**Appendix 2. Included studies’ description (N =42).**

**2.1 Description of longitudinal studies included in the qualitative synthesis and meta-analysis (n = 8; total sample size = 5,254).**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **#** | **Author (year) and location** | **Design** | **Participants** | **Ultra-processed foods item/group and classification** | **Dental caries classification** | **Adjusted confounders** | **Main findings**  **(% or mean and adjusted effect measures)** |
| 1 | Arheiam et al. (2020)  Benghazi, Líbia | Non-randomized trial | 1,134 school adolescents aged 12 years  Response rate: 94% | SSB  # Frequency of consumption: never (ref.) versus less than once a day and everyday | DMFS/DMFT index ≥ 1 | *SES/Family*: parents' education and occupation class  *Individual*: gender, source of drinking water, frequency of brushing teeth | % Caries: 42.8 (n=485)  % SSB less than once a day: 61.8 (n=701)  % SSB everyday: 29.5 (n=334) |
|  | SSB less than once a day: OR 1.84 (95% CI: 1.17, 2.91)  SSB everyday: OR 1.56 (95% CI: 0.96, 2.54) |
|  |  |  |  |  |  |  |  |
| 2 | Campain et al. (2003)  Melbourne, Australia | Cohort | 645 adolescents aged 12-13 yrs  2-year follow-up  Response rate:70% | Group 1: Biscuits, buns, doughnuts, cakes, puddings, scones, toasted muesli, muesli bars, some other breakfast cereals  Group 2: Breads, muffins, crumpets, crackers some cereals, pastries, potato chips, corn chips  # Mean daily consumption in grams of each group | DMFS index increment | *SES/Family*: Household income, parents’ education level, occupation and ethnicity  *Individual*: DMFS index at baseline | % Caries: 41 (n=264); % Caries increment: 38 (n=190)  Mean Group 1: 7.0 (SD 6.8) of sugars and 9.0 (SD 9.0) of starch  Mean Group 2: 3.29 (SD 2.04) of sugars and 53.3 (SD 38.1) of starch |
|  | Group 1: RR 1.04 (95% CI: 0.89–1.21)  Group 2: RR 1.23 (95% CI: 1.06–1.43) |
|  |  |  |  |  |  |  |  |
| 3 | Ghazal et al. (2015)  Alabama, United States | Cohort | 97 children aged 3-22 months  3-year follow-up  Response rate: not reported | Sweetened foods (eg.: Pop TartsTM and sugared cereals) and SSB  # Mean frequency of daily consumption of each group | dmfs index increment | *Individual*: sex, age, delivery type, prematurity, birthweight, presence of allergies and chronic systemic medical conditions and acute illnesses, frequency of brushing teeth, the use of toothpaste, and type of toothpaste, sources of drinking water, use of vitamin drops or tablets with fluoride, history of a dental problem, reason for last visit to the dentist and the presence of a regular dentist | % Caries increment: 65.8 (n=64)  Mean sweetened foods: 5.1  Mean SSB: 4.8 |
|  | Sweetened foods: OR 9.22 (95% CI: 2.32–36.67)  OR for SSB NS/not reported |
|  | Soft drinks: Coef. β 0.78 (-0.26–1.82)  Sweets: Coef. β 1.08 (0.11–2.05) |
|  |  |  |  |  |  |  |  |
| 4 | Matilla et al. (2001)  Turku, Finland | Cohort | 1,074 children aged 10 years  10-year follow-up  Response rate: 83% | Sweets  # Frequency of consumption: hardly ever (ref.), once a week or more than once a week, at 3-years-old | dmft/DMFT index increment from 7 to 10 years-old | *SES/Family*: parents’ ages, marital status, education, occupation, urban/rural living environment of the mother, company of other children, parents’ previous child rearing, atitudes, father’s participation in child care, parental toothbrushing frequency, dental flossing, use of toothpick, having caries, having calculus  *Individual*: child’s TV- and video-watching, child’s bedtime, frequency of tooth brushing, tooth brushing with parental assistance, headache, long-term diseases, allergies | % Caries: 44.8 (n=481)  % Sweets: 57.2 (n=614) |
|  | Sweets once a week: OR 2.0 (95% CI: 1.1–3.6)  Sweets more than once a week: OR 2.7 (95% CI: 1.5–4.8) |
|  |  |  |  |  |  |  |  |
| 5 | Mei et al.  (2021)  Wenzhou, China | Cohort | 606 children aged 3 to 4 years  Response rate: not reported | Carbonated beverage, sweet snacks, and candies/chocolate  # Frequency of daily consumption:  <1 time (ref.), 1 time or >1 time | dmfs index ≥ 1 | *SES/Family*: family income, mother’s education, caregiver who take care, parental oral health practices, parental oral health knowledge  *Individual*: bottle feeding habits, tooth brushing started and frequency of toothbrushing | % Caries: 59.8 (n=266) at baseline and 76.4 (n=428) at 2-year follow-up  Sweet snacks > 1 time: OR 1.86 (95% CI 1.06 - 3.27)  OR for carbonated beverage and candies/chocolate NS/not reported |
|  |  |  |  |  |  |  |  |
| 6 | Nirusittirat et al. (2016)  Khon Kaen, Thailand | Cohort | 556 children aged 3 to 4 years  4-year follow-up  Response rate: 64.7% | Sweet foods and beverages that included soft drinks, chocolate, candy, jelly and snacks (e.g. chips, crisp fried noodles)  # Frequency of consumption ≤3 times/week (ref.), 4 – 6 times/week, 7 – 9 times/week, ≥10 times/week at 36 months | dmfs index ≥ 1 | *SES/Family*: maternal age, maternal education, maternal occupation, family income  *Individual*: preterm birth, low brith weight, gender, duration of breastfeeding, age at bottle-feeding start, sleeping with breast or bottle feeding, age when brushing started, frequency of teeth brushing, floride supplement use, fluoride toothpast use, dental visit | % Caries: 88.1 (n=490)  % Sweet foods and beverages 4 – 6 times/week: 44.8 (n=249)  % Sweet foods and beverages 7 – 9 times/week: 35.6 (n=198)  % Sweet foods and beverages ≥10 times/week: 13.7 (n=76) |
|  | Sweet foods and beverages 4 – 6 times/week: RR 1.40 (95% CI: 0.51-3.87)  Sweet foods and beverages 7 – 9 times/week: RR 2.56 (95% CI: 0.91-7.22)  Sweet foods and beverages ≥10 times/week: RR 1.99 (95% CI: 0.59-6.77) |
|  |  |  |  |  |  |  |  |
| 7 | Peltzer et al. (2014)  Salaya, Thailand | Cohort | 597 children aged 2-3 years  1-year follow-up  Response rate: 76% | Candies  # Frequency of consumption: 0-2 days/week (ref.) versus 3-7 days/week | dmfs/dmft index increment ≥ 1 from 24 to 36 months | *SES/Family*: maternal age at birth, maternal education at birth, single parent, family income, family size, religious affiliation, parental psychological distress, parenting style, family distress, family support, spousal relationship  *Individual*: sex, first child in the family, infant feeding at 6 months, nocturnal feeding at 12 months, Sleeps with bottle at 30 months, brushing teeth in the past 2 weeks at 12 months, brush with tooth paste at 12 months, brushing teeth at 26 months, dental visit | % caries at 24 months: 34.2 (n = 206)  % caries at 36 months: 68.5 (n = 409)  % caries increment: 52.9 (n=193)  % Candies 3-7 days/week: 21.7 (n=79) |
|  | OR NS/not reported |
|  |  |  |  |  |  |  |  |
| 8 | Peres et al. (2005)  Pelotas, Brazil | Cohort | 359 children aged 6 years  6-year follow-up  Response rate: 89.7% | Sweets  # Frequency of consumption: almost never/less than once a day (ref.) versus every day at least once at 6 years-old | dmft index ≤ 1 (ref.) versus dmft index ≥ 4  at 6-years-old | *SES/Family*: social class at birth, parents’ education at birth, parents’ emloyment status, mother’s work during pregnancy, mother’s employment at 12 and 24 monts, family income at birth, water supply at 12 months,  *Individual*: sex, number of erupted teeth at 12 months, birth weight height by age deficit at 12 months, breastfeeding, bottle feeding at night, hospital disease during life, medicine consumption, children day care attendance, frequency of brushing teeth, age that started brushing teeth, dental floss and dental visit | % Caries (dmft index ≥ 4): 46.6 (n=136)  % Sweets: data not reported |
|  | Sweets: OR 2.3 (95% CI: 1.3–3.9) |
|  | Candies = OR 2.2 (95% CI: 1.06-4.64) for quartile 4  Ice cream = OR 2.18 (95% CI: 1.24-3.83) for quartile 4  Soft drinks = OR 1.36 (95% CI: 0.90-2.06)  OR of other ultraprocessed foods NS/not reported |
|  | SSB: PR 1.04 (95% CI: 1.01–1.06) |
|  | OR for sweets and junk food NS/not reported |

ref. = reference category. % percentage/prevalence. SD = Standard Deviation. dmfs = decayed, missing and filling surfaces in primary dentition. DMFS = decayed, missing and filling surfaces in permanent dentition. dmft = decayed, missing and filling teeth in primary dentition. DMFT= decayed, missing and filling teeth in permanent dentition. SSB = Sugar sweetened beverages. OR = Odds Ratio. RR/IRR: Risk ratio.

**2.2 Description of cross-sectional and case-control studies included in the qualitative synthesis and the meta-analysis (n = 19; total sample size = 35,425).**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **#** | **Author (year) and location** | **Design** | **Participants** | **Ultra-processed foods item/group and classification** | **Dental caries classification** | **Adjusted confounders** | **Main findings**  **(% or mean and adjusted effect measures)** |
| 1 | Alhabdan et al. (2018)  Riyadh, Saudi Arabia | Cross-sectional | 578 male school children aged 6–8 years  Response rate:51% | Fast food, candies, potato chips, flavored juices, soft drinks, flavored milk  # Frequency of consumption at least twice a week: no (ref.) versus yes | dmft index ≥ 1 | *SES/family*: father’s education, mother’s education, parent’s occupation, family monthly income, region of residence, type of residence, medical insurance with dental coverage  *Individual*: age, frequency of brushing teeth, age that started brushing teeth, dental floss use, mouthwash use, dental visit, reason for dental visit, milk feeding practices, age of the child when breast feeding was stopped, age of the child when drinking with a bottle was stopped, child sleeps with bottle in mouth, number of meals per day | % Caries: 83 (n=479)  % Fast food: 59.3 (n=343)  % Candies: 83.4 (n=482)  % Potato chips: 83.4 (n=482)  % Flavored juices: 90 (n=520)  % Soft drinks: 68.3 (n=395)  % Flavored milk: 35.6 (n=206) |
|  | Soft drink: OR 5.3 (95% CI: 1.5–18.0)  Flavored milk: OR 7.7 (95% CI: 2.6–23.0)  **\***OR for other ultraprocessed foods NS/not reported |
|  |  |  |  |  |  |  |  |
| 2 | Arora et al. (2017)  South Wales, Australia | Cross-sectional | 495 school children and adolescents aged 5-10 years  Response rate:49.5% | SSB and chocolate  # Mean consumption serves per day for each food (1 serve equals 1 cup–250 mL of SSB and 1 serve equals 1 chocolate) | dmft index ≥1 | *SES/Family*: age of father, age of mother, father’s education, extractions due to tooth decay in mother, extractions due to tooth decay in father, family income  *Individual*: age, frequency of brushing teeth, age when tooth brushing started, type of toothpaste used, past exposure to water fluoridation | % Caries: 50.6 (n=251)  Mean number of serves not reported |
|  | Chocolate: OR 1.52 (95% CI: 1.19, 1.93)  SSB: NS/not reported |
|  |  |  |  |  |  |  |  |
| 3 | Campus et al. (2008)  Milan, Italy | Cross- sectional | 1,333 school adolescents aged 13-18 yrs  Response rate:85% | Snacks  # Frequency of daily consumption: none (ref.), once a day and more than once a day | DMFT index ≥ 1 | *Individual*: sex, age, school and frequency of brushing teeth | % Caries: 59.1 (n=788)  % Snacks: not reported |
|  | Snacks more than once a day: OR 1.1 (95% CI: 0.9-1.2) |
|  |  |  |  |  |  |  |  |
| 4 | David et al. (2005)  Thiruvananthapuram district, India | Cross-sectional | 838 school adolescents aged 12 years  Response rate: not reported | Sweets  # Frequency of consumption: never (ref.) versus more often | DMFT index ≥ 1 | *SES:* mother’s education  *Individual*: child gender, dental visits, use toothbrush, oral hygiene status, use of fluoridated toothpaste, subjective assessment, school performance | % Caries: 27 (n=226)  % Sweets: 50 (421) |
|  | Sweets: OR 1.4 (95% CI: 1.0–1.9) |
|  |  |  |  |  |  |  |  |
| 5 | De Souza et al.  (2020)  Pelotas, Brazil | Cross-sectional | 309 children aged 0 to 3 years  Response rate:88% | Chocolate powder, dairy sweetened beverage, artificial juice, canned fruit juice, instant noodles, salty crackers, sweet-filled biscuit/  cracker, snacks (chips), hamburgers and sausages, chocolate bars/bonbons, candies/caramels, gum/lollypop, regular sodas, light soft drinks, gelatin, and ice cream/  popsicle using FFQ and classification based on NOVA system  # Frequency of overall daily consumption: 0 to 3 times (ref.) vs. 4 or more times | dmfs index ≥ 1  and  non-cavitated caries ≥ 1 | *SES/family*: degree of kinship with  the children, caregiver age, caregiver marital status, caregiver’s education, family income  *Individual*: child gender, child age, skin color, breast-feeding, child oral hygiene and child use of dental services | % Caries: 9.4 (n=29)  % non-cavitated caries: 20.4 (n=63)  All ultra-processed foods ≥4 times a day: 67.6 (n=209)  All ultra-processed foods ≥4 times a day: PR 3.48 (95% CI: 1.18 – 10.30) for dmfs index  All ultra-processed foods ≥4 times a day: PR 2.25 (95% CI: 1.19 – 4.27) for non-cavitated caries |
|  |  |  |  |  |  |  |  |
| 6 | Gao et al. (2018)  Hong Kong, China | Cross-sectional | 5,167 preschool children aged 3 years  Response rate:82% | Snacks  # Frequency of daily consumption: no (ref.) versus yes.  # Mean frequency of daily snacks consumption | Mean dmft index | *SES/Family*: parental condition, primary caregiver, father’s education, mother’s education, family income  *Individual*: gender, birth place, bottle feeding before sleep, age of start tooth brushing, frequency of brushing teeth, assistance of tooth brushing, dental visit | % Caries: 22 (n=1,130)  % Snacks: 94.8 (n=4,897)  Mean snacks: 2.13 |
|  | Coef. β of snacks: NS/not reported |
|  |  |  |  |  |  |  |  |
| 7 | García-Pola et al. (2021)  Florida, United States | Case-control | 90 children aged 6 years  Response rate: not reported | Chips, sweets and SSB  # Frequency of weekly consumption: never (ref. vs. sometime a week | dmft index ≥ 1 | *Family:* mother’s age  *Individual:* oral hygiene, dental visit, birth weight and weight at 6 years old | % Caries 33.3 (n=15) in case vs. 82.2 (n=37) in control  % Chips: 48.9 (n=22) in case vs. 62.2 (n=28) in control  % Sweets: 68.9 (n=31) in case vs. 86.7 (n=39) in control  % SSB: 0 in both groups  Chips: OR 0.46 (0.01–6.92)  Sweets: OR 11.14 (1.55–238.03)  SSB: OR 0.22 (95% CI 0.03–1.04) |
|  |  |  |  |  |  |  |  |
| 8 | Han et al. (2014)  Ulsan, Corea | Cross-sectional | 1,214 preeschool children aged 3-5 years  Response rate:83% | Snacks or soft drinks  # Frequency of consumption: none (ref.), once in 2-3 days, once in a day, ≥2 times/day | dmfs index ≥ 1 | *SES/Family:* caregivers’ working status, type of housing, caregivers’ regular dental visit, caregivers’ scaling experience  *Individual*: age, gender, frequency of brushing teeth, regular dental checkup and global caregiver-rating of oral health | % Caries: 47.5 (n=577)  % Snacks or soft drinks once in 2–3 day: 35.5 (n=431)  % Snacks or soft drinks once in a day: 39 (n=474)  % Snacks or soft drinks ≥2 times/day: 17.5 (n=212) |
|  | Snacks or soft drinks once in 2–3 day: PR 1.01 (95% CI: 0.82–1.24)  Snacks or soft drinks once in a day: PR 1.16 (95% CI: 0.95–1.41)  Snacks or soft drinks ≥2 times/day: PR 1.23 (95% CI: 1.00–1.51) |
|  |  |  |  |  |  |  |  |
| 9 | Hu et al. (2018)  Zhejiang, China | Cross-sectional | 4,815 school adolescents aged 12-14 years  Response rate:99% | Snacks and soft drink  # Frequency of daily consumption: less than once per day (ref.) versus once or more per day | DMFS index ≥ 1 | *SES/Family*: residence location, father’s eduation, mother’s eduation  *Individual*: gender, age, frequency of brushing teeth, use of toothpaste, use of dental floss, smoke, health self-assessment, tooth status self-assessment, tooth injury, toothache, dental visit, reason for dental visit, dental knowledge and dental attitude | % Caries: 44 (n=2,119)  % Snacks: 36.6 (n=1721)  % Soft drink: 19.6 (n=919) |
|  | Snacks: OR 1.24 (95% CI: 1.09-1.40)  OR of Soft drink NS/not reported |
|  |  |  |  |  |  |  |  |
| 10 | Huew et al. (2012)  Benghazi, Libia | Cross-sectional | 791 school adolescents aged 12-years  Response rate:88% | Sugared carbonated drinks, non-sugared carbonated drinks, sports drinks, flavoured milk  # Frequency of daily consumption: never (ref.), < 1 per day, ≥ 1 per day | DMFS/DMFT index ≥ 1 | Unclear | % Caries: 57.8 (n=457)  \*for ≥ 1 per day category:  % Sugared carbonated drinks: 31.7 (n=251)  % Non-sugared carbonated drinks: 2.8 (n=22)  % Sports drinks: 3.3 (n=26)  % Flavoured milk: 17.7 (n=140) |
|  | OR of ultraprocessed beverages NS/not reported |
|  |  |  |  |  |  |  |  |
| 11 | Jain et al. (2018)  Karad, India | Cross-sectional | 200 preeschool children ages 2-6 years  Response rate: not reported | Snacks  # Frequency of daily consumption: never (ref.), once a day, 2 times or more | dmft index ≥ 1 | *SES/Family*: mother's and father's education, household income, family size, number of siblings, whether the secondary caregivers had access to the child's diet, prenatal dental advice, parental stress, parental self-efficacy, sense of coherence and oral health knowledge  *Individual*: oral health rating, feeding habits, frequency of brushing teeth, dental visit | % Caries: 87.5 (n=175)  % Snacks (2 or more times/day): 20.5 (n=41) |
|  | Snacks: OR 2.84 (p=0.003) |
|  |  |  |  |  |  |  |  |
| 12 | Kierce et al. (2016)  Manchester, United States | Cross- sectional | 132 children aged 2-5 years  Response rate: not reported | Soda, candies and crackers  # Mean of daily servings per day | dmft index ≥ 1 | *Individual*: age, sex, child breastfed, age bottle us­age ended, usage of a sippy-cup, age of first dental appointment, presence of biofilm, and presence of gingivitis | % Caries = 50.8 (n=67)  Mean of consumption not reported |
|  | Soda: OR 0.80 (95% CI: 0.62-1.03)  Candies: OR 1.21 (95% CI: 1.01-1.45)  Crackers: OR 1.03 (95% CI: 0.87-1.22) |
|  |  |  |  |  |  |  |  |
| 13 | Kumar et al. (2016)  Udaipur District, India | Cross-sectional | 831 school children and adolescents aged 6-12 years  Response rate:90% | Soft drinks and sweets  # Frequency of consumption: seldom/never (ref.) versus sometimes a week/more than once a day for each item | DMFT index ≥1 | *SES/Family*: residence location, father’s occupation, mother’s occupation, father’s education, mother’s education  *Individual*: gender, brushing teeth frequency, oral hygiene aids, use of toothpaste, dental visit | % Caries: 64.9 (n=539)  % Soft drinks: 43 (n=357)  % Sweets: 55.6 (n=462) |
|  | Soft drinks: PR 1.22 (95% CI: 1.09-1.68)  Sweets: PR 1.07 (95% CI: 1.01-1.47) |
|  |  |  |  |  |  |  |  |
| 14 | Markovic et al. (2015)  Belgrade, Serbia | Cross-sectional | 406 children and adolescents aged 6-18 years  Response rate:96% | Sweets, snacks and SSB (juices and sodas)  # Frequency of daily consumption: no (ref.) versus yes | dmft/DMFT index ≥1 | *SES*: household income  *Individual*: gender, age, body mass index, physical activity, TC watching, frequency of brushing teeth | % Caries: 76.6 (n=311)  % Sweets: 71 (n=288)  % Snacks: 41 (n=166)  % Sugar-sweetened juices: 38 (n=154)  % Sugar-sweetened sodas: 22 (n=88) |
|  | \*Only reported for children aged 12-18 yrs-old:  Sugar-sweetened juices: OR 14.4 (95% CI: 1.7–124.7)  Sugar-sweetened sodas: OR 1.0 (95% CI: 0.0–1.1)  OR for sweets and snacks NS/not reported |
|  |  |  |  |  |  |  |  |
| 15 | Serra Majem et al. (1993)  Catalunha, Spain | Cross-sectional | 893 school children and adolescents aged 5-14 years  Response rate: 89.3% | Candies, chocolate, ice cream, bakery foods and pastries, industrial cakes, soft drinks, packed fruit juice, milk with cocoa, sweetened peanuts, salted appetizers, sausage, butter/margarine.  # Frequency of weekly consumption calculated by the sum of the FFQ scores for each ultraprocessed food and classified in quartiles | dmft/DMFT index ≥1 | *Individual*: age, sex, frequency of teeth brushing and dental visit | % Caries: 54.4 (n=486)  Mean candies: 7.0  Mean chocolate: 8.7  Mean ice cream: 2.9  Mean bakery foods and pastries: 7.8  Mean industrial cakes: 2.6  Mean soft drinks: 3.7  Mean packed fruit juice: 2.4  Mean milk with cocoa: 8.7  Mean sweetened peanuts: 0.2  Mean salted appetizers: 1.2  Mean sausage: 6.9  Mean butter/margarine: 4.7 |
|  | Candies = OR 2.2 (95% CI: 1.06-4.64) for quartile 4  Ice cream = OR 2.18 (95% CI: 1.24-3.83) for quartile 4  Soft drinks = OR 1.36 (95% CI: 0.90-2.06)  OR of other ultraprocessed foods NS/not reported |
|  |  |  |  |  |  |  |  |
| 16 | Simangwa et al. (2019)  Massai, Tanzania | Cross-sectional | 906 school adolescents aged 12-14 years  Response rate: 91.6% | Sweets, biscuits and carbonated soft drinks  # Frequency of consumption: low (≤1per week; ref.) versus high (≥2 per week or daily) for each food | DMFT index ≥1 | *SES/Family*: Mother’s education, district of residence, wealth index  *Individual*: age, sex, ethnicity, oral hygiene status | % Caries: 8.8 (n=80)  % Sweets: 39.2 (n=355)  % Biscuits: 35.5 (n=322)  % Carbonated soft drinks: 33.7 (n=305) |
|  | Biscuits = OR 2.5 (95% CI: 1.7–3.8)  OR of other ultraprocessed foods not reported/not associated with caries |
|  |  |  |  |  |  |  |  |
| 17 | Su et al. (2018)  Shanghai,  China | Cross- sectional | 9,804 preeschool children aged 3-6 years  Response rate: 86% | SSB  # Mean frequency per week | dmft index ≥1 | *SES/Family*: education level of guardians, who is the guardian, household registration,guardians’ oral health knowledge, parental perception about children’s oral health  *Individual*: gender, age helping children brush teeth, frequency of teeth brushing, the age of starting brushing teeth, eating sweets before sleep, frequency of eating desserts, feeding patterns | % Caries = 47.0 (n=4,608)  Mean SSB not reported |
|  | SSB: PR 1.04 (95% CI: 1.01–1.06) |
|  |  |  |  |  |  |  |  |
| 18 | Vanobbergen et al. (2001)  Flemish region, Belgium | Cross- sectional | 4,351 school children aged 7 years  Response rate: 97% | SSB  # Frequency of daily consumption: no (ref.) versus yes | dmft index ≥1 | *SES*: residence location  *Individual*: age, ethnicity, frequency of brushing teeth, age at start of brushing, toothpast amount, regular use of fluoride supplement, between-meal snacks | % Caries: 56 (n=2437)  % SSB: 54.8 (n=2383) |
|  | SSB: OR 1.38 (95% CI: 1.18-1.59) |
|  |  |  |  |  |  |  |  |
| 19 | Villalobos-Rodelo et al. (2007)  Sinaloa,  Mexico | Cross-sectional | 2,272 school children and adolescents aged 6-10 years  Response rate: 64% | Soft drinks  # Frequency of daily consumption: once a day (ref.) versus more than once a day | dmft index ≥1  DMFT index ≥1 | *SES/Family:* socioeconomic level, health insurance, type of school, family size, mother’s age, father’s age  *Individual*: age, sex, age started brushing teeth, age that stopped bottle feeding, oral hygiene status, preventive dental use | % Caries (dmft): 91.6 (n=2480)  % Caries (DMFT): 77.1 (n=1752)  % Soft drinks: 11 (n=243)  Soft drinks = OR 2.25 (95% CI: 1.21-4.20) |

ref. = reference category. % percentage/prevalence. SD = Standard Deviation. dmfs = decayed, missing and filling surfaces in primary dentition. DMFS = decayed, missing and filling surfaces in permanent dentition. dmft = decayed, missing and filling teeth in primary dentition. DMFT= decayed, missing and filling teeth in permanent dentition. SSB = Sugar sweetened beverages. PR = Prevalence ratio. OR = Odds Ratio.

**2.3 Description of all studies included in the qualitative synthesis, but excluded from the meta-analysis (n = 15; 1 cohort and 14 cross-sectional; total sample size = 13,468).**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **#** | **Author (year) and location** | **Design** | **Participants** | **Ultra-processed foods item/group and classification** | **Dental caries classification** | **Adjusted confounders** | **Main findings**  **(% or mean and adjusted effect measures)** |
| 1 | Jamieson et al. (2013)  Northern  Territory, Australia | Cohort | 441 indigenous adolescents aged 18 years  18-year follow-up  Response rate: 64% | Soft drinks and sweets  # Frequency of consumption: once a week or less often (ref.) versus every day or a few times per week | Mean DMFT index | *SES/Family*: residential location, source of household income, household size, car ownership  *Individual*: anthropometric measures, age, dental visit, toothbrush ownership, frequency of brushing teeth, age when started brushing, use of toothpaste, tobaco smoking | Mean caries: 4.83  % Soft drinks: 72.3 (n= 319)  % Sweets: 54 (n= 238) |
|  | Soft drinks: Coef. β 0.78 (-0.26–1.82)  Sweets: Coef. β 1.08 (0.11–2.05) |
|  |  |  |  |  |  |  |  |
| 2 | Almasi et al. (2016)  Kermanshah, Irã | Cross-sectional | 698 school  Adolescentes aged 10-12 years  Response rate: not reported | Sweet biscuits, confectionery cookies and cakes, sweetened hot milk, soft drinks, ice cream, chocolate, fizzy soft beverages  # Frequency of consumption of each food was scored on a four-item ‘Likert’ scale: more than once daily (4 points); once daily (3 points); three or four times a week (2 points); less than three times a week or never (1 point; ref.) using a FFQ | mean of DMFT index | *Individual*: age, gender, BMI | Mean DMFT and frequency of ultraprocessed food consumption not reported |
|  | \*OR for more than once daily category (4 points):  Sweet biscuits: OR 1.47 (95% CI: 1.16-1.87)  Confectionery cookies and cakes: OR 1.43 (95% CI: 0.82-2.48)  Sweetened hot milk: OR 1.07 (95% CI:0.24-4.6)  Soft drinks: OR 1.58 (95% CI: 0.6-4.3)  Ice cream: OR 2.05 (95% CI: 0.91-3.2)  Chocolate: OR 1.32 (95% CI: 0.74-2.3)  Fizzy soft beverages: OR 2.24 (95% CI: 1.76-2.8) |
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| 3 | Chen et al. (2017)  Hong Kong,  China | Cross- sectional | 459 preschool children aged 5 years  Response rate: 80% | Sugary snacks  # Frequency of daily consumption: ≤ 2 versus >2 (ref.) | dmft index = 0 | *SES/Family:* parenthood and his/her primary caregiver, family income, father’s education, mother’s education, parental dental knowledge  *Individual*: sex, age, birthplace, bottle feeding before  sleeping, bottle feeding duration, frequency of brushing teeth, brushing started age, use other cleansing aids, assistance in brushing, dental visit | % Caries: 55.4 (n=254)  % Sugary snacks ≤ 2: 57 (n=197) |
|  | Sugary snacks: OR 1.98 (95% CI:1.18 – 3.34) |
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| 4 | Gao et al. (2014)  Shaanxi Province, China | Cross-sectional | 424 preschool children aged -6 years and 564 school adolescents aged 12-15 years  Response rate: 95% | Sweets (eg.: desserts, sugary chocolate, sugar water, carbonated beverages/juice and sweetened milk)  # Global score of sweets consumption based on each type of sweet: 1 point = rarely or never consumed, 2 points = less than four times per month, 3 points = once per week, 4 = more than once per week but less than seven per week, 5 = once per day, 6 =more than once a day. Scores ranged from 0 to 30, with higher scores indicating more frequent consumption of sweets | Mean dmft index and mean DMFT index | *Family*: demographic background  *Individual* frequency of brushing teeth, use of fluoridated toothpaste, time since last visit to the dentist, reason for the last dental visit, oral health knowledge, oral health atitudes | *Among 4-6 year-olds*  Mean caries: 3.05 (SD 0.36)  % Caries: 67 (n=378)  Mean sweets: 20.12 (SD 4.9)  Sweets: Coef. β 0.437 (p=0.000) |
|  | *Among 12-15 year-olds*  Mean caries: 0.45 (SD 1.08)  % Caries: 23.9 (n=101)  Mean sweets: 14.21 (SD 5.48)  Coef. β of sweets: NS/not reported |
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| 5 | Garcia-Closas et al. (1997)  Manresa, Spain | Cross-sectional | 236 school children and adolescents aged 6-15 years  Response rate: 96% | Group of confectionery foods (eg.: toffees, sugared candies, sugared chewing gums, and chocolate without bread) and sweetened baked goods (eg.: bakery products, cakes, pastry, cookies, biscuits, doughnuts, bread with chocolate, sliced bread, and breakfast cereals)  # Terciles of servings per week: low (ref.), moderate and high consumption measured by a 40-item FFQ | DMFT index ≥ 3 | *SES*: socioeconomic group according to school attendance  *Individual*: sex, age, high-fluoride water intake, fluoride supplement consumption, fluoride mouth rinsing with 2% NaF solution in a school-based preventive program, frequency of brushing teeth, dental visits and consumption of the food groups of no direct interest in this study | % Caries: 40.8 (n=96)  Mean confectionery foods: 10.5 (SD 15.1)  Mean sweetened baked goods: 17.6 (SD 14.9) |
|  | OR sweetened baked goods (moderate): 2.1 (95% CI: 0.8-5.9)  OR sweetened baked goods (high): 1.9 (95% CI: 0.7-5.0)  OR confectionery foods: NS/not reported |
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| 6 | Hasheminejad et al. (2020)  Kerman, Iran | Cross-sectional | 600 school adolescents aged 12-15 years  Response rate: not reported | Milk beverage (eg. chocolate milk, and other flavored milk) and SSB  # Frequency of consumption: daily (ref.), occasionally (monthly), weekly and never assessed using a FFQ. | Mean DMFT index | *SES/Family:* father’s education and mother’s education  *Individual*: gender, frequency of brushing teeth, plaque index and other types of food | Mean Caries: 4.0 (SD 3.0)  \*for weekly category:  % Milk beverage: 55.7 (n=334)  % SSB: 61.8 (n= 371) |
|  | Milk beverage (weekly): IRR 1.38 (95% CI: 1.09, 1.74)  SSB (weekly): IRR 0.91 (95% CI: 0.71, 1.15) |
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| 7 | Hashim et al. (2009)  Ajman, United Arab Emirates | Cross-sectional | 875 school children aged 5-6 years  Response rate: 67% | Sweet baked goods (2-item: sweet biscuits and sweet pastries), Confectionery (3 -item: chocolate, candies, and jelly beans), Frozen confectionery (2 item: ice-cream and ice-muncher) and soft drinks  # Frequency of consumption of each group of foods < 2 times per week (ref.), otherwise, ≥ 3 times a day assessed using a FFQ.  # Overall sugary snacks consumption level (low, moderate and high) | Mean dmfs/dmft index | *SES/Family*: maternal education and family income  *Individual*: age and gender | Mean caries: 4.5 (SD 3.3)  \*for ≥ 3 times a day category:  % Sweet baked goods: 5.5 (n=49)  % Confectionery: 30.6 (n=279)  % Frozen confectionery:12.9 (n=117)  % Soft drinks: 5.5 (n=50)  % Sugary snacks (high) = 25.1 (n=221) |
|  | \*RR for ≥ 3 times a day category:  Sweet baked goods: RR 1.00 (95% CI: 0.87-1.14)  Confectionery: RR 1.31 (95% CI: 1.13-1.50)  Frozen confectionery: RR 1.29 (95% CI: 1.07-1.57)  Soft drinks: RR 1.15 (95% CI: 0.74-1.78)  Sugary snacks: RR 1.49 (95% CI: 1.29-1.72) |
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| 8 | Laniado et al.  (2020)  National survey,  United States | Cross-sectional | 6,044  children and adolescentes aged 2-19 years | SSB using a 24-hour dietary recall  # Frequency of daily consumption:  Never (ref.) vs. any SSB | Component d/D of dmft/DMFT index ≥1 | *SES*: poverty status  *Individual*: age, race, sex, last dental visit, dental insurance | *2-5 years*  % Untreated caries: 10.2 (n=152)  SSB: OR 1.53 (95% CI 0.89 - 2.63)  *6-8 years*  % Untreated caries: 14.2 (n=109)  SSB: OR 1.82 (95% CI 0.97 - 3.41)  *9-19 years*  % Untreated caries: 15.4 (n=583)  SSB: OR 1.37 (95% CI 1.05 - 1.80) |
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| 9 | Lin et al. (2017)  Kaohsiung, Taiwan | Cross-sectional | 485 preeschool children aged 4-6 years  Response rate: 96% | SSB  # Frequency of daily consumption: <1 times/day (ref.) versus ≥1 times/day | dmft index=0 (ref.), non-SiC (1-5 carious teeth), and SiC (6-19 carious teeth) | *SES/Family*: maternal age, race, educational attainment, occupation, family income, maternal self-efficacy, maternal oral health knowledge  *Individual*: gender, age, regular dental check-up visits | % Caries: 76.6 (n=379)  % SBB: 23.1 (n=112) |
|  | SSB and non-SiC: OR 0.89 (95% CI: 0.45 – 1.76)  SSB and SiC: OR 2.27 (95% CI: 1.15-4.48) |
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| 10 | Morikava et al. (2018)  Belo Horizonte, Brazil | Cross-sectional | 427 preschool children aged 5-years  Response rate: 84.4% | Powdered beverage, soft drink, cookies, ice cream and candy  # Frequency of daily consumption calculated by the sum of the FFQ scores of each food | d component of dmft index ≥ 1 | *SES/Family*: caregiver marital status and education  *Individual*: sex, eating before sleep, brushing teeth frequency, brushing teeth before sleep, visible plaque | % Caries (dmft): 56 (n=239)  % Untreated caries (d of dmft): 51 (n=218)  Mean of ultraprocessed foods: 2.04 |
|  | All ultraprocessed foods = PR 1.07 (95% CI: 1.03-1.12) |
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| 11 | Myint et al. (2019)  Yangon, Myanmar | Cross-sectional | 537 school adolescents aged 10-11 years  Response rate: 94.4% | Sugary snacks and SSB  # Frequency of daily consumption no (ref.) versus yes | Mean of d component of dmft/DMFT index | *SES/Family*: father’s occupation, mother’s occupation  *Individual*: sex, frequency of teeth brushing, mouth-rinsing habit, dental visit, oral hygiene score and bacteria level | Mean caries (dmft/DMFT): 0.65 (SD: 1.02)  Mean untreated caries (d of dmft/DMFT): 2.07 (SD: 2.15)  % Sugary snacks: 86.6 (n=465)  % SSB: 84.7 (n=455) |
|  | Sugary snacks: Coef. β 0.656 (SE: 0.268; p=0.015)  SSB: Coef. β 0.188 (SE: 0.256; p = 0.463) |
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| 12 | Silveira et al. (2018)  Brumadinho, Brazil | Cross-sectional | 245 school adolescents aged 12 years  Response rate: not reported | Corn flakes/filled biscuits, sweets, chocolate, soft drinks, milk flavoured with coffee and dairy milk  # Frequency of daily consumption: no (ref.) versus yes for each food | dmft/DMFT index ≥1 | *SES/Family*: area of residence, parents’ schooling, family income  *Individual*: gender, frequency of teeth brushing, flossing, eat breakfast, eat fruits and vegetables, chronotype and body mass index | % Caries = 42 (n=103)  % of ultraprocessed foods not reported |
|  | OR of ultraprocessed foods not reported/not associated with caries |
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| 13 | Olczak-Kowalczyk et al. (2020)  Poland | Cross-sectional | 656 children aged 3 years | SSB and potato crips  # Frequency of weekly consumption: less/never (ref.) versus more | dmft index ≥1 | *SES/Family*: place of residence, parental education, parental oral health knowledge  *Individual*: gender, child dental visit, breastfeeding, tooth brushing and cleaning child teeth by parents | % Caries: 53.8 (n=353)  OR NS/not reported |
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| 14 | Tsang et al. (2019)  Kathmandu and Lalitpur districts,  Nepal | Cross-sectional | 836 children aged 6 months-6 years  Response rate: not reported | Sweets and junk food  # Frequency of daily consumption: no (ref.) versus yes | dmft index ≥1 | *SES/Family*: mother age, mother education, number of children in the house, number of people in the house, potable water at home, cooking fuel other than wood, time to walk from home to a store  that sells junk food, maternal knowledge on caries risk, maternal nutrition and oral health practices  *Individual*: age, gender, breastfeeding, bottle feeding, bottle during sleep, own toothbrush, has toothpaste, mother helps brushing teeth, up-to-date immunizations, dental visit | % Caries: 58.2 (n=486)  % Sweets: 50.8 (n=425)  % Junk food: 24.0 (n=201) |
|  | OR for sweets and junk food NS/not reported |
|  | SSB: OR 1.38 (95% CI: 1.18-1.59) |
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| 15 | Varenne et al. (2006)  Burkina Faso, sub-Saharan Africa | Cross-sectional | 505 adolescents aged 12 years  Response rate: not reported | Soft drinks and sweets  # Frequency of consumption: seldom/never (ref.) versus once or more often a day and once or more often a week | DMFT index ≥1 | *SES*: residence location  *Individual*: oral health knowledge, oral health practices, perceived dental status, dental visits, location and consumption of fresh fruits | % Caries: not reported  % Sweets: 30 (n=151)  % Soft drink: 25 (n=126) |
|  | Soft drink once or more often a day: OR: 3.70; p< 0.001  Soft drink once or more often a week: OR: 2.06; p< 0.05  OR for sweets not reported/not associated with caries |

ref. = reference category. % percentage/prevalence. SD = Standard Deviation. dmfs = decayed, missing and filling surfaces in primary dentition. DMFS = decayed, missing and filling surfaces in permanent dentition. dmft = decayed, missing and filling teeth in primary dentition. DMFT= decayed, missing and filling teeth in permanent dentition. SSB = Sugar sweetened beverages. PR = Prevalence ratio. OR = Odds Ratio. RR/IRR: Risk ratio.