**Supplementary information**

**Additional file 1**

Table S1. Concomitant diagnoses and medication use, among individuals with JIA (n = 162) and the control group (n = 162) (10-16 years old), considered as potential oral health risk factors.

|  |  |  |
| --- | --- | --- |
|  | Individuals with JIA, n | Control group, n |
| Allergy and/or asthma (on medication) | 9 | 5 |
| Autism spectrum disorder | 0 | 1 |
| Psychiatric conditions (on psychotropic medications)  (Attention Deficit Hyperactivity Disorder (ADHD) and depression) | 3 | 1 |
| Coeliac disease | 4 | 0 |
| Diabetes\* | 3 | 0 |
| Down syndrome | 1 | 0 |
| Epilepsy\*\* | 1 | 0 |
| Hypothyroidism\*\*\* | 2 | 0 |

*Information was recollected by caregiver or participant. Intermittent medication use is not considered, nor previous diagnosis or medication use. Medications used in the treatment strategy of JIA (e.g., antiemetic, eye droplets) are not considered. \*Insulin use. \*\*No medication use. \*\*\*Levothyroxine use.*

**Additional file 2**

Table S1A. Categories for socio-behavioral characteristics, as originally coded and as re-coded for analyses.

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | Categories | Original code | New code |
| Share household with\* | Mother and father | 1 | 0 |
| Only mother | 2 | 1 |
| Only father | 3 | 1 |
| Other, specify | 4 | 0/1\* |
| Educational level of mother/father | Primary school | 1 | 1 |
| High school/vocational school | 2 | 1 |
| University/college (≥ 4years) | 3 | 0 |
| University/college (≤ 5 years) | 4 | 0 |
| Unknown | 90 | [sysmiss] |
| Missing | 99 | [sysmiss] |
| Frequency of toothbrushing | Never | 1 | 1 |
| Most days | 2 | 1 |
| Once a day | 3 | 1 |
| Twice a day, or more | 4 | 0 |
| Do not know | 90 | 1 |
| Missing | 99 | [sysmiss] |
| Frequency of tooth flossing during the last 3 months | Several times daily | 1 | 0 |
| Twice a day | 2 | 0 |
| Daily | 3 | 1 |
| Several times weekly | 4 | 1 |
| Several times a month, but not weekly | 5 | 1 |
| Seldom | 6 | 1 |
| Never | 7 | 1 |
| Do not know | 90 | 1 |
| Missing | 99 | [sysmiss] |
| During toothbrushing, gingival bleeding occurs | Every day | 1 | 1 |
| Most days | 2 | 1 |
| Once a week | 3 | 1 |
| Sometimes | 4 | 1 |
| Never | 5 | 0 |
| Do not know | 90 | 1 |
| Missing | 99 | [sysmiss] |
| Frequency of intraoral ulceration(s) | Once or several times a month | 1 | 1 |
| Several times yearly, but less than once a month | 2 | 0 |
| Less than once a year | 3 | 0 |
| Never | 4 | 0 |
| Do not know | 90 | 0 |
| Missing | 99 | [sysmiss] |
| Perception of dry mouth on a regular basis | Yes | 1 | 1 |
| No | 2 | 0 |
| Do not know | 90 | 0 |
| Missing | 99 | [sysmiss] |
| Oral health education after diagnosed with JIA: “Received information about importance of good oral health in relation to the JIA diagnosis.” *\*\** | Yes | 1 | 0 |
| No | 2 | 1 |
| Do not know | 90 | 1 |
| Missing | 99 | [sysmiss] |

*\*The variable “Share household with” was transformed into “Two caregivers in the household” (0), which also includes living across two households with two caregivers in each households, or ”Only one caregiver in the household” (1). The answer “Other, specify” was evaluated and recoded accordingly. \*\*Specifically for participants with JIA. [sysmiss] = system missing value.*

Table S1B. Categories for disease-specific features, as originally coded (if obtained) and re-coded for analyses.

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | Categories | Original code | New code |
| JIA category | Systemic arthritis |  | 1 |
| Oligoarthritis persistent |  | 2 |
| Oligoarthritis extended |  | 3 |
| Polyarthritis, RF positive |  | 4 |
| Polyarthritis, RF negative |  | 5 |
| Psoriatic arthritis |  | 6 |
| Enthesitis-related arthritis |  | 7 |
| Undifferentiated arthritis |  | 8 |
| Human leukocyte antigen B27 (HLA-B27) | Negative | 2 | 0 |
| Positive | 1 | 1 |
| Antinuclear antibodies (ANA) | Negative | 2 | 0 |
| Positive | 1 | 1 |
| Unknown | 90 | Missing |
| Missing | Missing | Missing |
| Rheumatoid factor (RF) | Negative | 2 | 0 |
| Positive | 1 | 1 |
| Unknown | 90 | Missing |
| Missing | Missing | Missing |
| Anti-cyclic citrullinated peptide (anti-CCP) | Negative | 2 | 0 |
| Positive | 1 | 1 |
| Unknown | 90 | Missing |
| Missing | Missing | Missing |
| Serum C-reactive protein (CRP) | < 5 mg/L |  | 0 |
| ≥ 5 mg/L |  | 1 |
| Missing | Missing | Missing |
| Erythrocyte sedimentation rate (ESR) | < 20 mm/h |  | 0 |
| ≥ 20 mm/h |  | 1 |
| Age at JIA onset | 6 years or less |  | 0 |
| Over 6 years |  | 1 |
| Durationof the JIA disease | 5 years or less |  | 0 |
| Over 5 years |  | 1 |
| Disease status on the day of visit\* | Continued activity since onset | 1 | 1 |
| Flare | 2 | 1 |
| Inactive disease on off medication but not yet remission | 3 | 0 |
| Remission on medication | 4 | 0 |
| Remission off medication | 5 | 0 |
| MDgloVAS | VAS score 0 |  | 0 |
| VAS score > 0 |  | 1 |
| Missing |  | Missing |
| PRgloVAS | VAS score 0 |  | 0 |
| VAS score > 0 |  | 1 |
| Missing |  | Missing |
| CHAQ hygiene item Tooth brushing | Without any difficulty | 1 | 0 |
| With some difficulty | 2 | 1 |
| With much difficulty | 3 | 1 |
| Unable to do | 4 | 1 |
| Not applicable | 90 | 1 |
| Missing | 99 | [sysmiss] |
| Steroids ongoing | Steroids, ongoing |  | 0 |
| No steroids, ongoing |  | 1 |
| Steroids ever used | Steroids ever used |  | 1 |
| No steroids ever used |  | 0 |
| DMARDs ongoing | No sDMARDs nor bDMARDs ongoing |  | 0 |
| No bDMARDs, but ongoing use of sDMARDs |  | 1 |
| No sDMARDs, but ongoing use of bDMARDs or bDMARDs and sDMARDs use ongoing |  | 2 |
| DMARDs ever used | No sDMARDs nor bDMARDs ever used |  | 0 |
| No bDMARDs ever used, but sDMARDs have been used |  | 1 |
| No sDMARDs ever used, but bDMARDs have been used. Or bDMARDs and sDMARDs have been used |  | 2 |

*\*Disease activity according to Wallace and the American College of Rheumatology (ACR) provisional criteria [1, 2] . RF = Rheumatoid Factor.* *sDMARDs = synthetic disease-modifying antirheumatic drugs. bDMARDs = biologic disease-modifying antirheumatic drugs. MDgloVAS = Physician's global assessment of disease activity. PRgloVAS = Patient's global assessment of overall wellbeing. CHAQ = Childhood Health Assessment Questionnaire. [sysmiss] = system missing value.*

Table S1C. Categories for “Other clinical characteristics of oral cavity”, as original coded and re-coded for analyses.

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | Categories | Original code | New code |
| Fissure of lip and/or corner of lip | No clear findings | 1 | 0 |
| Lip | 2 | 1 |
| Corner of lip | 3 | 1 |
| Missing | 99 | [sysmiss] |
| Gingival ulcers with discontinuation of epithelia of at least 3 mm | No | 1 | 0 |
| Yes | 2 | 1 |
| Missing | 99 | [sysmiss] |
| Buccal mucosa ridging | No | 1 | 0 |
| Yes | 2 | 1 |
| Missing | 99 | [sysmiss] |
| Tongue indentation | No | 1 |  |
| Yes | 2 |  |
| Missing | 99 | [sysmiss] |
| Gingival hyperplasia (buccal side of the lower and upper anterior teeth) | No clear findings | 1 | 0 |
| Yes | 2 | 1 |
| Missing | 99 | [sysmiss] |
| Dental mirror sticks to buccal mucosa | Yes | 1 | 1 |
| No | 2 | 0 |
| Missing | 99 | [sysmiss] |

Table S1D. Categories for oral variables, as original coded (not obtained) and re-coded for analyses.

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | Categories | Original code | New code |
| Oral cavity (side) | Right side (first and fourth quadrant) |  | 0 |
|  | Left side (second and third quadrant) |  | 1 |
| Anterior/posterior | Incisors (anterior) |  | 0 |
|  | Molars (posterior) |  | 1 |
| Surface (tooth) | Buccal (11, 31, 16, 26) |  | 1 |
|  | Lingual (36,46) |  | 0 |
| Surface (tooth) | Buccal surface of maxillary 1. molars (16, 26) |  | 0 |
|  | Lingual surface of mandibular 1. molars (36, 46) |  | 1 |
|  | Buccal surface of maxillary central (11) |  | 2 |
|  | Buccal surface of mandibular central (31) |  | 3 |
| Site (tooth)\* | Mesial (buccal, lingual) |  | 1 |
|  | Medial (buccal, lingual) |  | 2 |
|  | Distal (buccal, lingual) |  | 3 |
| Site (tooth)\* | Mesiobuccal site of maxillary 1. molars (16, 26) |  | 0 |
|  | Mediobuccal site of maxillary 1. molars (16, 26) |  | 1 |
|  | Distobuccal site of maxillary 1. molars (16, 26) |  | 2 |
|  | Mesiolingual site of mandibular 1. molars (36, 46) |  | 3 |
|  | Mediolingual site of mandibular 1. molars (36, 46) |  | 4 |
|  | Distolingual site of mandibular 1. molars (36, 46) |  | 5 |
|  | Mesiobuccal site of maxillary central (11) |  | 6 |
|  | Mediobuccal site of maxillary central (11) |  | 7 |
|  | Distobuccal site of maxillary central (11) |  | 8 |
|  | Mesiobuccal site of mandibular central (31) |  | 9 |
|  | Mediobuccal site of mandibular central (31) |  | 10 |
|  | Distobuccal site of mandibular central (31) |  | 11 |

*\*Only applicable to the modified version of Gingival Bleeding Index (GBI)*

**Additional file 3**

*Elaboration of the JIA-specific clinical background variables, collected by the pediatric rheumatologists*

Background characteristics in this sub-study were age at onset of JIA in years, disease duration in years and JIA category according to the ILAR classification criteria [3]. Disease status on the day of visit was recorded according to Wallace et al. [1] and the American College of Rheumatology (ACR) provisional criteria [2], where inactive disease (on or off medication) included no active arthritis, no fever, no generalized lymphadenopathy, no splenomegaly, no serositis, no rash as a result of JIA, no active uveitis, normal levels of erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP), no morning stiffness exceeding 15 minutes, and MDgloVAS = 0. Clinical remission on medication was defined as six continuous months of inactive disease on medications, and remission off medication as twelve continuous months of inactive disease and no anti-rheumatic medication [1]. Previous and on-going medication was registered and categorized into the following groups: 1) no synthetic disease modifying drugs (sDMARDs) nor biologic DMARDs (bDMARDs), 2) sDMARDs, but no bDMARDs, and 3) bDMARDs (with or without sDMARDs). Each group was mutually exclusive. The JIA cohort was also categorized into groups using or not using systemic steroid medication. All groups were registered according to ongoing medication, or medication ever used, the last included both previously used and ongoing medication. Self-reported physical disability was measured by the validated patient/parent-reported disease-specific childhood health assessment questionnaire (CHAQ), including the hygiene item Tooth brushing (0 = no difficulty and 3 = unable to perform), and the patient/parent overall well-being, PRgloVAS (0 = best and 10 = worst) [4, 5]. Global disease activity was registered by the physician using MDgloVAS (0 = no activity and 10 = maximum activity). Both PRgloVAS and MDgloVAS were registered on a 21-point VAS.

**Additional file 4**

*Blood tests*

The following blood tests have been taken at onset or during follow-up of all participants with JIA at each center; human leukocyte antigen B27 (HLA-B27), antinuclear antibodies (ANA), rheumatoid factor (RF), and anti-cyclic citrullinated peptide (anti-CCP). ANA was measured using immunofluorescence on HEp-2 cells. The methods and reference values for RF, anti-CCP and HLA-B27 varied slightly between and within each center during the period when the tests were taken. Therefore, each physician reported the results of ANA, RF and anti-CCP as positive or negative according to the reference values of their local laboratory. For ANA, RF, and anti-CCP a positive result required two positive tests taken at least three months apart. At each study visits, the following additional blood tests were taken and analyzed locally at the study centers: C-reactive protein (CRP) with reference value <5 mg/l at all study centers, erythrocyte sedimentation rate (ESR) with slightly diverging reference values at the different centers and according to age and gender. We chose to use CRP <5 mg/l and ESR <20 mm/hour as the cut-off values in the analyses.

**Additional file 5**

Table S1. Overview of participants (n) and index teeth/surfaces examined.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **10-16 years** | | | |
|  | JIA, n | Controls, n | Index teeth | Surfaces |
| **Modified version of OHI-S a** | 144 | 154 | 16, 11, 26, 31 | Buccal\* |
| 36, 46 | Lingual\* |
| **Modified version of GBI b** | 159 | 161 | 16, 11, 26, 31 | Buccal\*\* |
| 36, 46 | Lingual\*\* |

***a*** *Simplified Oral Hygiene Index (OHI-S) [6].* ***b*** *Gingival Bleeding Index [7]. \*Includes half of the mesial and distal surface. \*\*Three sites of the respective surface examined; mesial, medial and distal.*

**Additional file 6**

Table S1A. Illustration of the levels in the multilevel models, according to the dichotomous oral hygiene outcome variable and background variables.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Level** | |
|  |  | Surface (I) | Individual (II) |
| **Outcome variable** | OHI-S > 0 or = 0 \* | √ |  |
| **Background variables** | Socio-behavioral, and subjective clinical characteristics |  | √ |
| Oral variables\*\* | √ | √ |
| Disease-specific variables (JIA) |  | √ |

\**Dichotomized outcome variable (present or absent) of the modified version of the simplified oral hygiene index (OHI-S) [6]. \*\*Side (right, left), jaw (mandible, maxilla), anterior/posterior (incisors, molars), surface (tooth).*

Table S1B. Illustration of the levels in the multilevel models, according to the dichotomous gingival bleeding outcome variable and background variables.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **Level** | | |
|  |  | Site (I) | Tooth (II) | Individual (III) |
| **Outcome variable** | GBI > 0 or = 0 \* | √ |  |  |
| **Background variables** | Socio-behavioral, and subjective clinical characteristics |  |  | √ |
| Oral variables\*\* | √ | √ | √ |
| Disease-specific variables (JIA) |  |  | √ |

\* *Dichotomized outcome variable (present or absent) of the modified version of Gingival Bleeding Index (GBI) [7]. \*\*Side (right, left), jaw (mandible, maxilla), anterior/posterior (incisors, molars), surface (tooth), site (surface).*

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