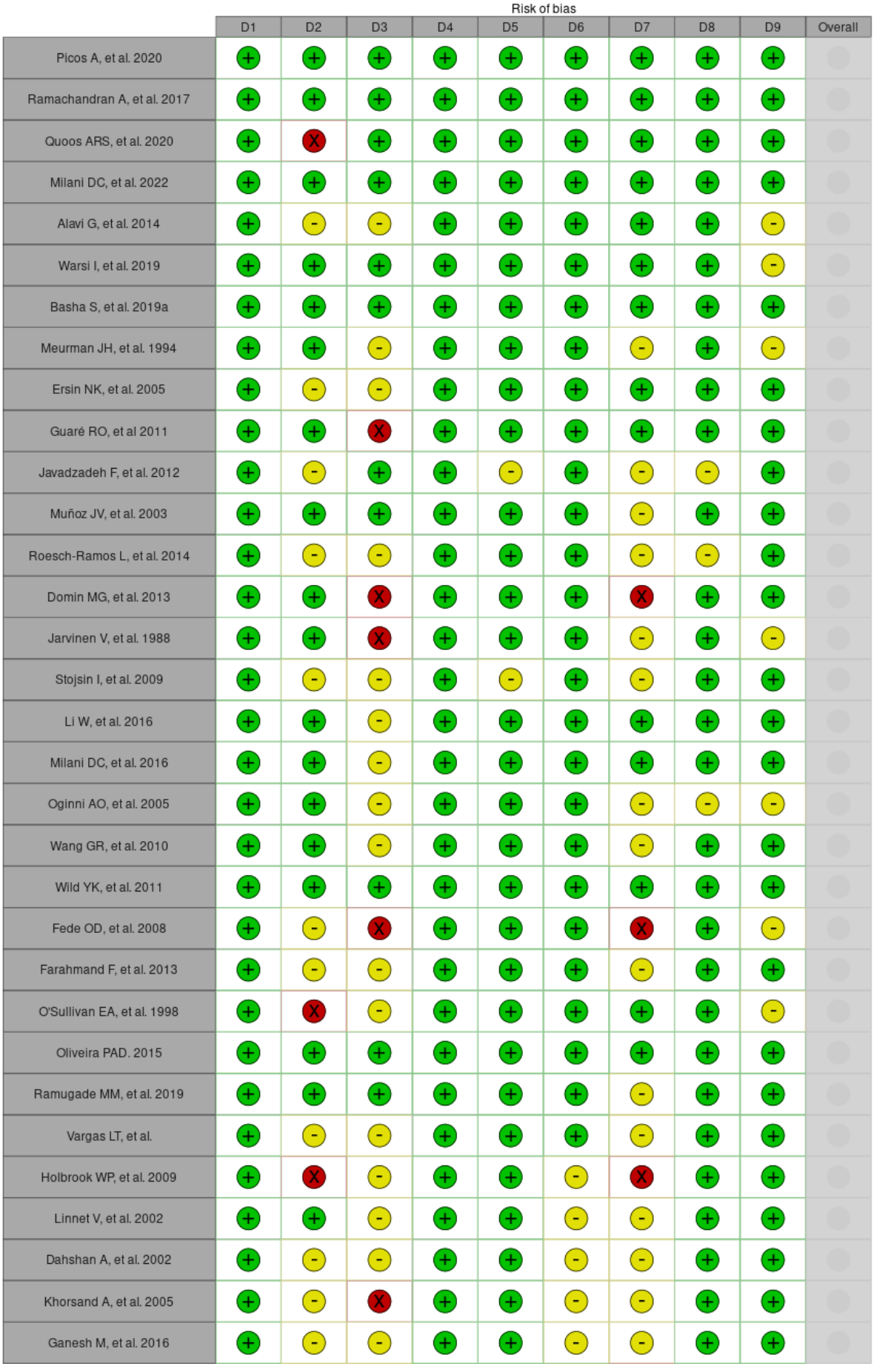
Appendix 3: Data extraction from the studies.

Occupacional and Sports				
Autors	Index	Age (years)	Size	% Occupacional and Sports
	WHO			
Petersen PE, Gormsen C. 1991	WHO	20-58 y	61	31%
Vidhya G,Karuppaiah RM,Garla BK, Umesh K,Taranath M, Pandian P. 2019	WHO	20-40 y	175	50.9%
	Lussi			
Buczkowska-Radlińska J, Lagocka R, Kaczmarek W, Gordski M, Nowicka A. 2013	Lussi Index	14-16 y	62	26%
Zebrauskas A, Birskute R, Maciulskiene V. 2014	Lussi Index	12-17 y and 18-25 y	76 e 56 respectivamente	25% e 50% respectivamente
	Others			
Frese C, Frese F, Kuhlmann S, Saure D, Reljic D, Staehle HJ, Wolff D. 2014	BEWE	mean age 36	35	BEWE score of 9.6
Amin WM, Al-Omoush A. Hattab FN. 2001	Dental erosion index	mean age 38 y and 42 y	37 and 24	100% and 79.16%
Baghele ON, Majumdar IA, Thorat MS, Nawar R, Baghele MO, Makkad S. 2013	Presença ou ausência de erosão	mean age 18 y (male) and 15 y (female)	100	90%

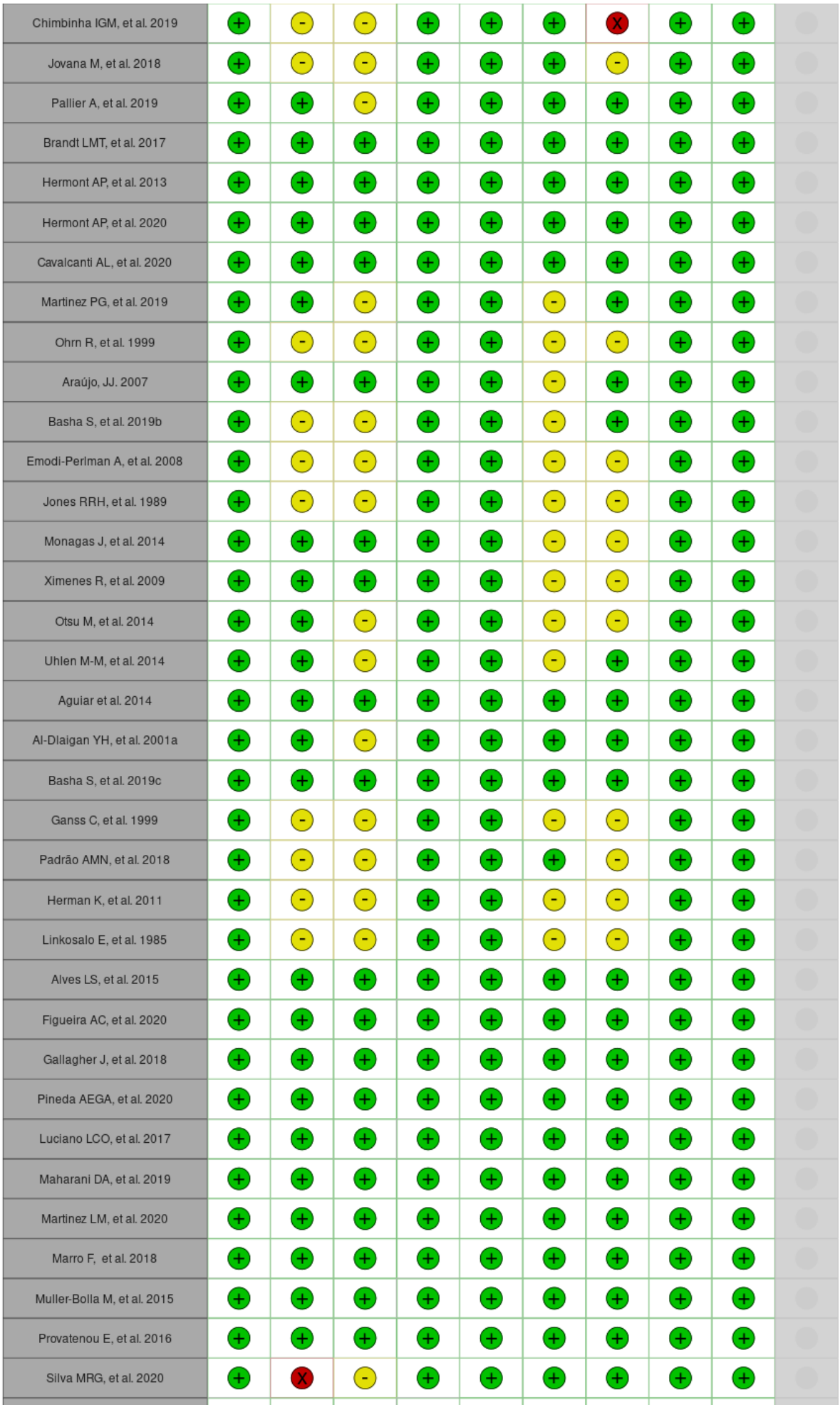
Appendix 3: Data extraction from the studies.

Kumar A, Puranik MP, Sowmya KR, Rajput S. 2019	Smith and Knight's tooth wear index modified by Millward et al. 1994	mean age 43	200	39.5%
Suyama Y, Takaku S, Okawa Y, Matsukubo T. 2010	based on “Occupational dental health” presented by the Japan Dental Association	mean age 42	40	22.5%
Abdelrahman HH, Ammar N, Hassan MG, Essam W, Amer H. 2023	BEWE	11+ y	90	60%

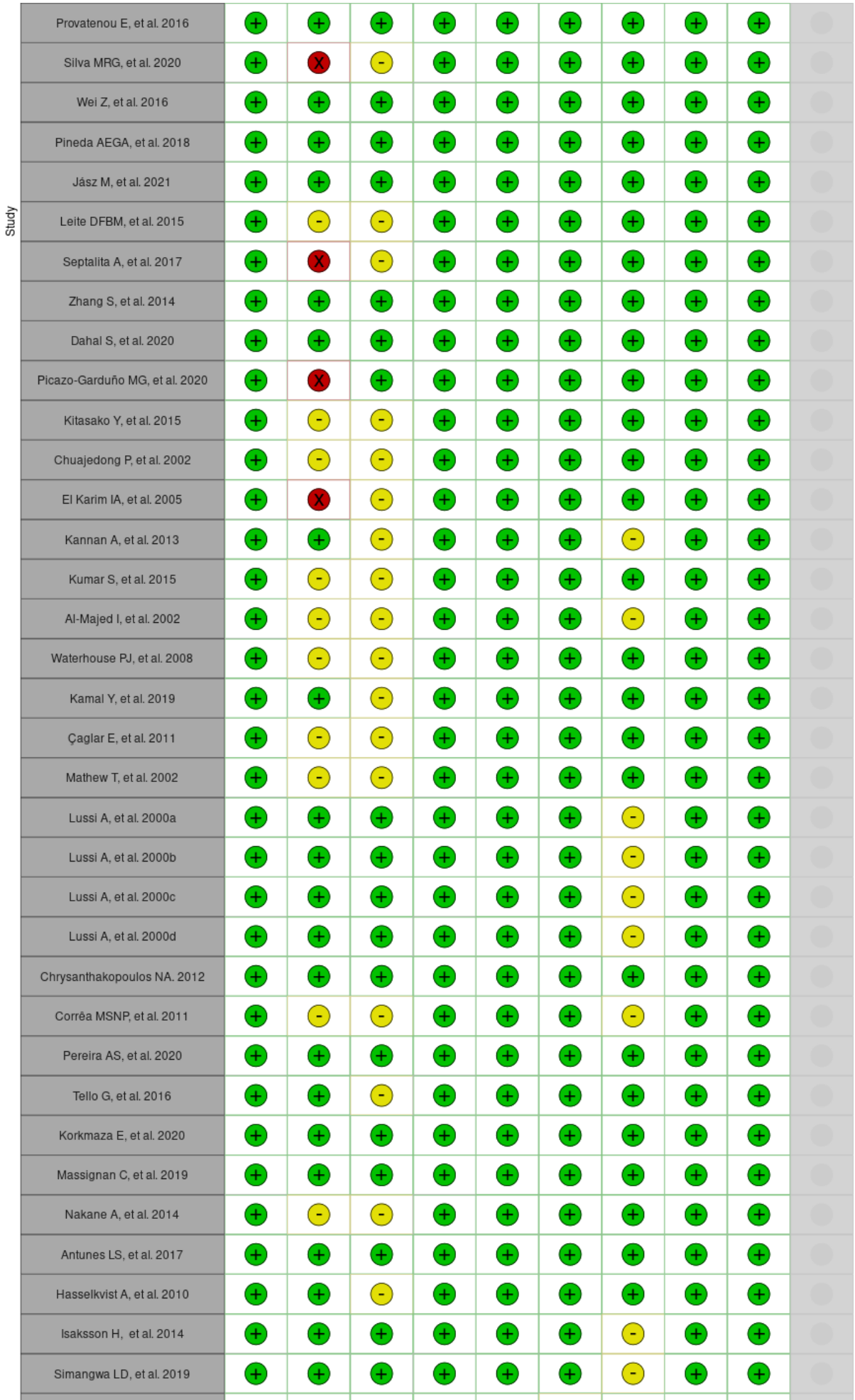
Appendix 4: "Traffic light" plots of the domain-level judgements for each individual result.



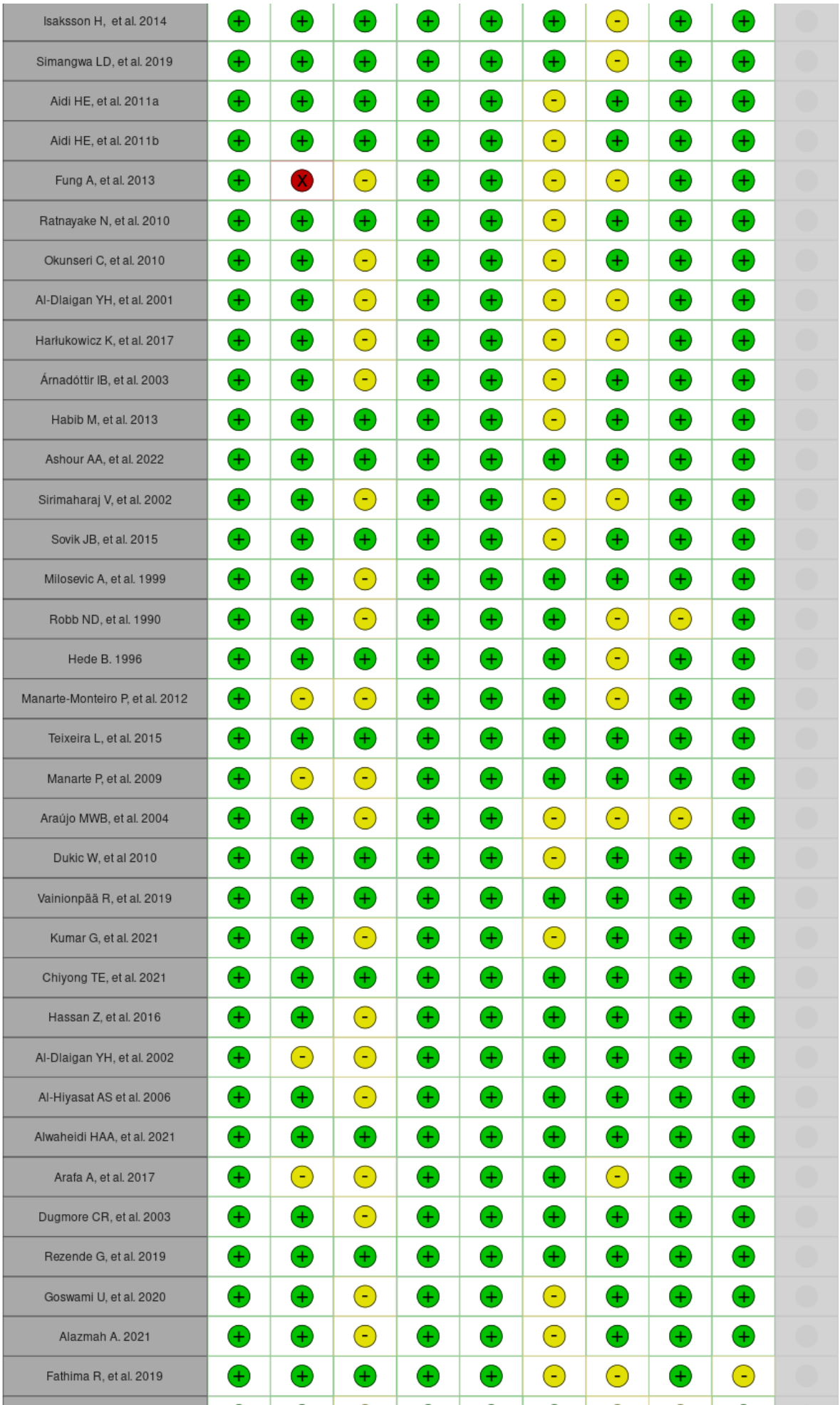
Appendix 4: "Traffic light" plots of the domain-level judgements for each individual result.



Appendix 4: "Traffic light" plots of the domain-level judgements for each individual result.



Appendix 4: "Traffic light" plots of the domain-level judgements for each individual result.



Appendix 4: "Traffic light" plots of the domain-level judgements for each individual result.