Razlike u prevalenciji karijesa i u rizičnim čimbenicima između privilegirane i neprivilegirane djece u Kolumbiji

**Introduction**

Dental caries is considered to be one of the most prevalent pathologies in the history of oral morbidity worldwide (1). Caries can cause functional, physical and esthetic deterioration, which can affect both the general health and quality of life of children (2). In Colombia, the prevalence of caries was 52.20% and 52.38% (in 5 year-old children) in primary and mixed dentition, respectively (3). At a local level, in students from Genoy (Pasto, Colombia) a 2008 study (published in 2012) showed that the dmft was 5.16 in 5 year-old children and the caries prevalence was 88% (4). In another study of the Genoy population, the prevalence of caries was similar: 88% (5).

**Materijali i metode:**

Istraživanje je obuhvatio 120 djece (od 4 do 6 godina) iz seoskih i gradskih škola u Kolumbiji. Postojanje karijesnih ležaja ocijenjeno je prema kriterijima ICDAS-a II. Primijenjena je i anketa o čimbenicima povezanim s karijesom. Hi-kvadrat i Fisherovi testovi upotrijebljeni su za procjenu razlika u svakoj varijabi između dviju skupina. Za usporedbu broja zuba između skupina prema kategoriji ICDAS-a II odabran je Mann-Whitney U test. Negativna binomna regresija korištena je za procjenu postotne promjene srednjeg broja zuba prema kategoriji ICDAS-a II među seoskim i gradskim učenicima.

**Rezultati:**

Učestalost zubnih karijesa između učenika iz seoskih škola u usporedbi s onima koji su pohađali škole u gradu (p = 0,0). Učestalost četkanja zuba (p = 0,006), kartografa prehrane, vrijeme proteklo od posljednjeg posjeta stomatolougu, socijalno-ekonomski status i vrsta zdravstvenog osiguranja (p < 0,001) bili su medu značajnim čimbenicima prema kojima su se razlikovale škole u ruralnom i urbanom području.

**Zaključak:**

Ovo je prvo istraživanje koje je uspoređivao dentalni status prema klasifikaciji ICDAS-a II između učenika seoskih i gradskih škola u Kolumbiji. Kod učenika iz seoskih škola ustanovljen je lošiji oralni status. Ovo istraživanje identificiralo je socijalno-ekonomiske i kliničke čimbenike koji mogu poslužiti kao smjernice za specifične intervencije kod seoske djece primjenom programa promicanja oralnoga zdravlja i prevencije bolesti.
tvo i niža razina obrazovanja te socijalno-ekonomskog statusa negoli u urbanim sredinama (10). U Kolumbiji, prema ENSAB-u IV, prevalencija zubnog karijesa u seoskim područjima mjerenje indeksom DMFT/dmft-a bila je niža u mlječnoj i mješovitoj denticiji (32,33 %), a u gradskim sredinama bila je veća u mlječnoj (46,41 %) i mješovitoj (57,88 %). Kad je riječ o prevalenciji karijesa izmjerno modificiranom verzijom DMFT-a koja je uključivala kriterije ICDAS-a (International Caries Detection and Assessment System) (D 2-6 ICDAS MFT), bila je veća u seoskim područjima u trima vrstama denticije – 69,59 % u mlječnoj, 93,59 % u mješovitoj i 82,59 % u trajnoj (3). Ovi podaci pokazuju da je DMFT/ dmft podijagnosticirane slučajeve karijesa.

Djeca populacija, posebno u ruralnim područjima, osjetljiva je na karijes pa je nužno uspostaviti dijagnostičke krite rije koji omogućuju pravodobno otkrivanje karijesnih lezija. Sustav ICDAS-a II nastao je kao vizualna metoda otkrivanja karijesa u ranoj fazi te određivanja veličine i mjerenja razine aktivnosti, a koristi se u kliničkoj praksi, istraživanjima i u javnim programima oralnoga zdravlja (11 – 13). Učinkovitost ICDAS-a II uspoređena je s transiluminacijom, fluorescencijom i radiografskim metodama (14 – 17). ICDAS-II sadrži se od dvoznamenkatog koda koji se dodjeljuje svakom zubu. Prva znamenka (0 – 9) odnosi se na stanje zuba (intaktan, djelomično zapečaćen, potpuno zapečaćen itd.) (18), a druga označava kategorije koje opisuju stupanj karijesa (13). Ovi izotvor sigurno istraživanja bio je usporediti dijagnosticirane slučajeve mjenja kriterijima ICDAS-a II, te čimbenike vezane za razvoj karijesa u djetetu iz seoskih i gradskih škola u Pastou (Kolumbija). Ovo istraživanje omogućit će usmjerenje javnih programa oralnoga zdravlja specifičnih za populaciju prema socijalno-demografskim uvjetima. To će znatno smanjiti učestalost karijesa u tim seoskim populacijama (19).

Materijali i metode

Obavljena je opservacijska analitička analiza poprečnog presjeka. Prikupljanje uzoraka među upisanim učenicima tijekom 2014. godine provedeno je u četiri srednje madžarske škole u Genoyi i u gradskoj školi – sve obrazovne institucije bile su u gradu Pastou, u Nariñu (Kolumbija). Seoske škole bile su javne, a gradska je bila privatna. Odabrana su djeca u dobi od četiri do pet godina (n = 120) s mlječnom denticijom. Exkluzivna su ona su sa stvarnim bolestima i stomatološkim pacijentima. Od ukupno 64 djeteta upisano u seoske škole uključeno je njih 60 (neprivilegiranih), pa su njihovi roditelji potpisali informirani pristanak. Na taj način određen je i broj djece iz gradskih škola. U njoj su bila 72 djeteta u dobi od 4 do 6 godina, a 60 (privileged) odabrano je za istraživanje slučajnom metodom. Roditelji djece odbrane iz gradskih škola također su potpisali informirani pristanak. Istraživanje je provedeno na temelju Helsinskih deklaracija i odobrio ga je Odbor za bioetiku Kolumbija. Odbor je odobrio ga je Odbor za bioetiku Kolumbija. Istraživanje je provedeno na temelju Helsinskih deklaracija i odobrio ga je Odbor za bioetiku Kolumbija. Odbor je odobrio ga je Odbor za bioetiku Kolumbija.
Kriteriji ICDAS-a II korišteni su za klasifikaciju svakog zuba prema zahvaćenosti karijesom (13). Dijagnoze je postavljao kalibrirani pedodont klasifikacijom prema ICDAS-u II. Tijekom postupka radio je na čistim, suhim zubima uz odgovarajuće osvjetljenje. Podatci su registrirani uporabom odontograma iz UCC-a Pasto. Ukupno su analizirane 22 varijable. Uključivale su broj zdravih zuba (ICDAS-II 0), broj zuba s početnim karijesom (ICDAS-II 1–2), broj zuba s umjerenim do teškim karijesom (ICDAS-II 3–6). Deset važnih kliničkih i dentalnih varijabli izmjerio je drugi doktor dentalne medicine, ili su uzete iz ankete o kariogenoj prehrani (UCC format). Varijable su bile slijedeće: vrijeme od posljednjeg posjeta stomatologu, korištenje četkice za zube, zubnog konca i otopina za ispiranje usta, učestalost četkanja zuba, krvarenje iz desni tijekom četkanja zuba, bakterijski plak, kariogeni prehrana te primjena fluora i dmft-a. Dmft je klasificiran kao vrlo nizak (0–1, 1), nizak (1,2–2,6), umjeren (2,7–4,4), visok (4,5–6,5) i vrlo visok (≥6,6). Jedanaest socijalno-demografskih varijabli mjerenje je u anketi koju su ispunili roditelji djece, a sastavio ju je glavni istraživač – uključuju spol, dob, socijalno-ekonomski status, razine obrazovanja, te pristup struji, kanalizaciji, televiziji, telefonu, internetu, mobitelu i zdravstvenoj skrbi. Provedeno je pilot-istraživanje u kojem je sudjelovalo 28 roditelja kako bi se validirala socijalno-demografska anketna – upotrijebljeno je Alfa Cronbachov test u kojemu je vrijednost blizu jedan značila visoku valjanost i dosljednost. Alfa Cronbachova vrijednost za pilot-istraživanje iznosila je 0,884.

Statistička analiza

Kliničke i socijalno-demografske varijable sažete su u skupine (ruralna ili urbana) koristeći se tablicama rizika s apsolutnim i relativnim frekvencijama. Da bi se sažele zavisne varijable, upotrijebljene su srednje vrijednosti i disperzije. Pearsonovim hi-kvadratnim testom identificirane su statistički značajne razlike za svaku kliničku i socijalno-demografsku varijablu među skupinama. Kada su očekivane vrijednosti za više od 20% čimbenika u tablici bile niže od 5, primijenjen je Fisherov egzaktni test. Usporedba broja zuba u kategoriji karijesa prema kriterijima ICDAS-II (zdravi, početni i umjereni-teški) među djecom iz seoskih i gradskih škola obavljena je Mann-Whitneyjevim U testom. Jednostavna i višestruka regresija prema kriterijima ICDAS-a II (zdravi, početni i umjereni-teški) među djecom iz seoskih i gradskih škola obavljena je jednostavnom i višestrukom negativnom binomnom regresijom. Alfa Cronbachov test u kojemu je vrijednost blizu jedan značila visoku valjanost i dosljednost. Alfa Cronbachova vrijednost za pilot-istraživanje iznosila je 0,884.

Cooperativa de Colombia (UCC) Pasto approved the study (Ethics Committee approval number: 04-2014).

The ICDAS-II criteria were used to classify each tooth according to the caries status (13). The diagnosis was established using a calibrated ICDAS-II pediatric dentist. During the procedure, the pediatric dentist worked on clean, dry teeth using adequate light. The data were registered using the odontogram formats from the UCC Pasto. A total of 22 variables were analyzed. The variables which were analyzed included the number of healthy teeth (ICDAS-II 0), the number of teeth in the initial stage of caries (ICDAS-II 1-2), and the number of teeth in the moderate-severe stages of caries (ICDAS-II 3-6). Ten important clinical and dental health variables were measured by a second dentist or taken from a survey of the cariogenic diet (UCC format). The variables were as follows: time since the last dental visit; use of a toothbrush, dental floss, and mouthwash; toothbrushing frequency; bleeding gums during toothbrushing; bacterial plaque; cariogenic diet; application of fluoride, and dmft. The dmft was classified as very low (0–1.1), low (1.2–2.6), moderate (2.7–4.4), high (4.5–6.5), and very high (≥6.6). Eleven sociodemographic variables were measured using a survey answered by the parents of the children and created by the principal investigator, including: gender, age, socioeconomic status, educational level, access to electricity, sewer systems, television, telephone, internet, cellphone, and type of health service. A pilot test was performed on 28 parents to validate the sociodemographic survey; an Alfa Cronbach test was used in which a value near one represented high validity and consistency. The pilot test Alfa Cronbach value was 0.884.

Statistical analysis

The clinical and sociodemographic variables were summarized per group (rural or urban) using contingency tables with absolute and relative frequencies. To summarize the dependent variables, we used measures of central tendency and dispersion. The Pearson's chi-square test was used to identify the significant differences for each clinical or sociodemographic variable between the groups. When the expected values of more than 20% of cells in a contingency table were lower than 5, the Fisher's exact test was applied. The comparison of the number of teeth per caries category, according to the ICDAS-II criteria (healthy, initial, and moderate-severe), among children from the rural and urban schools was performed using the Mann–Whitney U test. Simple and multiple negative binomial regressions were used to estimate the percentage change in the mean of healthy teeth (ICDAS-II 0) and teeth in the moderate-severe category (ICDAS-II 3-6) between the rural and urban students. The multiple regression was used to age-adjust for the estimated percentage change. The significant p-value threshold was set at 0.05. The analyses were performed using R v.3.3.3 and the libraries "tableone" and "MASS" (20).
Results

Analysis of the caries status according to ICDAS-II criteria

The ICDAS-II moderate and severe categories were grouped into one category called the moderate-severe category due to the small sample size per category. Therefore, the Mann–Whitney U test was performed independently for three ICDAS-II categories: healthy teeth (ICDAS-II 0), initial stage of caries (ICDAS-II 1–2), and moderate-severe caries (ICDAS-II 3–6), comparing the rural and urban groups. Table 1 shows the results of these analyses. Significant differences were found between the rural and urban students with respect to the healthy and moderate-severe (p < 0.001) categories. In both schools, most of the teeth were healthy (n = 20).

Table 1. Frequency distribution table of variables important to clinical practice and to comparison of dental health between rural and urban students.

| Variable | Seoska škola (n=60) | Gradska škola (n=60) | p |
|----------|---------------------|----------------------|---|
| Zdravi zubi • Healthy teeth (ICDAS-II 0) | 14.9 (4) | 18.2 (2.0) | <0.001* |
| Zubi s početnim karijesom • Teeth in initial stage of caries (ICDAS-II 1 – 2) | 0.3 (1) | 0.2 (0.5) | 0.737* |
| Zubi s umjerenim do teškim karijesom • Teeth in moderate-severe stage of caries (ICDAS-II 3 – 6) | 4.0 (3) | 1.2 (1.5) | <0.001* |
| Vrijeme proteklo od posljednjeg posjeta stomatologu • Time since the last dental visit | 12 (20.0) | 6 (10.0) | <0.001 |
| Korištenje četkice za zube • Use of toothbrush | 57 (95.0) | 60 (100.0) | 0.242 |
| Korištenje zubne svile • Use of dental floss | 18 (30.0) | 23 (38.3) | 0.441 |
| Korištenje otopina za ispiranje • Use of mouthwash | 9 (15.0) | 33 (55.0) | <0.001 |
| Učestalost četkanja (puta na dan) • Toothbrushing frequency (times/day) | 7 (11.7) | 2 (3.3) | 0.006 |
| Krvarenje iz gingive tijekom četkanja • Bleeding gums during toothbrushing | 7 (11.7) | 21 (35.0) | 0.005 |
| Bakterijski plak • Bacterial plaque | 59 (98.3) | 42 (70.0) | <0.001 |
| dmft (%) | 3 (5.0) | 27 (45.0) | <0.001 |
| Kariogena prehrana • Cariogenic diet | 57 (95.0) | 23 (38.3) | <0.001 |
| Primjena fluora • Fluoride application | 3 (5.0) | 35 (58.3) | <0.001 |

*Mann−Whitneyjev U test; razlike između varijabli procijenjene su hi-kvadratnim ili Fisherovim testom; vrijednosti manje od 0.05 su podebljane; SD: standardna devijacija • Mann-Whitneyjev U test. The differences between category variables were evaluated using chi-square or Fisher’s tests, as appropriate. Values lower than 0.05 are shown in bold. SD: standard deviation.
14,9 ± 4,0), a 19 u gradskoj (srednja vrijednost 18,2 ± 2,0). U umjerenoj do teškoj kategoriji, 15 zuba učenika u seoskoj školi u usporedbi s 5 u gradskoj, klasificirano je ocjenama od 3 do 6 prema ICDAS-II. Medijan zuba s umjerenim do teškim karijesom bio je 3,5 (sredina 4 ± 3,0) u seoskim školama i 0 (sredina 1,2 ± 1,5) u gradskoj. Izračunata je promjena broja zuba u postotcima u zdravoj ili umjerenoj do teškoj kategoriji između seoskih i gradskih učenika. Njihovi rezultati su negativne binomne regresije prilagođene dobi ili ne, kako bi se ustanovio mogući utjecaj dobi na razlike koje su se promatrale između skupina. Prije prilagodbe dobi i poslije nje, srednji broj zuba u umjerenoj do teškoj kategoriji značajno je porastao za 233% kod djece iz ruralnog područja u odnosu prema dječici iz urbanog područja. Srednji broj zdravih zuba bio je značajno manji (16%) među učenicima iz seoskih škola

U tablici 1. rezultati su usporedbi varijabli važnih za kliničku praksu i zdravlje zuba djece iz seoskih i gradskih škola. Značajne varijable u skupinama (p < 0,001) bile su vrijeme od posljednjeg posjeta stomatologu, korištenje otopina za zube, a u seoskim školama

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**Tablica 2.** Distribucija socijalno-demografskih varijabli između privilegirane i neprivilegirane djece

| Varijable • Variable | Razina • Level | Seoske škole • Rural school (%) | Gradске škole • Urban school (%) | p |
|-----------------------|----------------|--------------------------------|--------------------------------|---|
| n                     | 60             | 60                             |                                 |   |
| Spol • Gender         | Ženski • Female | 24 (40.0)                      | 33 (55.0)                      | 0.144 |
|                       | Muški • Male    | 36 (60.0)                      | 27 (45.0)                      |   |
| Dob • Age             | 4              | 0 (0.0)                        | 11 (18.3)                      | <0.001 |
|                       | 5              | 25 (41.7)                      | 12 (20.0)                      |   |
|                       | 6              | 35 (58.3)                      | 37 (61.7)                      |   |
| Socijalno-ekonomski status • Socioeconomic status |                                       |                                 |   |
| Razina edukacije • Educational level |                                                   |                                 |   |
| Predškolska • Preschool | 8 (13.3)      | 22 (36.7)                      |                                 | <0.001 |
| Dječji vrtić • Kindergarten | 33 (55.0)     | 9 (15.0)                       |                                 |   |
| Prvi stupanj • First grade | 19 (31.7)     | 29 (48.3)                      |                                 |   |
| Struja • Electricity  | Da • Yes       | 59 (98.3)                      | 60 (100.0)                     | 1   |
|                       | Ne • No        | 1 (1.7)                        | 0 (0.0)                        |   |
| Kanalizacija • Sewer systems | Da • Yes     | 41 (68.3)                      | 60 (100.0)                     | <0.001 |
|                       | Ne • No        | 19 (31.7)                      | 0 (0.0)                        |   |
| Televisija • Television | Da • Yes     | 56 (93.3)                      | 59 (98.3)                      | 0.361 |
|                       | Ne • No        | 4 (6.7)                        | 1 (1.7)                        |   |
| Telefon • Telephone   | Da • Yes       | 10 (16.7)                      | 48 (80.0)                      | <0.001 |
|                       | Ne • No        | 50 (83.3)                      | 12 (20.0)                      |   |
| Internet • Internet   | Da • Yes       | 10 (16.7)                      | 53 (88.3)                      | <0.001 |
|                       | Ne • No        | 50 (83.3)                      | 7 (11.7)                       |   |
| Mobilni • Cellphone   | Da • Yes       | 52 (86.7)                      | 54 (90.0)                      | 0.776 |
|                       | Ne • No        | 8 (13.3)                       | 6 (10.0)                       |   |
| Zdravstveno osiguranje i režim • Health regime | Subvencionirano • Subsidized | 60 (100.0)                     | 3 (5.0)                         | <0.001 |

Razlike između varijabli procijenjene su hi-kvadratnim ili Fisherovim testom; vrijednosti manje od 0,05 su podebljane; SD: standardna devijacija • The differences between category variables were evaluated using chi-square or Fisher’s tests as appropriate. Values lower than 0.05 are shown in bold. SD: standard deviation.
ispiranje usta, bakterijski plak, kariogena prehrana, primjena fluora i dmft-a (%). Značajna je bila i učestalost četkanja zuba i pojavnost krvenja tijekom četkanja (p < 0,05). Za razliku od gradskih škole, u seoskim je dmft bio visok i prehrana vrlo kariogena (tablica 1.). Četkanje četkom tri ili više puta na dan i korištenje sredstava za ispiranje usta bili su tijedi u ruralnim područjima. U tablici 2. sažeti su rezultati bivarijantne analize između seoskih škole i gradskе škole. Nije bilo značajnih razlika u spolu između škola. Utvrđene su značajne razlike (p < 0,001) za dob, socijalno-ekonomski status, razinu obrazovanja, pristup kanalizaciji, telefonu i internetu te u vrsti zdravstvenog osiguranja. Najčešći socijalno-ekonomski status od pet mogućih bio je prvi (najniži) u seoskim školama i treći i četvrti u gradskоj školi. Sva djeca u seoskim školama imala su subvencionirano zdravstveno osiguranje, u usporedbi s 5 % učenika u gradskоj školi. Kad je riječ o pristupu javnim uslugama, ruralno područje imalo je značajno manji pristup kanalizaciji (68.3 %) u usporedbi s urbanom područjem (100 %). Pristup internetu bio je ograničen u ruralnom području (16.7 %) u odnosu prema urbanoj (88.3 %). Korištenje mobitela bilo je u oba područja slično.

**Discussion**

Ovo istraživanje uspoređivalo je dentalni status prema kriterijima ICDAS-a II te kliničke i socijalno-demografske čimbenike povezane s karijesom kod djece iz seoskih i gradskоh škole u Pastou u Kolumbiji. Nekoliko istraživanja analiziralo je status oralnогa zdravlja i populacije i uspoređivalo prevalenciju karijesa u ruralnim i urbanim sredinama na temelju indeksa DMFT/dmft-a (4, 10, 21). U ovom radu procijenili smo stanje zuba primjenom obiju metoda – ICDAS-a II i dmft-a, te istaknuli rezultate klasifikacije ICDAS-a II. Osim populacije iz Genove koja je proučavana ( ruralna), ovo je prvi put da je dentalni status djece procijenjen s pomoću klasifikacije ICDAS-a II koja omogućuje praćenje evolucije karijesa. Jedno drugo istraživanje procijenilo je dentalni status prema kriterijima ICDAS-a II u ruralnim i urbanim populacijama (22). To francusko istraživanje obuhvatio je 6-godišnju djecu iz seoskih i gradskих škola i pronašlo značajne razlike između dviju populacija za ocjene 1 – 2 ICDAS-a II, in the groups (p < 0.001) were time since the last dental visit, use of mouthwash, presence of bacterial plaque, cariogenic diet, fluoride application, and dmft (%). The toothbrushing frequency and presence of bleeding gums during toothbrushing (p < 0.05) were also significant. In contrast to the urban school, in the rural school, the dmft was considered high and the diet was highly cariogenic (Table 1). Toothbrushing 3 or more times per day and the use of mouthwash were less frequent in the rural area. Table 2 summarizes the results of the bivariate analysis between the rural and urban schools. There were no significant differences in gender between the schools. Significant differences (p < 0.001) were found for age, socioeconomic status, educational level, access to sewer systems, telephone, and internet, and type of health regime. The most frequent socioeconomic status among the 5 statuses was 1 (the lowest) in the rural schools and 3 and 4 in the urban school. All children in the rural schools belonged to the subsidized health regime, compared to 5% of the urban students. In terms of access to public services, the rural area had significantly less access to sewer systems (68.3%) compared to the urban area (100%). The access to internet was limited in the rural area (16.7%) compared to the urban area (88.3%). The use of cellphones was similar between the two areas.

**Rasprava**

Ovo istraživanje uspoređivalo je dentalni status prema kriterijima ICDAS-a II te kliničke i socijalno-demografske čimbenike povezane s karijesom kod djece iz seoskih i gradskih škole u Pastou u Kolumbiji. Nekoliko istraživanja analiziralo je status oralnогa zdravlja i populacije i uspoređivalo prevalenciju karijesa u ruralnim i urbanim sredinama na temelju indeksa DMFT/dmft-a (4, 10, 21). U ovom radu procijenili smo stanje zuba primjenom obiju metoda – ICDAS-a II i dmft-a, te istaknuli rezultate klasifikacije ICDAS-a II. Osim populacije iz Genove koja je proučavana ( ruralna), ovo je prvi put da je dentalni status djece procijenjen s pomoću klasifikacije ICDAS-a II koja omogućuje praćenje evolucije karijesa. Jedno drugo istraživanje procijenilo je dentalni status prema kriterijima ICDAS-a II u ruralnim i urbanim populacijama (22). To francusko istraživanje obuhvatio je 6-godišnju djecu iz seoskih i gradskих škola i pronašlo značajne razlike između dviju populacija za ocjene 1 – 2 ICDAS-a II, in the groups (p < 0.001) were time since the last dental visit, use of mouthwash, presence of bacterial plaque, cariogenic diet, fluoride application, and dmft (%). The toothbrushing frequency and presence of bleeding gums during toothbrushing (p < 0.05) were also significant. In contrast to the urban school, in the rural school, the dmft was considered high and the diet was highly cariogenic (Table 1). Toothbrushing 3 or more times per day and the use of mouthwash were less frequent in the rural area. Table 2 summarizes the results of the bivariate analysis between the rural and urban schools. There were no significant differences in gender between the schools. Significant differences (p < 0.001) were found for age, socioeconomic status, educational level, access to sewer systems, telephone, and internet, and type of health regime. The most frequent socioeconomic status among the 5 statuses was 1 (the lowest) in the rural schools and 3 and 4 in the urban school. All children in the rural schools belonged to the subsidized health regime, compared to 5% of the urban students. In terms of access to public services, the rural area had significantly less access to sewer systems (68.3%) compared to the urban area (100%). The access to internet was limited in the rural area (16.7%) compared to the urban area (88.3%). The use of cellphones was similar between the two areas.

**Discussion**

The present study compared the caries status according to the ICDAS-II criteria and caries-related clinical and sociodemographic factors for children from rural and urban schools in Pasto, Colombia. Several studies have evaluated the oral health status of the general population and have compared the prevalence of caries in rural and urban areas based on the DMFT/dmft indices (4, 10, 21). In the present study, we evaluated the history of caries using both methods, ICDAS-II and dmft, and emphasized the ICDAS-II results. In the population studied from Genoy (rural), this is the first time that the caries status of children has been evaluated using the ICDAS-II system, which will allow for a follow-up of the evolution of the caries in those children. One other study evaluated the caries status using the ICDAS-II criteria in rural and urban populations (22). This French study included 6-year-old children from rural and urban schools and found significant differences between the two zones for the ICDAS-
Korištenjem metode ICDAS-a II, 39 % djece bilo je bez karijesa, a korištenjem osnovne metode WHO-a 67,2 % djece nje imalo karijes – ti rezultati upućuju na veću preciznost ICDAS-a II u mjerenju nekavitiranih karijesnih lezija u (22).

U ovom istraživanju najčešća kategorija dmft-a bila je vrlo visok među učenicima iz seoskih škola i vrlo nizak među učenicima iz gradskih škola. To je u skladu s rezultatima ICDAS-a II. U drugim istraživanjima provedenima u Genoyu mjerilo se stanje zuba metodom dmft-a (4, 5). Prosečni dmft iznosio je 5,16 (visok) za 5-godišnju djecu i 4,58 (visok) za 12-godišnjake (4). Rezultati za petogodišnju djecu bili su slični našim rezultatima u kojima je prevaldavala vrlo visoka zuba karijesa. Važno je uzeti u obzir da je ovo istraživanje uključivalo djecu u dobi od 4 do 6 godina i moglo bi utjecati na srednju vrijednost dmft-a. Istraživanja obavljena u Popayan (Papajina Cauca), u južnom gradu kolumbijske pokrajine Nariño, gdje se nalazi Genoy, pronašlo je 96 % karijesa kod 12-godišnje djece i dmft od 3,02 (23) – te su vrijednosti bile slične onima pronađenima u Genoyu.

Općenito, u ovom istraživanju karijesi je status bio lošiji kod učenika iz seoskih škola u usporedbi s gradskom školom, što se može usporediti s rezultatima u kojima su izvijestili Cabrera i suradnici (10), Fernandez-Gonzalez i suradnici (24) iz Čilea te Ribeiro de Campos Mello i suradnici (25) iz Brazila. Istraživanja diljem svijeta pokazala su kontradiktorni rezultati u prevalecijiji karijesa u urbanima i ruralnim po- dručjima, ovisno o zemlji. U Sjedinjenim Državama, Kini, Švedskoj, Burkini Faso i Senegalu (26) prevalencija karijesa kod djece i adolescenata bila je veća u urbanim negoli u ruralnim područjima. No u drugim istraživanjima veća učestalost zabilježena je u ruralnim područjima u usporedbi s urbaniima (Indija, Rusija i Poljska) (27 – 29). Ti kontradiktorni rezultati dijelom se mogu objasniti time što se vrlo izoliranim ruralnim područjima, iako je donekle moguć pristup uslužama oralne zdravstvene zaštite, nepovoljni socijalno-ekonomski uvjeti ograničavaju pristup kariogenoj hrani koja se vrlo jednostavno može nabaviti u gradovima (26). Ta kontradiktorna istraživanja pokazala su da se oralno zdravlje u ruralnim i urbanim područjima razlikuje između razvijenih država i zemalja u razvoju. Nadalje, razlikuje se i među regijama unutar iste države ili između zemalja s istom ekonomskom razinom. Preporučuju se daljnja istraživanja i intervencije u populacijama iz gradova i ruralnih područja, ovisno o zemlji. U Sjedinjenim Državama, Kini, Švedskoj, Burkini Faso i Senegalu (26) prevalencia karijesa kod djece i muderskih djece u dobi od 4 do 6 godina i moglo bi utjecati na srednju vrijednost dmft-a. Istraživanje obavljeno u Popayan (province of Cauca), a southern Colombian city in the province next to Nariño, where Genoy is located, found a 96% history of caries in 12-year-old children and a dmft of 3.02 (23); these values were similar to the ones found in Genoy.

In general, the caries status was worse in the rural students compared to the urban students in the present study, which was comparable to results reported by Cabrera et al.(10), Fernandez-Gonzalez et al.(24) in Chile and Ribeiro de Campos Mello et al.(25) in Brazil. Worldwide, the studies showed contradictions for the prevalence of caries in urban and rural areas depending on the country. In the United States, China, Sweden, Burkina Faso and Senegal(26), the prevalence of caries in children and adolescents was higher in the urban areas than in the rural areas. However, in other studies the highest prevalence of caries occurred in rural areas compared to urban areas (India, Russia and Poland)(27-29). These contradictory results can be explained in part because in very isolated rural areas, although there is less access to oral health services, the unfavorable socioeconomic conditions limit the access to cariogenic food, which can be easily found in urban zones(26). These contradictory studies have shown that the differences in oral health found in rural and urban areas differ between developed and developing countries; furthermore, they differ among regions inside the same country or between countries with the same economic levels. It is recommended to conduct a follow-up investigation and intervene in populations at a small regional scale, considering the socioeconomic conditions and behavioral aspects of each region that create barriers to maintaining good oral health(26).

Comparison of variables important for clinical practice and dental health

Nine variables important for clinical practice and dental health were significantly different in rural students compared to urban students. Children from the rural schools had more bacterial plaque and bleeding during toothbrushing; in summary, they showed worse oral health. Other important dental health variables agree with the low quality of oral health observed in the rural schools from Genoy. The presence of bacterial plaque and a cariogenic diet was higher in the rural stu-
uporaba otopina za ispiranje usta i primjena fluora bili su rjeđi među tom djecom. Kariogena prehrana, uz slabu oralno-zdravstvenu zaštitu, smatra se rizikovim čimbenikom za razvoj karijesa kod djece i odraslih (25, 26, 28, 30).

Usporedba socijalno-demografskih varijabli

Korištenje mobitelja bilo je slično u ruralnim i urbanim područjima jer Kolumbija ima pristup niskopropitnim mobilnim tarifama. Važno je uzeti u obzir različite tehnologije koje su dostupne stanovništvu kada se definiraju programi poboljšanja zdravstva i prevencije bolesti. Na primjer, u kućanstvima djece iz seoskih i gradićkih škola oko 90% ima pristup telefonima i televiziji te se ti medijski kanali mogu iskoristiti za širenje informacija o intervencijskim programima s pomoću mobilnih aplikacija ili televizijskih reklama. Većina učenika sa sela najriješnijega je socijalno-ekonomskog statusa. Uz to, seoske škole bile su javne, a gradićka je bila privatna. U istraživanju Doa i suradnika (31) (2015.) provedeno u Australiji, kod djece od 5 do 8 godina iz javnih škola (51,7%) prevalencija karijesa bila je veća nego u privatnim (37,8%) ili katoličkim školama (38,4%). Uočena je i veća učestalost karijesa kod obitelji s niskim primanjima (54,4%) u usporedbi s onima srednjeg (44,0%) do visokog (37,8%) dohotka (31). Razlike u socijalno-ekonomskom statusu i vrsti škole (privatna ili javna) bile su povezane s vrstom zdravstvenog osiguranja djece u ruralnom i urbanom području. U ovom istraživanju svi sa sela pripadali su subvencioniranom zdravstvenom osiguranju, a većina djece u gradićkoj školi doplačivala je zdravstveno osiguranje. Vrsta zdravstvenog osiguranja utječe na zdravlje pojedinca, uključujući i oralno zdravlje (32). Zdravstveni sustav u Kolumbiji je nejednaka – obuhvaćen je neuniverzalno te postoje razlike u zdravstvenim planovima i izdatcima sustava prema prihodima stanovništva (33). Razlike između subvencioniranog osiguranja i onoga s doplaćivanjem ograničavaju pristup preventivnim uslugama u ruralnim područjima (3) jer je u slučaju nedoplaćivanja osiguranja vrijeme do dobivanja zdravstvene usluge dulje. Uz to, zahtijevan je i dobro obučen terapija, lijekovka i terapija traju dulje, zbog čega neki građani često odbijaju pravo na pristup zdravstvenoj zaštiti. Na primjer, u Kolumbiji se u 2010. godini 65% ljudi iz ruralnih područja konzultiralo o zdravlju u medicinskih centrima u usporedbi sa 73% u urbanim sredinama (34). Osim toga, u ruralnim područjima Kolumbije ljudi s višim promjenama u zdravstvenom osiguranju se mogu platiti prijevoz u liječnički centar izvan svojeg mjesta stanovanja (32).

Ovo je istraživanje imalo ograničenja – broj učenika u seoskim školama bio je malen jer je populacija toga područja s pristupom obrazovanju bila maloobražena. Bilo je poteškoća u dobivanju informiranog pristanka zato što neki roditelji nisu mogli biti na sastanku s istraživačima u školi radi prikupljanja dokumenata. Kad je to bilo moguće, roditelje se posjetilo kod kuće kako bi potpisali informirani pristanak. U seoskim školama nije bilo četverogodišnje djece, pa je zato zabilježena dobra razlika između seoskih i gradićkih skupina. Ipak, razlike u dobi nisu utjecale na rezultate, kao što se vidi u tablici 2. Students; toothbrushing, the use of mouthwash and application of fluoride were less frequent in rural students. A cariogenic diet, along with poor oral health care, is considered a risk factor for caries in children and adults (25, 26, 28, 30).

Comparison of sociodemographic variables

The utilization of cellphones was similar in the rural and urban areas because, in Colombia, there is access to low cost low-end and prepaid cellphones. It is important to consider the different technologies available to the population when health promotion and disease prevention programs are designed. For example, in the homes of children from the rural and the urban schools, there is approximately 90% access to cellphones and television; thus, these media channels can be used for dissemination of intervention programs using cellphone applications or television commercials. Most rural students belonged to the lowest socioeconomic status, which was 1 in Colombia. In addition, the rural school was public, and the urban school was private. In a study by Do et al. (31) (2015) completed in Australia, there was a higher weighted prevalence of caries in children from 5 to 8 years old from public schools (51.7%) than private (37.8%) or catholic schools (38.4%). There was also a higher weighted prevalence of caries from families with low incomes (54.4%) compared to families of mid (44.0%) to high (37.8%) incomes (31). The differences in the socioeconomic status and the kind of school, private or public, were related to the type of health regime to which the children were affiliated in both the rural and urban area; in the present study, all the rural students belonged to the subsidized health regime and most children in the urban school belonged to the contributory health regime. The kind of regime with which a person is affiliated has an impact on their health, including their oral health (32). The health system in Colombia is inequitable; the coverage is not universal, and there are differences in the health plans and the system’s expenditure according to the population’s income (33). The differences between the contributory and subsidized regimes create limitations for accessing preventive services and timely oral health attention in the rural areas (34). In addition, in the rural areas of Colombia, people cannot afford medical treatments not covered by their health regimes, or if the treatments are available only in urban zones (which is common), they cannot afford transportation to visit a medical center outside their towns (32).

This study had limitations; the number of students in the rural schools was small because the population of this rural area with access to education was also small. There were difficulties collecting the voluntary informed consent due to some parents being unable to attend the researchers’ visit to the school to collect the documents. When possible, the parents were visited at home to get the signed voluntary informed
Zaključak
U ovom istraživanju ustanovljena je razlika u dentalnom statusu između djece iz seoskih i gradskih škola u Pastou (Kolumbija) na temelju klasifikacije ICDAS-II i dmft-a. Ovo istraživanje bilo je prvo koje je procijenilo dentalni status na temelju kriterija ICDAS-a II u tim populacijama. Primjena ICDAS-a II za mjerenje zahvaćenosti karijesa u ovom istraživanju omogućit će donošenje mjera za zaštitu zdravih zubnih plića kako bi se izbjegao razvoj karijesa u aktivnim ili neaktivnim lezijama te otkrila djeca izložena riziku od pogoršanja oralnoga zdravlja. Šesnaest od 22 analizirane varijable značajno su se razlikovale među djecom iz seoskih i gradskih škola. Kao i ostala istraživanja koja su procjenjivala dentalni status ruralnih populacija, otkrili smo da su četkanje zuba, kariogena prehrana, vrijeme od posljednjega stomatološkog posjeta te socijalno-ekonomski i zdravstveni status povezani s težinom karijesa. Statistički značajno različite varijable između seoske i gradske skupine mogu djelomično objasniti razinu karijesa zabilježenu kod djece sa sela i na taj način upozoriti na aspekte oralnoga zdravlja i socijalno-demografske parametre koje treba iskoristiti za intervencije u tim populacijama na temelju provedbe specifične promidžbe oralnoga zdravlja i programa prevencije bolesti kako bi se smanjili visoki indeksi karijesa na tom ruralnom području.

Conclusion
The present study found differences in the caries status between the children from rural and urban schools in Pasto (Colombia) using the ICDAS-II criteria and the dmft index. This study was the first to evaluate caries using ICDAS-II criteria in these populations. The application of the ICDAS-II system to measure the caries status in this study will allow the creation of actions to protect healthy dental surfaces, to avoid the development of caries in active or inactive lesions and to detect children at risk of worsening their oral condition. Sixteen out of 22 variables analyzed were significantly different in children from the rural and urban schools. Like other studies that evaluated the caries status of rural populations, we found that toothbrushing, a cariogenic diet, time since the last dental visit; socioeconomic status and health regime were related to caries severity. The significantly different variables between the rural and urban group could explain in part the caries levels observed in rural children, and thus, which aspects of oral health and sociodemographic parameters are to be used for interventions in these populations through the implementation of specific oral health promotion and disease prevention programs to reduce the high caries indices observed in this rural zone.

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Conflict of interest
None declared
Abstract

Objective: The objective of this study was to compare the ICADS-II caries status and caries-related factors among rural and urban schoolchildren. Materials and Methods: The study included 120 children (4-6 year-old children) from rural (privileged) and urban (unprivileged) schools. Caries was evaluated using the ICADS-II criteria. A survey about the factors related to the presence of caries was applied. Chi-square and Fisher’s tests were used to assess the differences in each study variable between the two groups. A Mann–Whitney U test was used to compare the number of teeth, per ICADS-II category, between the groups. Negative binomial regression was used to estimate the percentage change in the mean number of teeth, per ICADS-II category, among the rural and urban students.

Results: Significant differences were found between the rural and urban students for the ICADS-II 0 and 3-6 categories (p<0.001). The mean number of teeth with moderate-to-severe caries status increased 233% in children from the rural school compared to those attending the urban school (p=0.0). Toothbrushing frequency (p=0.006), cariogenic diet, time elapsed from last dental visit, socioeconomic status, and type of health regime (p<0.001) were among the significant factors related to the rural and urban schools. Conclusions: This was the first study to compare ICADS-II caries status between rural and urban students in Colombia. A worse caries status was found in rural students. This study identified the socioeconomic and clinical factors to guide specific interventions for rural children by modifying the available oral health promotion and disease prevention programs.

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