EVALUATE THE PREVALENCE OF DENTAL ANXIETY IN CHILDREN: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Abstract :

The study of Dental anxiety and its prevalence is very important to increase the comfort and well-being of patients. It can also provide valuable information for organizing dental services and increasing dentists' awareness of Dental anxiety. Therefore the aim of current study was evaluate the prevalence of dental anxiety in children.

Key words: Dental Anxiety, Children, Dental Anxiety Question

Introduction :

Dental anxiety is fear, anxiety or stress in a dental setting (such as a dental clinic). Being scared to visit the dentist can result in delaying or avoiding dental treatment. Things like needles, drills or the dental setting in general can trigger dental anxiety(1). There is uncertainty about the conceptualization of dental anxiety, fear of teeth, dental panic. Dental fear, or dentophobia, is a normal emotional reaction to one or more specific threatening stimuli in the dental situation(2). Dental anxiety can be described as an aversive emotional state of apprehension or worry in anticipation of the feared stimulus of dental(3). Dental phobia is a more serious condition than anxiety. It leaves people panic-stricken and terrified(4). Distinguishing Dental fear from Dental phobia is challenging for dentists, Phobia is a clinical diagnosis, not just a definite fear(5). In studies, especially epidemiological studies, the terms Dental fear, Dental anxiety and Dental phobia are often used interchangeably. Dental anxiety is prevalent worldwide and affects people of all ages. Patients with Dental anxiety often delay dental treatment and the consequences are more complex treatment needs(1). The prevalence of Dental anxiety is reported to be approximately 5.7% to 20.2%(6, 7). Studies have shown that dental treatments are associated with Dental anxiety. Dental anxiety shares similar characteristics with many clinical anxiety disorders, and this is especially the case with other specific fears and phobias(8). There are many scales of multiple self-report and one-question questionnaires in this area, such as the Dental Fear Survey, Children's Dental Fear Picture Test, the Children's Fear Survey Schedule Dental Subscale and its faces version, the Modified Child Dental Scale and its faces version, and the Dental Anxiety Question (DAQ). All these measures assess trait anxiety (9-11). The study of Dental

anxiety and its prevalence is very important to increase the comfort and well-being of patients. It can also provide valuable information for organizing dental services and increasing dentists' awareness of Dental anxiety. Therefore the aim of current study was evaluate the prevalence of dental anxiety in children.

Method: A search of the PubMed, Scopus, Web of Science, EBSCO and Embase electronic Dental Anxiety tabases to review the systematic literature over the past ten years was conducted between 2011-2021. Two authors blind and independently extracted Dental Anxiety ta from reviewed abstract and full text of all citations. The 95% confidence interval for effect size, Random model and REML method were calculated. Meta-analysis was performed using Stata/MP v.16 software (The fastest version of Stata).

Methods :

Search strategy :

From the electronic databases, PubMed, Scopus, LILACS, Web of Science, EBSCO, LIVIVO, and Embase have been used to perform a systematic literature over the last ten years between 2011 and September 2021. The reason for choosing studies in the last ten years is to be able to provide sufficient evidence in this area and use newer studies. Therefore, a software program (Endnote X8) has been utilized for managing the electronic titles.

Searches were performed with mesh terms: A search of the PubMed, Scopus, Web of Science, EBSCO and Embase electronic Dental Anxiety tabases to review the systematic literature over the past ten years was conducted between 2011-2021. Two authors blind and independently extracted Dental Anxiety ta from reviewed abstract and full text of all citations. The 95% confidence interval for effect size, Random model and REML method were calculated. Meta-analysis was performed using Stata/MP v.16 software (The fastest version of Stata).

(("Dental Anxiety/classification"[Mesh] OR "Dental Anxiety/complications"[Mesh] OR "Dental Anxiety/diagnosis"[Mesh] OR "Dental Anxiety/epidemiology"[Mesh] OR "Dental Anxiety/etiology"[Mesh] OR "Dental Anxiety/statistics and numerical data"[Mesh] OR "Dental Anxiety/therapy"[Mesh])) AND ("Child"[Mesh] OR "Adult Children"[Mesh] OR "Dental Care for Children"[Mesh] OR "Only Child"[Mesh]).

This systematic review has been conducted on the basis of the key consideration of the PRISMA Statement– Perfumed Reporting Items for the Systematic Review and Meta-analysis(12).

Data Extraction and analysis method :

The data were extracted from the research included years, study design, sample size, mean/range of age, environmental research, study tools.

The quality of studies reporting prevalence data was assessed using Joanna Briggs Institute Critical Appraisal Checklist (13). To answer the questions of this tool, yes, no, or unclear is used. A study should have a positive answer in all areas, and if the answer is "no" (negative) in each area, the study will be of lower quality.

For Data extraction, two reviewers blind and independently extracted data from abstract and full text of studies that included. Prior to the screening, kappa statistics was carried out in order to verify the agreement level between the reviewers. The kappa values were higher than 0.80.

Effect size with 95% confidence interval (CI), fixed effect or random effect model and Inverse-variance or REML method were calculated.

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Random effects were used to deal with potential heterogeneity and I^2 showed heterogeneity. I^2 values above 50% signified moderate-to-high heterogeneity. The Meta analysis have been evaluated with the statistical software Stata/MP v.16 (The fastest version of Stata).

Results :

In the review of the existing literature using the studied keywords, 8702 studies were found. In the initial review, duplicate studies were eliminated and abstracts of 841 studies were reviewed. At this stage, 683 studies did not meet the inclusion criteria, so they were excluded, and in the second stage, the full text of 158 studies was reviewed by two authors. At this stage, 134 studies were excluded from the study due to incomplete data, inconsistency of results in a study, poor studies, lack of access to full text, inconsistent data with the purpose of the study. 870 studies were reviewed, of which the text of 158 studies was reviewed and finally 24 studies were selected for meta-analysis. Prevalence of Dental Anxiety in Children was 29% (ES, 29% 95% CI 22%, 35%). Prevalence of Dental Anxiety in Children when used Dental Anxiety Question, Dental Fear Survey and MCDAS was 32% (ES, 32% 95% CI 26%, 37%), 24% (ES, 24% 95% CI 16%, 32%) and 22% (ES, 22% 95% CI 16%, 28%).
Finally, 24 studies were selected (Figure1).
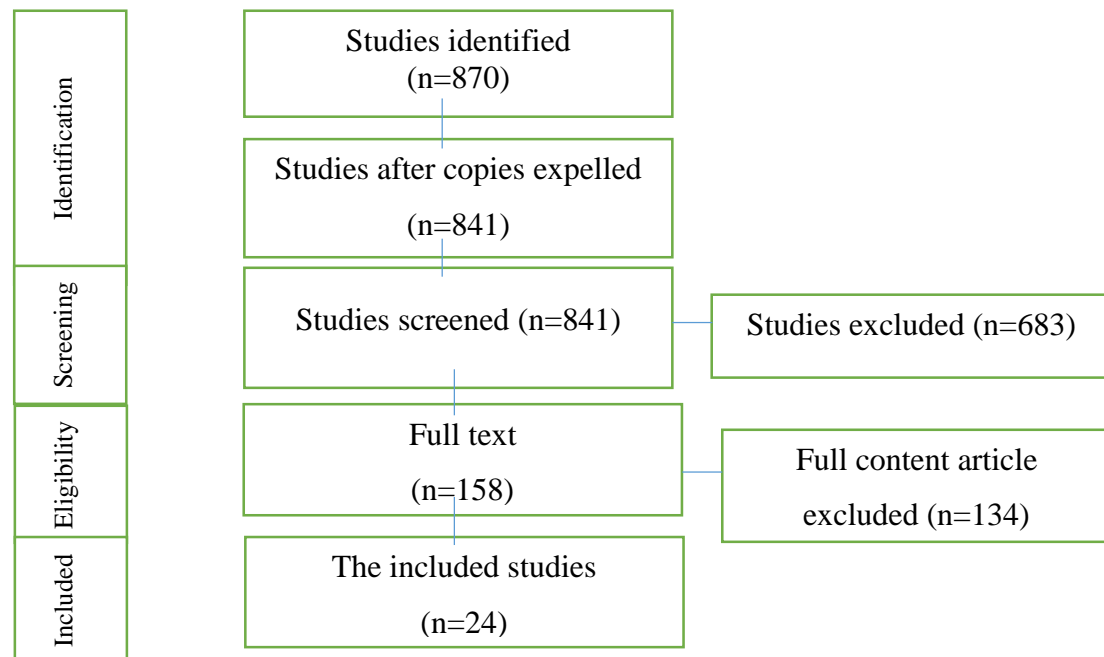
Figure 1. Study Attrition

Characteristics :

24 studies (three cohort studies and 21 Cross-sectional studies) have been included in present article. The number of participants a total was 13700 with range of age between 2-18 years. The research environment was school, Dental College and Hospital, University dental clinic, Pediatric hospital, Public dental service. The scale used for

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DA assessment in six studies Dental Anxiety Question, two studies Dental Fear Survey, four studies Modified Child Dental Scale, eleven studies Children's Fear Survey Schedule Dental Subscale and one study was Venham Picture Test (Table1).

Bias assessment :

The studies were low methodological quality. In general, the quality of studies estimated moderate to be low.

Table 1. Studies were selected for systematic review and meta-analysis.

N	Study. Years	Study design	Sample size	Mean/ Range of age (years)	environmental research	study tools
1	Lima et al.,2021 (14)	Cross-sectional	1189	6-12	School	Dental Anxiety Question
2	Soares et al.,2020 (15)	cohort	416	7-9	School	Dental Anxiety Question
3	Strom et al.,2020 (16)	Cross-sectional	345	<18	School	Dental Fear Survey
4	Kumar et al.,2019 (17)	Cross-sectional	400	6-12	DC-H	MCDAS
5	Khanduri et al.,2019 (18)	Cross-sectional	300	4-13	UDC	CFSS-DS
6	Menoncin et al.,2019 (19)	Cross-sectional	731	8	School	Dental Anxiety Question
7	Alsadat et al., 2018 (20)	Cross-sectional	1546	6-12	School	CFSS-DS
8	Barasuol et al., 2017 (21)	Cross-sectional	168	6-12	UDC	Dental Anxiety Question
9	Barreto et al., 2017 (22)	Cross-sectional	1367	6-7	School	Dental Anxiety Question
10	Silveira et al., 2017 (23)	Cross-sectional	1202	8-12	School	Dental Anxiety Question
11	Reis et al., 2016 (24)	Cross-sectional	69	4-12	UDC	Venham Picture Test
12	Klein et al., 2015 (25)	cohort	184	6-10	P-H	CFSS-DS
13	Bajric et al., 2015 (26)	Cross-sectional	40	2-8	UDC	CFSS-DS
14	Patel et al., 2015 (27)	Cross-sectional	132	7-16	PDS	MCDAS

15	Lalic et al., 2015 (28)	Cross-sectional	231	12	PDS	CFSS-DS
16	Torriani et al., 2014 (29)	cohort	1129	4-6	PDS	CFSS-DS
17	Honkala et al., 2014 (30)	Cross-sectional	661	13-15	School	MCDAS
18	Gyergyay et al., 2015 (31)	Cross-sectional	406	11-18	School	Dental Fear Survey
19	Lin et al., 2014 (32)	Cross-sectional	1542	10-11	School	CFSS-DS
20	Paryab et al., 2013 (33)	Cross-sectional	150	6-12	UDC	MCDAS
21	Beena et al., 2013 (34)	Cross-sectional	444	6-12	School	CFSS-DS
22	Salem et al., 2012 (35)	Cross-sectional	200	3-6	UDC	CFSS-DS
23	Chhabra et al., 2012 (36)	Cross-sectional	523	5-14	UDC	CFSS-DS
24	Krikken et al., 2012 (37)	Cross-sectional	325	7-11	School	CFSS-DS

DC-H: Dental College and Hospital; UDC: University dental clinic; P-H: Pediatric hospital; PDS: Public dental service; CFSS-DS: Children's Fear Survey Schedule Dental Subscale; MCDAS: Modified Child Dental Scale

Prevalence of Dental Anxiety in Children :

Prevalence of DA in Children was 29% (ES, 29% 95% CI 22%, 35%) among 24 studies with high heterogeneity (I^2=91.51%; P =0.00) (Figure2).

Prevalence of Dental Anxiety in Children by instrument :

Subgroup meta-analysis showed Prevalence of DA in Children by instrument used to assess DA. Prevalence of DA in Children when used DA Question, Dental Fear Survey and MCDAS was 32% (ES, 32% 95% CI 26%, 37%) among six studies with low heterogeneity (I^2=31.12%; P =0.20); 24% (ES, 24% 95% CI 16%, 32%) among two studies with low heterogeneity (I^2=0.01%; P =0.81) and 22% (ES, 22% 95% CI 16%, 28%) among four studies with low heterogeneity (I^2=0.01%; P =0.98), Respectively (Figure3).

Table3. Risk of bias assessment (Joanna Briggs Institute Critical Appraisal Checklist (13))

study	Sample size	Sampling	sample size adequate	subjects and settings described in detail	data analysis	condition measured reliably	appropriate statistical analysis	subgroups' differences identified
Lima et al.,2021 (14)	?	?	+	+	+	+	-	-
Soares et al.,2020 (15)	+	+	+	+	+	?	-	-
Strom et al.,2020 (16)	+	+	+	+	+	?	-	-

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Study	1	2	3	4	5	6	7	8
Kumar et al.,2019 (17)	+	+	+	+	?	+	-	-
Khanduri et al.,2019 (18)	-	-	-	+	+	+	-	-
Menoncin et al.,2019 (19)	-	?	+	+	+	+	-	-
Alsadat et al., 2018 (20)	+	+	+	-	+	?	-	-
Barasuol et al., 2017 (21)	?	+	-	+	?	+	-	-
Barreto et al., 2017 (22)	?	+	+	+	+	+	-	-
Silveira et al., 2017 (23)	+	+	+	+	+	+	-	+
Reis et al., 2016 (24)	?	?	+	+	+	+	-	-
Klein et al., 2015 (25)	-	-	-	+	?	?	-	-
Bajric et al., 2015 (26)	-	-	-	+	?	?	-	-
Patel et al., 2015 (27)	-	-	-	+	+	?	+	-
Lalic et al., 2015 (28)	-	-	-	+	?	?	-	-
Torriani et al., 2014 (29)	+	+	+	+	?	+	+	+
Honkala et al., 2014 (30)	-	+	+	+	+	+	-	-
Gyergyay et al., 2015 (31)	?	+	+	+	?	+	-	-
Lin et al., 2014 (32)	+	+	+	+	+	+	-	-
Paryab et al., 2013 (33)	-	-	-	+	?	?	-	-
Beena et al., 2013 (34)	-	-	+	+	?	?	-	-
Salem et al., 2012 (35)	-	-	+	+	?	?	-	-

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Chhabra et al., 2012 (36)	-	-	+	+	?	?	-	-
Krikken et al., 2012 (37)	-	?	-	+	?	+	-	-

Low (+), unclear (?), high (-)

Prevalence of DA in Children when used CFSS-DS was 24% (ES, 24% 95% CI 19%, 29%) among eleven studies with low heterogeneity (I^2=31.12%; P =0.20) and when used Venham Picture Test was 23% (ES, 23% 95% CI 11%, 35%) among one study (Figure3).
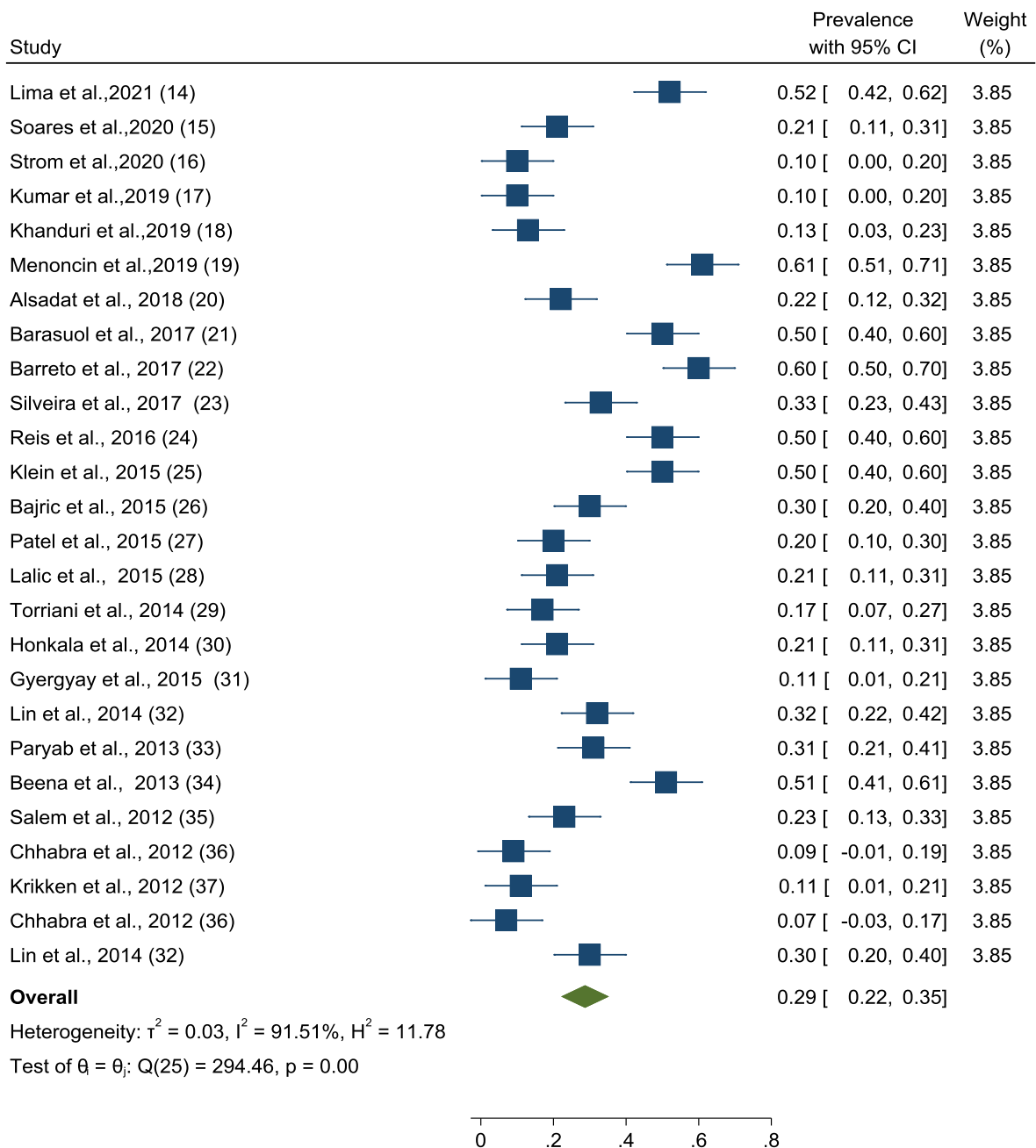
The overall prevalence of DA in Children by instrument was 25% (ES, 25% 95% CI 23%, 28%) among 24 studies with low heterogeneity (I^2=31 %; P =0.08). the test of subgroup differences showed there was no Statistically significant difference between scale used for DA assessment (p=0.17).

Prevalence of Dental Anxiety in Children by sex :

Subgroup meta-analysis showed Prevalence of DA in Children by sex. Prevalence of DA in girls and boys was 42% (ES, 42% 95% CI 23%, 61%) among seven studies with high heterogeneity (I^2=96.28%; P =0.00) and 37% (ES, 37% 95% CI 17%, 58%) among seven studies with high heterogeneity (I^2=96.64%; P =0.00), respectively (Figure4). These results showed the prevalence of DA is higher in girls than boys.

The overall prevalence of DA in Children sex was 40% (ES, 40% 95% CI 26%, 53%) among seven studies with high heterogeneity (I^2=96.21%; P =0.00).

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Figure2. Forest plot showed Prevalence of Dental Anxiety in Children

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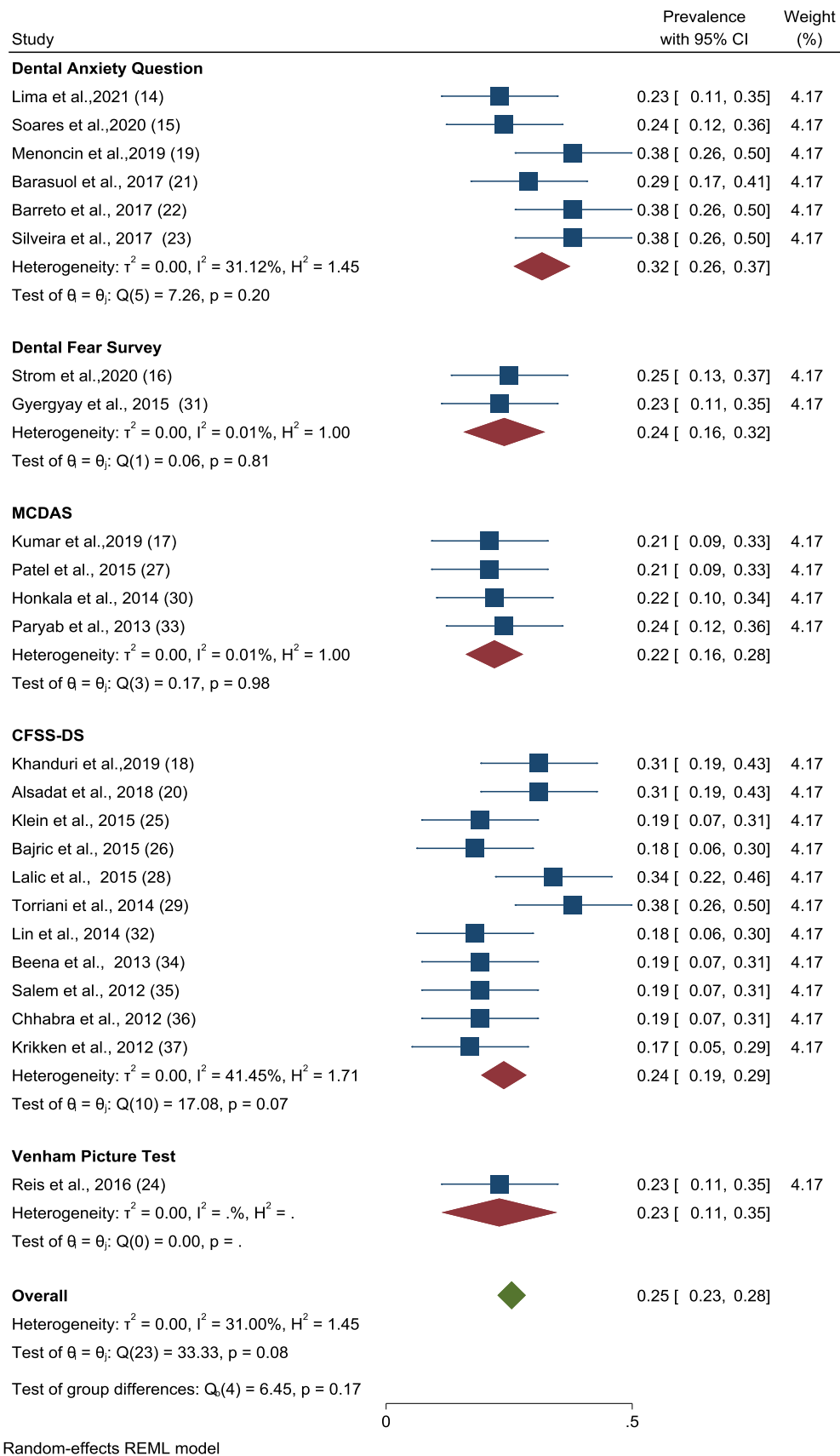

Figure3. Forest plot showed Prevalence of Dental Anxiety in Children by instrument

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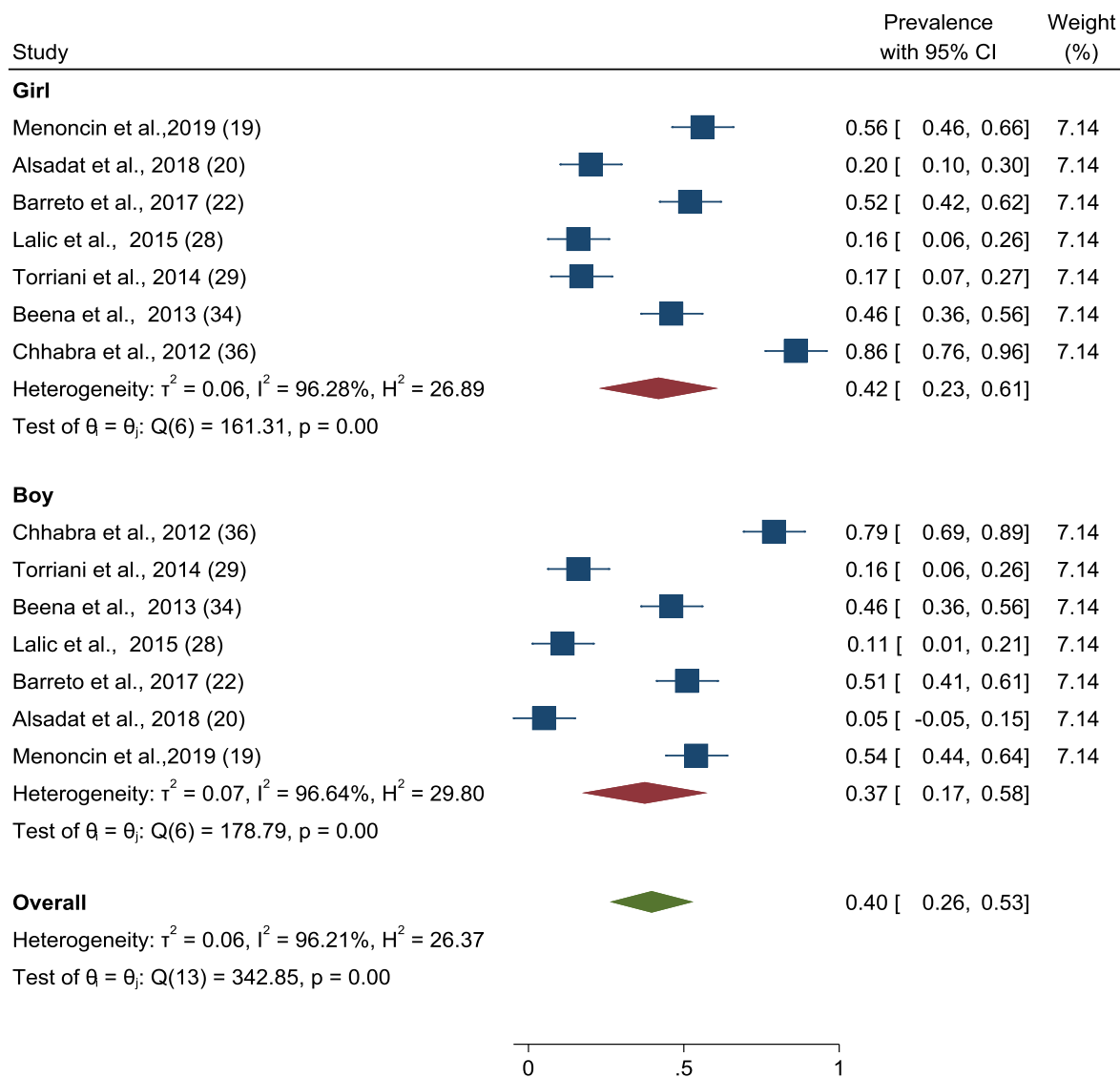
Study	Prevalence with 95% CI	Weight (%)
Girl		
Menoncin et al.,2019 (19)	0.56 [0.46, 0.66]	7.14
Alsadat et al., 2018 (20)	0.20 [0.10, 0.30]	7.14
Barreto et al., 2017 (22)	0.52 [0.42, 0.62]	7.14
Lalic et al., 2015 (28)	0.16 [0.06, 0.26]	7.14
Torriani et al., 2014 (29)	0.17 [0.07, 0.27]	7.14
Beena et al., 2013 (34)	0.46 [0.36, 0.56]	7.14
Chhabra et al., 2012 (36)	0.86 [0.76, 0.96]	7.14
Heterogeneity: τ^2 = 0.06, I^2 = 96.28%, H^2 = 26.89	0.42 [0.23, 0.61]	
Test of $\theta_i = \theta_j$: Q(6) = 161.31, p = 0.00		
Boy		
Chhabra et al., 2012 (36)	0.79 [0.69, 0.89]	7.14
Torriani et al., 2014 (29)	0.16 [0.06, 0.26]	7.14
Beena et al., 2013 (34)	0.46 [0.36, 0.56]	7.14
Lalic et al., 2015 (28)	0.11 [0.01, 0.21]	7.14
Barreto et al., 2017 (22)	0.51 [0.41, 0.61]	7.14
Alsadat et al., 2018 (20)	0.05 [-0.05, 0.15]	7.14
Menoncin et al.,2019 (19)	0.54 [0.44, 0.64]	7.14
Heterogeneity: τ^2 = 0.07, I^2 = 96.64%, H^2 = 29.80	0.37 [0.17, 0.58]	
Test of $\theta_i = \theta_j$: Q(6) = 178.79, p = 0.00		
Overall	0.40 [0.26, 0.53]	
Heterogeneity: τ^2 = 0.06, I^2 = 96.21%, H^2 = 26.37		
Test of $\theta_i = \theta_j$: Q(13) = 342.85, p = 0.00		

Random-effects REML model

Figure4. Forest plot showed Prevalence of Dental Anxiety in Children by sex

Discussion :

The aim of current Systematic Review and Meta-Analysis study was evaluate the prevalence of dental anxiety in children. According to meta-analysis prevalence of DA was reported to be 29%. These findings indicate that DA in children is very common worldwide. Simple measures such as empathetic communication style and appropriate level of physical contact along with verbal and reassuring explanation may lead to more participatory behaviors in children during dental treatment and can reduce their DA. It can also be seen that DA decreases with age, with a higher prevalence of DA reported in younger children. Studies have shown that most children who were initially anxious did not become anxious after 2 years(38). High heterogeneity was found between the methodology of the studies and the reason could be the difference in the study environment and the difference in the tools used. The study method was mostly cross-sectional descriptive studies and few cohort studies were found. Due to the fact

that cross-sectional studies that are not population-based and do not use random sampling are very prone to selection bias, caution is recommended when extending the results of our meta-analysis to other populations and environments. In the present study, subgroup meta-analysis was performed between DA assessment tools to provide stronger evidence. In preschool children, the distribution of studies based on the type of questionnaire was well balanced. However, when prevalence estimates in preschool children were combined based on the type of DA scale, a significant combined prevalence with Venham Picture Test was found compared to CFSS-DS and Dental Anxiety Question (9). Studies have not mentioned how to complete the tools, the type of respondent (children themselves or caregivers) and can be one of the limitations of the present study and one of the reasons for the high heterogeneity between the methodologies of the studies. When CFSS-DS is applied to students and their parents, DA parents value their children above their children. Meta-analysis showed that there was no significant difference between the two groups of boys and girls in terms of DA, but DA was higher in girls than boys. Children 6 to 12 years old with caries and those who had never seen a dentist had a significantly higher prevalence of DA. However, since our data come from preliminary studies with a cross-sectional design, these findings do not necessarily imply cause-and-effect relationships.

Conclusion :

In current Systematic Review and Meta-Analysis study, the results showed that the prevalence of DA in the population of children is relatively high, especially in girls, and appropriate strategies should be considered to reduce DA. Due to the fact that the methodology of the studies was not the same and there was a difference in the research environment and tools, there was heterogeneity between the studies. Also, most descriptive studies are cross-sectional, which is one of the weaknesses of the studies. It is suggested that future studies be conducted with high quality and similar methodology. Further investigation is needed to confirm the evidence from the findings of the present study. In current Systematic Review and Meta-Analysis study, the results showed that the prevalence of Dental Anxiety in the population of children is relatively high, especially in girls, and appropriate strategies should be considered to reduce Dental Anxiety

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