Global and regional estimates of dental pain among children and adolescents—systematic review and meta-analysis

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Abstract
Aim We aimed to evaluate the pooled prevalence of dental pain amongst children and adolescents.
Methods Studies conducted in children and adolescents up to 18 years of age and where prevalence of dental is reported or calculated were included. Search was performed in four major databases from inception to June 1st, 2019. Prevalence estimate at the maximal recall for the dental pain for the individual study was used to calculate the overall pooled estimate.
Results The prevalence of dental pain ranged from 1.33 to 87.8% in the included publications (n = 97). More than half of the publications reported the lifetime prevalence of dental pain (n = 51) while few studies reported the current prevalence of dental pain (n = 3) and only one study evaluated the dental pain in the past one week. Heterogeneity was high among the included publications (Q = 49,063.12; P < 0.001; df = 96 and I² = 99.8; P < 0.001). Overall pooled prevalence of dental pain was 32.7 (CI = 29.6–35.9). No difference was seen with respect to the trends in prevalence of dental pain (Coefficient: 0.005; 95% CI −0.001–0.011; P-value: 0.101).
Conclusion Two out of ten children below five years, four out of ten children between 6 and 12 years and three out of ten adolescents between 13 and 18 years would have experienced pain in the past. Overall, three out of ten children or adolescents might have experienced dental pain in the past. There was no difference in the pain prevalence between male and females. Studies from Africa reported highest pooled prevalence (50.1%) with least being from Australia (20.7%). Studies from India (40.4%), China (41.3%) and Iran (42.6%) reported high pooled prevalence estimates of dental pain.

Keywords Adolescents · Children · Dental pain · Prevalence · Toothache

Introduction
Pain is defined as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage (Treede 2018).” Pain is multidimensional in nature and consists of physiological and psychological variables linked with tissue damage (Santos et al. 2019). Despite considerable improvements in oral health care delivery, dental pain is acknowledged as a common symptom of oral disease (Goes et al. 2008). It is one of the major problems due to which individuals avail dental treatment. It has a considerable impact on the daily activities of individuals like eating, sleeping, homework, paying attention in the class (Goes et al. 2008; Naidoo et al. 2013; Santos et al. 2019), school absenteeism (Ferraz et al. 2014; Ruff et al. 2019), playing, low academic achievement, (Ruff et al. 2019; Seirawan et al. 2012) and avoidance of particular foods which might trigger the pain. Similarly, parents of children having dental pain reported higher workplace absenteeism (Ribeiro et al. 2015b), increased expenditure (2016) and guilt (Gomes et al. 2014). In view of the potential impact of dental pain on oral health-related quality of life, reducing the prevalence of dental pain is included as one of the critical components in the Global Goals for Oral Health 2020 (Hobdell et al. 2003).

Many terminologies like dental pain, oral pain, facial pain, orofacial pain are used interchangeably. Oral pain refers to the pain within the mouth (Macfarlane et al. 2002) whereas dental pain refers to the “pain that originates from innervated tissues within the tooth or
immediately adjacent to it (Gibbs and Hargreaves 2013)."

"Facial pain (FP) includes pain whose origin is below the canthomeatal line, above the neck and anterior to the ears, while oral pain indicates that the pain is originating from structures within the mouth (Macfarlane et al. 2002)."

Studies have shown a direct relationship of dental pain with oral conditions like dental caries (Moura-Leite et al. 2008), abscess (Ferraz et al. 2014), and dentoalveolar trauma (Moure-Leite et al. 2011). Erupting teeth, as well as exfoliating primary teeth, have also shown to cause dental pain (Shepherd et al. 1999). The most consistent clinical correlate for the occurrence of dental pain is due to the advanced stage of dental caries, primarily in the lower socioeconomic groups with limited access to care (Slade 2001). Young children with dental caries are at risk of experiencing further dental pain (Levine et al. 2002). Even gingivitis has shown to cause dental pain in preschool children (Moura-Leite et al. 2008).

Neurophysiological processes, along with other factors (socio-demographic, cultural, and psychological), have an influential role in the perception of dental pain (Ratnayake and Ekanayake 2005). Adults and children have a different understanding of pain as well as health problems and their effect on oral health-related quality of life (Moura-Leite et al. 2008).

Dental pain was shown to be associated with poor oral health status and decreased access to oral health care which are considered as predictor or proxy indicator to evaluate the use of dental services (Ekanayake and Mendis 2002). Dental pain is a traumatic experience and often requires treatment. Hence, oral health professionals and researchers must understand associated physiological factors, pathological factors, intensity, severity and methods to avoid the dental pain. Considering the impact of dental pain on the individual and the community, it is necessary to understand the scope of this dental public health problem. Such an evaluation helps researchers and planners help to understand the impact of dental pain, frame policies, and the allocation of appropriate and valuable resources (Fernandes et al. 2019). Systematic reviews exist on various clinical oral conditions like caries (Al Agili 2013; Al Ayyan et al. 2018) and molar incisor hypomineralization (Pentapati et al. 2017) in children, dental pain and caries among children and adolescents (Slade 2001), dental pain (Pau et al. 2003) and root caries (Pentapati et al. 2019) in the adults. To date, there were no systematic reviews or meta-analysis on the subjective indicators like the self-reported prevalence of dental pain among children and adolescents. Hence, we aimed to evaluate the pooled prevalence of dental pain amongst children and adolescents.

### Materials and methods

#### Selection criteria

Cohort or cross-sectional observational studies which reported period or point prevalence of dental pain among children and adolescents up to 18 years of age in English language were included. Studies published as conference proceedings, editorials or letters were excluded.

#### Search strategy

Publications were identified by searching four databases (PubMed, Scopus, Embase, and CINAHL) from inception to June 1st, 2019. Search was performed using keywords and free text words based on the previous publications (“dental pain” OR “teeth pain” OR “tooth pain” OR “toothache” OR “teeth ache” AND “Prevalence” OR “Cross-sectional studies” OR “Epidemiology” OR “Epidemiologic methods” OR “Epidemiologic research design” OR “Epidemiologic studies” OR “Epidemiologic measurements” OR “Cohort studies”) (Mansfield et al. 2016; Pentapati et al. 2019, 2017). Limits applied were children and adolescents up to 18 years of age, humans and English through filters provided by individual databases mentioned above. The studies were transferred to the Rayyan website (https://rayyan.qcri.org/) for the removal of duplicates and screened for titles and then abstracts by evaluators (PKC and YSK). Shortlisted publications were subjected to full-text screening by evaluators (PKC and YSK) to assess the eligibility. Discrepancies were resolved after appraisal by the third evaluator (HS).

#### Assessment of risk of bias (ROB)

All publications were appraised for ROB assessment using a nine item tool developed for prevalence studies (Hoy et al. 2012) by evaluators (YSK and HS and discrepancies were resolved by a third evaluator (PKC)).

#### Data extraction

Two evaluators independently (YSK and PKC) performed the data extraction and any discrepancies were resolved by a third evaluator (HS). Details included were age, gender and geographic distribution, prevalence estimates as per gender, publication year, and prevalence estimates of dental pain (current, 1 week, 1, 3, 6, 12 months, and life-time experience).

#### Statistical analysis

Prevalence estimate at the maximal recall for the dental pain for each individual study was used to calculate the overall
pooled estimate. \( I^2 \) statistic which serve as an measure of heterogeneity was calculated. Meta-analysis was performed using Open Meta software (Metafor Package 1.4). (1999) Random-effects model was used to calculate summary prevalence data and 95% confidence intervals (DerSimonian and Laird 1986). Sub-group analysis was performed for variables like continent, gender, risk of bias and time recall of prevalence of dental pain. Meta-regression was performed to evaluate the trends in prevalence of dental pain and Funnel plot was used to assess publication bias (Sterne and Egger 2001).

Results

Search results

Our initial search resulted in 1814 publications. After the removal of duplicates, 1186 publications were screened for title and abstract. Full-text screening was performed for eligible publications \((n = 196)\). Seventy seven publications were excluded due to inappropriate study design or unclear outcome \((n = 74)\), wrong study population \((n = 1)\), age of the included participants beyond 18 years \((n = 5)\) and other languages \((n = 2)\). One publication was included by manual searching of citation list. A total of 115 publications were included in the qualitative synthesis. Eighteen publications were later excluded (secondary data analysis of published studies), and 97 publications were included in the final meta-analysis (Table 1 and Fig. 1).

Prevalence

The prevalence of dental pain ranged from 1.33 to 87.8% (Ananthakrishnan et al. 2001; Naidoo et al. 2001). Sixteen publications reported a prevalence of more than 50% (Adeniyi and Oduwanya 2017; Alzahrani 2019; Barreto et al. 2017; Bashirian et al. 2018; Dandi et al. 2011; Mendes et al. 2015; Figueiredo et al. 2011; Santos et al. 2019; Shekhawat et al. 2016; Shidara et al. 2017; Soares et al. 2015). Only ten studies reported a prevalence of less than 10% (Ananthakrishnan et al. 2001; Booth et al. 1992; Hardy et al. 2018; Karibe et al. 2015; Lemos et al. 2015; Rupali et al. 2010; Sarri et al. 2012; Sillers et al. 2004; Siqueira et al. 2013; Sousa et al. 2014) and 18 publications reported prevalence between 10 and 20% (Bastos et al. 2008; Corrêa-Faria et al. 2018; Dogar et al. 2011; Du et al. 2011; Evans et al. 1995; Figueiredo et al. 2011; Goettems et al. 2018; Guskuma et al. 2017; Kamran et al. 2017; Kumar et al. 2014; Lewis and Stout 2010; Maharani et al. 2019; Misrohmasari et al. 2018; Perera and Ekanayake 2008; Ratnayake and Ekanayake 2005; Treasure and Dever 1992; Vargas et al. 2005, 2002). There was high variability among the studies in the assessment of the prevalence of dental pain. The majority of the publications reported the lifetime prevalence of dental pain \((n = 51)\), very few studies assessed the current prevalence of dental pain \((n = 3)\) and only one study evaluated the dental pain in the past 1 week.

Age

There was no clear distinction in the age grouping of the children and adolescents for most of the publications. Eighteen publications reported prevalence of pain for children less than 5 years \([18.5\% (95\% CI 14.7–22.4)]\), 25 publications reported for 6–12 \([41.7\% (95\% CI 33.3–50.2)]\) years old and only nine publications reported for 13–18 years old \([25.8\% (95\% CI 14–37.5)]\). Six studies reported prevalence among WHO index age group 5 years \((Range: 12.66–34.93) [21.5\% (95\% CI 17.1–26)]\) (Carmichael et al. 1989; Evans et al. 1995; Ferreira-Júnior et al. 2015; Moura-Leite et al. 2008; Perazzo et al. 2017; Tsakos et al. 2012). Eight studies used the WHO index age groups 12 years \((Range: 12.09–71.4) [30.9\% (95\% CI 14.1–47.8)]\) (Andegiorgish et al. 2017; Bastos et al. 2008; Dandi et al. 2011; Guskuma et al. 2017; Jürgensen and Petersen 2009; Lopes et al. 2013; Robinson et al. 2005; Traebert et al. 2005), four studies reported prevalence among 12 and 15 years old \((Kumar et al. 2016; Maharani et al. 2019; Peres et al. 2010; Shekhawat et al. 2016) [28.8\% (95\% CI 12.9–44.7)]\) and one study reported prevalence in 15 years old \((Perera and Ekanayake 2008)\). Nine studies evaluated the dental pain in the past 1 week.
Table 1 Summary characteristics of the included studies

| Author and year                                      | Total | Continent | Age                | ROB | Prevalence | Questionnaire |
|------------------------------------------------------|-------|-----------|--------------------|-----|------------|---------------|
| (Carmichael et al. 1989)                             | 827   | E         | 5                  | L   | 21.77      | P             |
| (Treasure and Dever 1992)                            | 342   | Au        | 5                  | L   | 16.67      | P             |
| (Booth et al. 1992)                                  | 227   | E         | 3                  | L   | 3.96       | P             |
| (Evans et al. 1995)                                  | 1185  | E         | 5                  | L   | 12.66      | P             |
| (Slade et al. 1996)                                  | 8568  | Au        | 5–15               | L   | 23.80      | P             |
| (Shepherd et al. 1999)                               | 589   | E         | 8                  | L   | 47.54      | S             |
| (Honkala et al. 2001)                                | 27,765| E         | 12, 14, 16, 18     | L   | 30.99      | S             |
| (Naidoo et al. 2001)                                 | 1025  | Af        | 8–10               | L   | 87.80      | S             |
| (Ananthakrishnan et al. 2001)                        | 150   | As        | 5–12               | L   | 1.33       | U             |
| (Vargas et al. 2002)                                 | 560   | NA        | 3–5                | L   | 16.96      | P             |
| (De Barretto et al. 2004)                            | 601   | SA        | 8–9                | L   | 45.92      | S             |
| (Nomura et al. 2004)                                 | 169   | SA        | 12–13              | L   | 33.73      | P             |
| (Siegal et al. 2004)                                 | 2555  | NA        | 2–5                | L   | 9.00       | P             |
| (Jiang et al. 2005)                                  | 2662  | As        | 11, 13, 15         | L   | 41.28      | S             |
| (Kiwanuka and Åstrøm 2005)                           | 614   | Af        | 10–14              | L   | 39.25      | S             |
| (Ratnayake and Ekanayake 2005)                       | 576   | As        | 8                  | L   | 17.88      | S             |
| (Robinson et al. 2005)                               | 174   | Af        | 12                 | L   | 36.21      | S             |
| (Traebert et al. 2005)                               | 930   | SA        | 12                 | L   | 33.98      | S             |
| (Vargas et al. 2005)                                 | 2411  | NA        | KG and 3rd grade   | L   | 11.78      | P             |
| (Van Dijk et al. 2006)                               | 495   | NA        | 9–13               | M   | 81.62      | S             |
| (Bernabé et al. 2007)                                | 805   | SA        | 11–12              | L   | 43.35      | S             |
| (Goes et al. 2007)                                   | 1052  | SA        | 14–15              | L   | 33.65      | S             |
| (Pau et al. 2007)                                    | 187   | E         | 12                 | L   | 22.46      | S             |
| (Shidara et al. 2007)                                | 366   | As        | 6–16               | M   | 68.58      | S             |
| (Bastos et al. 2008)                                 | 339   | SA        | 12                 | L   | 12.09      | S             |
| (Moura-Leite et al. 2008)                            | 549   | SA        | 5                  | L   | 24.95      | P             |
| (Pau et al. 2008)                                    | 500   | As        | 11–14              | L   | 30.40      | S             |
| (Perera and Ekanayake 2008)                          | 1218  | As        | 15                 | L   | 12.32      | S             |
| (Campus et al. 2009)                                 | 913   | E         | Secondary school   | L   | 28.26      | S             |
| (Jürgensen and Petersen 2009)                        | 594   | As        | 12                 | L   | 69.36      | S             |
| (Verslout et al. 2009)                               | 652   | E         | 2–5                | M   | 22.09      | P             |
| (Jamieson et al. 2010)                               | 301   | Au        | 16–18              | L   | 21.9       | S             |
| (Lewis and Stout 2010)                               | 86,730| NA        | 1–17               | L   | 10.70      | P             |
| (Peres et al. 2010)                                  | 5815  | SA        | 12 and 15          | L   | 25.54      | S             |
| (Rupali et al. 2010)                                 | 400   | As        | 14–15              | L   | 7.00       | S             |
| (Areai et al. 2011)                                  | 9098  | Au        | 9–13               | L   | 22.90      | S             |
| (Barrêto et al. 2011)                                | 174   | SA        | 8–9                | L   | 42.53      | S             |
| (Da Silva et al. 2011)                               | 190   | SA        | 11–12              | M   | 45.79      | S             |
| (Dandi et al. 2011)                                  | 2203  | As        | 12                 | L   | 71.40      | S             |
| (Dogar et al. 2011)                                  | 253   | Au        | 2–4                | M   | 13.44      | P             |
| (Du et al. 2011)                                     | 14,836| E         | 3–17               | L   | 10.92      | P&S           |
| (Figueiredo et al. 2011)                             | 835   | SA        | 6–7                | L   | 18.92      | S             |
| (Jung et al. 2011)                                   | 74,689| As        | 13–18              | L   | 33.90      | S             |
| (Jürgensen and Petersen 2011)                        | 612   | As        | 11–13              | L   | 70.26      | S             |
| (Ravaghi et al. 2011)                                | 234   | As        | 15–17              | M   | 26.07      | S             |
| (Yuen et al. 2011)                                   | 153   | NA        | 10–18              | M   | 33.99      | S             |
| (Leal et al. 2012)                                   | 587   | SA        | 6–7                | L   | 21.81      | S             |
| (Ravaghi et al. 2012)                                | 639   | As        | 15–17              | L   | 30.20      | S             |
| (Sarri et al. 2012)                                  | 965   | E         | 15–16              | L   | 7.36       | S             |
| (Tsakos et al. 2012)                                 | 292   | E         | 5                  | L   | 34.93      | S             |
### Table 1 (continued)

| Author and year                  | Total | Continent | Age       | ROB | Prevalence | Questionnaire |
|----------------------------------|-------|-----------|-----------|-----|------------|---------------|
| (Yusof and Jaafar 2012)          | 132   | As        | 11–12     | L   | 43.94      | S             |
| (Colares et al. 2013)            | 970   | SA        | 5–12      | L   | 44.95      | P             |
| (de Lacerda et al. 2013)         | 385   | SA        | 7–8       | L   | 31.69      | S             |
| (Hu et al. 2013)                 | 305   | As        | 7.6–9.3   | M   | 47.54      | S             |
| (Lopes et al. 2013)              | 4249  | SA        | 12        | L   | 23.91      | P             |
| (Prasai Dixit et al. 2013)       | 131   | As        | 8–16      | M   | 31.30      | S             |
| (Siqueira et al. 2013)           | 814   | SA        | 3–5       | L   | 8.72       | P             |
| (Kumar et al. 2014)              | 306   | As        | 10–15     | L   | 34.97      | S             |
| (Mulu et al. 2014)               | 147   | Af        | 6–15      | L   | 27.21      | S             |
| (Noro et al. 2014)               | 688   | SA        | 11–15     | L   | 31.69      | S             |
| (Souza et al. 2014)              | 732   | SA        | 3–5       | L   | 6.42       | P             |
| (Ferreira-Júnior et al. 2015)    | 7280  | SA        | 5         | L   | 21.94      | P             |
| (Karibe et al. 2015)             | 1415  | As        | 11–15     | L   | 9.96       | S             |
| (Lemes et al. 2015)              | 385   | SA        | 2–4       | L   | 9.87       | P             |
| (Ribeiro et al. 2015a)           | 837   | SA        | 3–5       | L   | 31.66      | P             |
| (Schuch et al. 2015b)            | 750   | SA        | 8–10      | L   | 33.33      | S             |
| (Schuch et al. 2015a)            | 1199  | SA        | 8–12      | L   | 35.70      | S             |
| (Soares et al. 2015)             | 101   | SA        | 6–16      | M   | 57.43      | S             |
| (Ul Hasan et al. 2015)           | 152   | As        | Primary school | M | 42.76 | U |
| (Veiga et al. 2015)              | 447   | E         | 12–18     | M   | 30.65      | S             |
| (Babo Soares et al. 2016)        | 959   | Au        | 6–17      | L   | 35.77      | S             |
| (Nguyen et al. 2016)             | 556   | As        | 8–10      | L   | 33.45      | S             |
| (Shekhawat et al. 2016)          | 200   | As        | 12–15     | L   | 77.00      | S             |
| (Kumar et al. 2016)              | 800   | As        | 12–15     | L   | 10.13      | S             |
| (Adeniyi and Odusanya 2017)      | 414   | Af        | 8–12      | L   | 61.35      | S             |
| (Andegiorgish et al. 2017)       | 225   | Af        | 12        | L   | 48.00      | S             |
| (Barreto et al. 2017)            | 1367  | SA        | 6–7       | L   | 50.84      | S             |
| (Escoffié-Ramirez et al. 2017)   | 1404  | NA        | 6–12      | M   | 49.86      | P             |
| (Ghorbani et al. 2017)           | 9875  | Au        | 4–17      | L   | 22.79      | P             |
| (Guskuma et al. 2017)            | 1233  | SA        | 12        | L   | 16.71      | S             |
| (Kamran et al. 2017)             | 753   | SA        | 4–17      | L   | 10.23      | S             |
| (Perazzo et al. 2017)            | 768   | SA        | 5         | L   | 23.44      | P             |
| (So et al. 2017)                 | 1407  | NA        | 6 m–6y    | L   | 37.67      | P             |
| (Bashirian et al. 2018)          | 988   | As        | 7–12      | L   | 71.26      | S             |
| (Corrêa-Faria et al. 2018)       | 563   | SA        | 2–5       | L   | 18.29      | P             |
| (Goettems et al. 2018)           | 1196  | SA        | 8–12      | L   | 16.89      | S             |
| (Hardy et al. 2018)              | 3671  | Au        | 10–16     | L   | 4.09       | S             |
| (Hu et al. 2018)                 | 4815  | As        | 12–14     | L   | 52.88      | S             |
| (Mishra et al. 2018)             | 210   | As        | 5–15      | M   | 81.43      | S and P       |
| (Misrohmasari et al. 2018)       | 2377  | As        | 12–14     | L   | 13.93      | S             |
| (Oliveira et al. 2018)           | 9727  | SA        | 13–17     | L   | 59.49      | S             |
| (Xu et al. 2018)                 | 1425  | As        | 2–6       | L   | 23.58      | P             |
| (Alzahrani 2019)                 | 92    | As        | 12–16     | M   | 79.35      | P             |
| (Fernandes et al. 2019)          | 306   | SA        | 1–3       | L   | 40.20      | P             |
| (Maharani et al. 2019)           | 494   | As        | 12–15     | L   | 17.61      | S             |
| (Miao et al. 2019)               | 7022  | As        | 11–18     | L   | 38.49      | S             |
| (Santos et al. 2019)             | 1589  | SA        | 8–10      | L   | 51.54      | S             |

SA South America; NA North America; Af Africa; As Asia; Au Australia; L Low; M Moderate; S self-reported; P parent reported; U Unclear
The majority of the publications were in low-risk category ($n = 82$) while very few publications were at moderate risk ($n = 15$). The prevalence estimates for low and moderate ROB publications were 30.1 and 47.4% respectively (Table 2).

**Risk of bias**

The funnel plot showed asymmetry ($p < 0.001$) (Fig. 4).

**Publication bias**

The funnel plot showed asymmetry ($p < 0.001$) (Fig. 4).
Discussion

Dental pain can be a preventable and or treatable condition, although it may be self-limiting in few cases. In this review, we aimed to evaluate the pooled prevalence of dental pain among children and adolescents through subjective self/proxy reports of dental pain in children and adolescents. A total of 97 studies constituted for the pooled estimates in this meta-analysis. The pooled prevalence has to be interpreted with caution due to high heterogeneity among the included publications. High heterogeneity could be due to the variability in disease prevalence which could have caused the dental pain, recall time interval for the prevalence of dental pain, geographic variation, access to care, social status, and availability of services. The overall pooled prevalence of dental pain was 32.7%. Large population or national surveys reported prevalence in the range of 10.7–59.5% (Ferreira-Júnior et al. 2015; Jung et al. 2011; Lewis and Stout 2010; Lopes et al. 2013; Misrohmasari et al. 2018; Oliveira et al. 2018; Peres et al. 2010). Studies from Africa reported high pooled prevalence (50.1%) and lowest pooled prevalence was seen in Australia (20.7%). Females showed marginally higher prevalence estimates than males. There was no significant difference in the trend of dental pain prevalence over the three decades. Among the included studies, age and gender-specific prevalence estimates have not been reported adequately.

There was no consensus in the recording of dental pain among the included studies. Studies have used single-item questions or questionnaires to evaluate the history of dental pain. Also, there was diversity in the recall time interval used across the studies viz., current, 1 week, 1 month, 3, 6, 12, and a lifetime experience of dental pain. Few studies used more than one recall time interval which creates ambiguity in prevalence estimates. Nevertheless, we have used the maximal recall time interval from each study to calculate the overall prevalence of dental pain.

Dental pain could be due to a variety of reasons (eruption, exfoliation, carious teeth, dentinal hypersensitivity, or abscess) among children adolescents. The reason for the dental pain in most of the studies was not emphasized. Most of the reasons which cause dental pain may need treatment from a dental professional while reasons like eruption and exfoliation could be self-limiting. There could be overall inflation of the prevalence estimates due to the lack of emphasis on the etiology of the dental pain in the published studies.

Exclusion of non-English studies, lack of age specific prevalence estimates for substantial number of publications, and reason for dental pain are few of the limitations. Within the limits of this review, we could conclude that three out of ten children or adolescents could have experienced dental pain in the past. However, the prevalence estimates of dental pain may not indicate the exact treatment need due to reasons like self-limiting pain. It can be indicative of the burden of disease and its impact on children and adolescents. Such data may be useful for planning public health programs. Dental professionals should consider the fact that dental pain can be a common symptom among children and adolescents and is based on the subjective feeling of the individual.

Future studies on the prevalence of dental pain should use the the standard guidelines of “Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)” and widely accepted criteria for the recall time interval for self-reported dental pain. Emphasis should be made on the reasons for dental pain to prevent overestimation of prevalence.

Table 2 Subgroup analysis of the pooled estimates (Age, Continent, risk of bias, and dental pain recall)

| Category                  | Number of publications | Estimate (confidence interval) |
|---------------------------|------------------------|--------------------------------|
| Age                       |                        |                                |
| ≤ 5 years                 | 18                     | 18.5 (14.7–22.4)               |
| 6–12 years                | 25                     | 41.7 (33.3–50.2)               |
| 13–18 years               | 9                      | 25.8 (14–37.5)                 |
| Continent                 |                        |                                |
| Europe                    | 12                     | 22.7 (15.3–30.1)               |
| Australia                 | 8                      | 20.7 (13.1–28.3)               |
| Africa                    | 6                      | 50.1 (27–73.1)                 |
| Asia                      | 31                     | 38.6 (32.3–44.8)               |
| North America             | 8                      | 31.3 (21.2–41.5)               |
| South America             | 32                     | 31 (25.2–36.9)                 |
| Risk of Bias              |                        |                                |
| Low                       | 82                     | 30.1 (26.7–33.5)               |
| Moderate                  | 15                     | 47.4 (35.3–59.5)               |
| Prevalence of dental pain as per the recall |                      |                                |
| Current                   | 3                      | 25.1 (9.8–40.5)                |
| 1 week                    | 1                      | 20.9                           |
| 1 month                   | 15                     | 28 (16.3–39.7)                 |
| 3 months                  | 7                      | 30.7 (18.2–43.3)               |
| 6 months                  | 12                     | 27.6 (22.1–33.2)               |
| 1 year                    | 17                     | 41.9 (32.6–51.3)               |
| Life time prevalence      | 51                     | 31.4 (26.6–36.1)               |

Conclusion

Considering the limitations of the study, two out of ten children below 5 years, four out of ten children between 6 and 12 years and three out of ten adolescents between 13 and 18 years would have experienced pain in the past. Overall, three out of ten children or adolescents might have experienced dental pain in the past. There was no difference in the
Fig. 2  Forest plot of the prevalence of dental pain
pain prevalence between male and females. Studies from Africa reported highest pooled prevalence (50.1%) with least being from Australia (20.7%). Studies from India (40.4%), China (41.3%) and Iran (42.6%) reported high pooled prevalence estimates of dental pain.

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Compliance with ethical standards

Conflicts of interest The authors declare that they have no conflict of interest.

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