

## Article

# Oral Health in Migrants: An Observational Study on the Oral Health Status of a Migrant Cohort Coming from Middle- and Low-Income Countries

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**Abstract:** *Introduction.* The oral health conditions of migrants coming from middle- and low-income countries to developed countries have been shown to be poorer than those of the host population. Since the phenomenon of migration has continued to grow over the past five decades, the oral health status of migrant populations should be an issue of great concern. *Objectives.* The objective of our observational study was to analyse the periodontal health status and the prevalence of dental caries and lesions of the oral mucosa in a migrant cohort resident in Italy, assessing the association between the oral health status and the educational level of the included patients. *Materials and Methods.* Our research was conducted at the dental department of Policlinico Tor Vergata (Rome, Italy). A sample of 200 migrants coming from middle- and low-income countries, aged between 3 and 37, was included in our study. Each patient underwent a physical examination of the oral cavity, recording the DMFT/dmft index, Community Periodontal Index of Treatment Needs (CPI), and lesions of the oral mucosa. The one-way ANOVA test was used to establish the correlation between the oral health status and the educational level of the participants. *Results.* Many participants (62.5%) showed a DMFT/dmft Index  $\geq 4$ ; only 27% of the migrants had a DMFT/dmft Index lower than 4, and only 21 of them (10.5%) were recorded at 0. A CPI equal to 0 or 1 was observed in 131 patients (65.5%), while only 30 participants presented a CPI equal to or higher than 4 (15%), and 19.5% (39 patients) were assigned to code 2 and 3. Significant statistical differences were found in the CPI after adjusting data for the educational level of the included participants ( $p$ -value  $< 0.01$ ). *Conclusions.* The data obtained in our research highlighted poor oral conditions among the analysed migrant population, recording a high prevalence of dental caries and inadequate oral hygiene habits.

**Keywords:** migrants; middle-and low-income countries; oral health of migrants; oral hygiene habits; migrant children's oral health status; dental caries; gingival bleeding



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## 1. Introduction

The literature has reported that a migration background can affect the oral health status of individuals [1,2], and, since the number of international migrants has continued to grow over the past five decades, this issue is salient.

According to the World Migration Report 2022, it is estimated that 218 million people now in a country other than their country of birth, and it was observed that the number of migrants is three times higher than in 1970 [3]. The International Migration Report

by the United Nations [4] highlighted that in 2017 more than 50% of the total number of international migrants settled in developed countries.

It has been reported that 1.9 million persons migrated to the European Union (EU) from non-EU countries in 2020, and, in 2021, 5.3% of the entire population living in the EU were migrants [5].

It has been largely demonstrated that poor oral health can have a negative effect on general health, consistently impacting daily activities [6–10], so much so that oral health was defined as a Leading Health Indicator 2020 [11].

Many developing countries, such as Bangladesh, Sri Lanka, Pakistan, and India, presented a very low oral health literacy [12], which the World Health Organization defined as “the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health” [13]. Furthermore, the healthcare system in these countries is often less qualified, not well organized, and without specific regulations [1].

Migrants move from their countries for many reasons, such as conflicts, persecution, and poverty [14,15], and they face many barriers once they reach the host country: social and economic inequalities, language and legal status problems, different cultural habits, and difficulties in accessing healthcare facilities [16,17]. Therefore, the phenomenon of migration, which includes economic, social, and emotional disruption, may negatively affect the quality of life of migrants and, consequently, their general health and oral health [18].

Several authors have demonstrated that people who migrated from middle- and low-income countries to high-income countries presented a lower oral health status, a condition due to cultural habits, religiosity, and social behaviours of their native nations [19–21].

Pabbla et al. [22] recorded in his systematic review a significantly higher prevalence of dental caries and gingival bleeding among migrant children coming from Asian and African countries compared to the population of the host countries (European countries). The same study highlighted a general poor knowledge of oral health among migrants and a lack of monitoring by migrant parents of the oral health of their children.

Serna et al. [23] investigated the dental care utilization among Hispanic migrant farmworkers in South Florida, showing that most of them did not have a past year dental visit, and they presented poor oral conditions, having difficulties in accessing healthcare services.

The article by Svensson et al. [24] assessed poor oral hygiene in half of the analysed migrant children coming from Somalia to Sweden, underlining that 78–82% of them had never visited a dental department in their native nation, and that, in most cases, parents did not assist their youngest children during tooth cleaning.

There are different risk factors, which prevent migrant children from maintaining good oral health, and Reza et al. [25] grouped them into 3 levels: (1) the child level, due to the different oral hygiene habits, (2) the family level, including economic barriers, parents' inadequate knowledge of oral health practices, and scant attention to the oral health condition of their children and (3) the community level, that is, lack of medical insurance.

Considering these, interventions aimed at reducing disparities in access to dental treatment are necessary [26–28].

This observational study aimed to assess the periodontal health status and the prevalence of dental caries and lesions of the oral mucosa of a migrant cohort coming from middle- and low-income countries to Italy. Furthermore, we investigated the association between dental caries, periodontal status, and educational level of the included migrants.

## 2. Materials and Methods

A cross-sectional design was used to realize this observational study, recording the prevalence of dental caries, oral mucosa lesions, and gingival health status in a migrant population coming from middle- and low-income countries and resident in Italy. Our research included 200 migrant subjects, aged between 3 and 37, who visited the dental department of the Policlinico Tor Vergata (Rome, Italy) in the period from 1 September

2021 to 31 March 2022. This study was approved by the Fondazione Policlinico Tor Vergata (Rome, Italy) ethical committee (approval number N. 0001919/2020 del 29/01/2020).

Inclusion criteria were as follows: (a) subjects under the age of 40 years; (b) patients identified as migrants; (c) persons whose country of origin was identified as middle- or low-income country; (d) participants aged 18 years and older had to be born in middle- or low-income countries; (e) parents of patients under the age of 18 had to be born in middle- or low-income countries; (f) migrants resident in Italy. Persons aged 40 years and older, migrants identified as asylum seekers or refugees, non-migrant subjects, or migrants coming from high-income countries were excluded from our study.

The selected sample included 110 female and 90 male subjects aged between 3 and 37 (median age 9.39 years old  $\pm$  6.49). This research selected 188 children, of whom 30 were born in middle- and low-income countries, and 158 were born in Italy but had both parents whose country of birth was a middle- or low-income country. The subjects selected for our study came from (Table 1):

**Table 1.** Country of origin of included patients.

Country	Total N.	Parents' Country of Birth N.	Child's Country of Birth (Aged between 3 and 17)	Adult Subject's Country of Birth (Aged between 18 and 37)
			N.	N.
Egypt	42	28	11	3
Peru	36	28	7	1
Ecuador	13	12	/	1
The Philippines	12	11	/	1
Tunisia	4	2	1	1
Morocco	10	9	/	1
Montenegro	3	3	/	/
Bangladesh	5	4	1	/
Pakistan	1	/	1	/
Algeria	1	1	/	/
Romania	13	10	1	2
Sri Lanka	6	5	1	/
Nepal	1	1	/	/
Moldavia	5	4	1	/
Albania	13	11	/	2
Turkey	2	2	/	/
Kosovo	2	2	/	/
Senegal	3	3	/	/
Bolivia	1	1	/	/
Venezuela	1	/	/	1
Bosnia and Herzegovina	1	/	1	/
India	3	3	/	/
El Salvador	7	4	3	/
China	6	6	/	/
Ukraine	6	4	2	/
Cameroon	1	1	/	/
Mauritius	1	1	/	/
Saudi Arabia	1	1	/	/
Total	200	158	30	12

Africa ( $n = 62$ ): Egypt ( $n = 42$ ), Morocco ( $n = 10$ ), Tunisia ( $n = 4$ ), Senegal ( $n = 3$ ), Algeria ( $n = 1$ ), Cameroon ( $n = 1$ ), and Mauritius ( $n = 1$ );

Central and South America ( $n = 58$ ): Peru ( $n = 36$ ), Ecuador ( $n = 13$ ), El Salvador ( $n = 7$ ), Venezuela ( $n = 1$ ), and Bolivia ( $n = 1$ );

Europe ( $n = 45$ ): Romania ( $n = 13$ ), Albania ( $n = 13$ ), Ukraine ( $n = 6$ ), Moldavia ( $n = 5$ ), Kosovo ( $n = 2$ ), Montenegro ( $n = 3$ ), Bosnia and Herzegovina ( $n = 1$ ), and Turkey ( $n = 2$ );

Asia ( $n = 35$ ): China ( $n = 6$ ), India ( $n = 3$ ), the Philippines ( $n = 12$ ), Pakistan ( $n = 1$ ), Sri Lanka ( $n = 6$ ), Bangladesh ( $n = 5$ ), Nepal ( $n = 1$ ), and Saudi Arabia ( $n = 1$ ).

### 2.1. Clinical Methods

Each patient underwent a physical examination of the oral cavity, during which the following clinical parameters were analysed:

Decayed Missing Filled Teeth Index for permanent dental elements/decayed missing filled teeth index for primary dental elements (DMFT/dmft) [29–31]. The presence of caries was determined following the International Caries Classification and Management System [32].

Community Periodontal Index of Treatment Needs (CPI) [33,34]:

Code 0 → no treatment needs;

Code 1 → bleeding gingiva after gentle probing;

Code 2 → periodontal pockets not deeper than 3 mm, presence of supra- or subgingival calculus or plaque;

Code 3 → 4–5 mm deep periodontal pockets;

Code 4 → 6 mm or deeper periodontal pockets.

Lesions of oral mucosa or new mucosal formations [35] with the following characteristics:

Acute/chronic onset ulcerative vesiculo-bullous lesions;

Red, blue, or red-purple plan/exophytic lesions, not removable white lesions, white and red, yellowish, pigmented lesions;

Swelling on palate, tongue, oral floor, vestibular mucosa, and/or gingiva.

The examination was conducted by one clinician, who performed the inspection of dental elements and the palpation of soft tissues (lips, tongue, cheeks, palate, and oral floor) of each participant. Periodontal probing was performed by the same operator using a probe with calibrations given in 3 mm sections. In order to diagnose the presence of caries, the operator used a dental mirror and a probe, analysing the occlusal, distal, mesial, palatal, and buccal portion of each dental element.

Aside from the clinical parameters, demographic data were collected: age, sex, country of birth, and level of education. In the case of minor subjects, the parents' level of education was taken into consideration. All these demographic data were recorded by using a questionnaire.

The medical history of the included patients was collected before proceeding with the oral examination, and each person's data were collected after obtaining informed consent.

### 2.2. Statistical Methods

The prevalence of dental caries (DMFT/dmft Index), oral mucosa lesions, and gingival health status (CPI) was obtained using means  $\pm$  standard deviation and percentages. The calculation was performed according to country of origin, age group, and sex. The one-way ANOVA test was performed to analyse the correlation between the educational level and the clinical parameters (DMFT/dmft Index and CPI).

## 3. Results

Our study analysed the prevalence of dental caries, gingival health status, and lesions of oral mucosa in a sample of 200 migrants from middle- and low-income countries. Most participants (62.5%, 124 migrants out of 200) showed a DMFT/dmft Index  $\geq 4$ ; 27% of the migrants had a DMFT/dmft Index lower than 4, and only 21 of them (10.5%) were recorded at 0.

A CPI equal to 0 or 1 was observed in 131 patients (65.5%), while only 30 participants presented a CPI equal or higher than 4 (15%), and 19.5% (39 patients) of them were assigned code 2 and 3. The CPI results were low in the selected population.

The DMFT/dmft Index and CPI were on average  $5.2 \pm 2.23$  and  $1.4 \pm 1.24$ , respectively (Table 1). Migrants born in Turkey, Pakistan, and Saudi Arabia had the highest mean values of the DMFT/dmft Index:  $9 \pm 3$ , 8, and 8, respectively. Romania had the highest CPI mean

value ( $1.76 \pm 2.32$ ), while patients born in Senegal, Mauritius, Bolivia, Nepal, and Bosnia and Herzegovina had no bleeding after gentle probing (CPI = 0).

Higher mean values of DMFT/dmft Index were recorded in migrants coming from Bangladesh ( $7.6 \pm 3.38$ ), China ( $7.16 \pm 3.43$ ), Egypt ( $6.11 \pm 4.06$ ), Romania ( $6 \pm 3.96$ ), the Philippines ( $5.41 \pm 4.03$ ), El Salvador ( $5.42 \pm 4.74$ ), Albania ( $5.15 \pm 3.5$ ), and Ukraine ( $5.16 \pm 2.79$ ) than in those coming from the remaining countries.

The lowest DMFT/dmft Index mean value was found in migrants whose country of origin was Sri Lanka ( $1.5 \pm 1.5$ ).

Migrants coming from Africa and from Europe were found to have the lowest DMFT/dmft index ( $3.8 \pm 1.13$ ) and CPI ( $1.27 \pm 0.62$ ), respectively.

Asian countries (China, the Philippines, India, Pakistan, Sri Lanka, Bangladesh, Nepal, and Saudi Arabia) were recorded to have the highest DMFT/dmft index ( $6.83 \pm 2.82$ ) and a CPI equal to  $1.58 \pm 1.26$ . Participants born in Europe (Romania, Albania, Kosovo, Moldavia, Montenegro, Bosnia and Herzegovina, Ukraine, and Turkey) had a DMFT/dmft index higher than those born in Central and South America (Peru, Ecuador, Venezuela, Bolivia, and El Salvador):  $5.36 \pm 1.82$  and  $4.76 \pm 0.92$ , respectively (Figures 1–4).

Patients whose country of origin was Africa (Egypt, Morocco, Tunisia, Algeria, Senegal, Cameroon, and Mauritius) showed a lower CPI ( $1.32 \pm 1.3$ ) than those coming from Central and South America ( $1.75 \pm 1.71$ ).

Based on the age range (Table 2), children aged between 3 and 6 years ( $n = 74$ ) had the highest dmft index ( $6.5 \pm 4.1$ ). Adult subjects aged between 21 and 37 years ( $n = 14$ ) had the highest CPI ( $3.4 \pm 2.77$ ). The DMFT/dmft Index in males was higher than in females ( $5.61 \pm 4.10$  and  $4.5 \pm 3.12$ , respectively), but the CPI was lower in males than in females ( $1.15 \pm 1.67$  and  $1.45 \pm 2.15$ , respectively) (Table 2). The mean value of the CPI in children and adolescents (3–6/7–12 and 13–20 years old) was equal to  $1.01 \pm 0.33$ , showing better periodontal health compared to the enrolled adult patients.

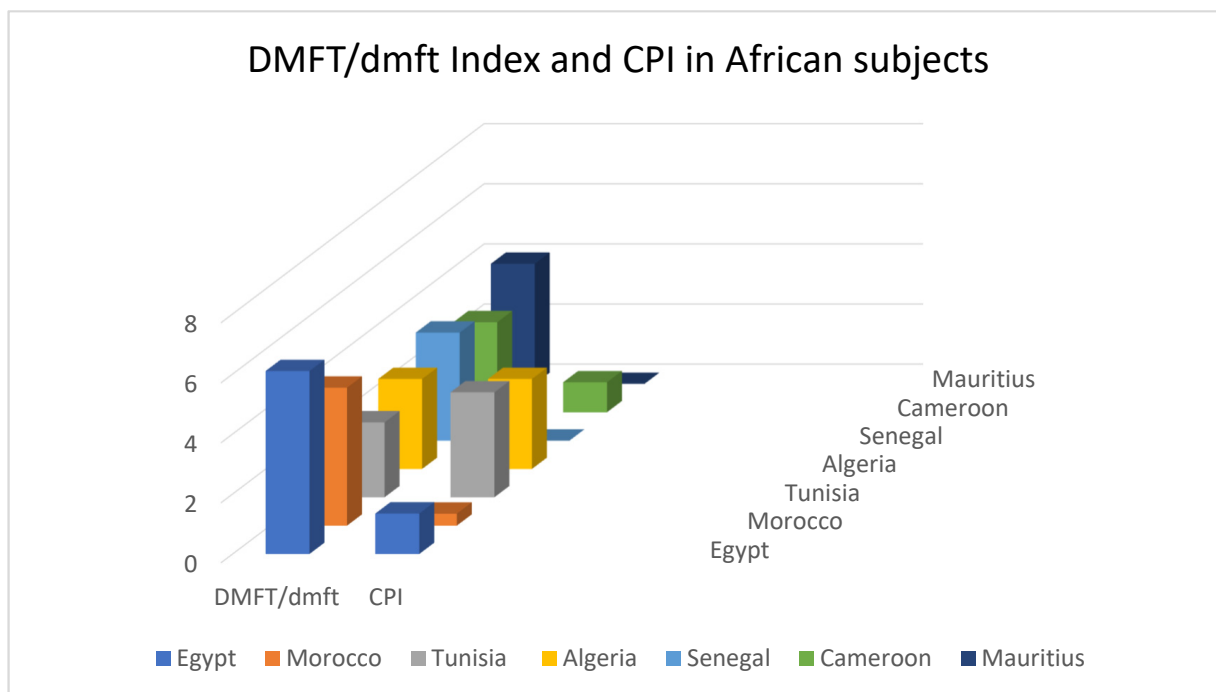


Figure 1. DMFT/dmft Index and CPI (means) in African patients.

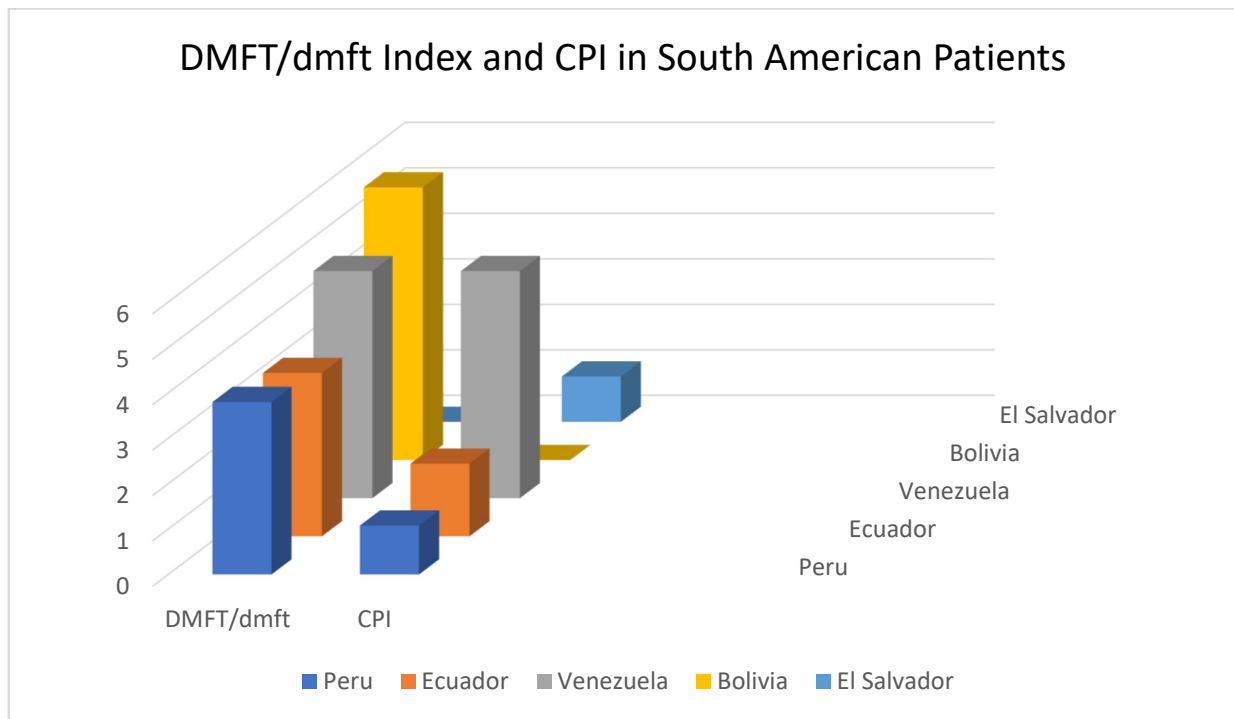


Figure 2. DMFT/dmft Index and CPI (means) in Central and South American patients.

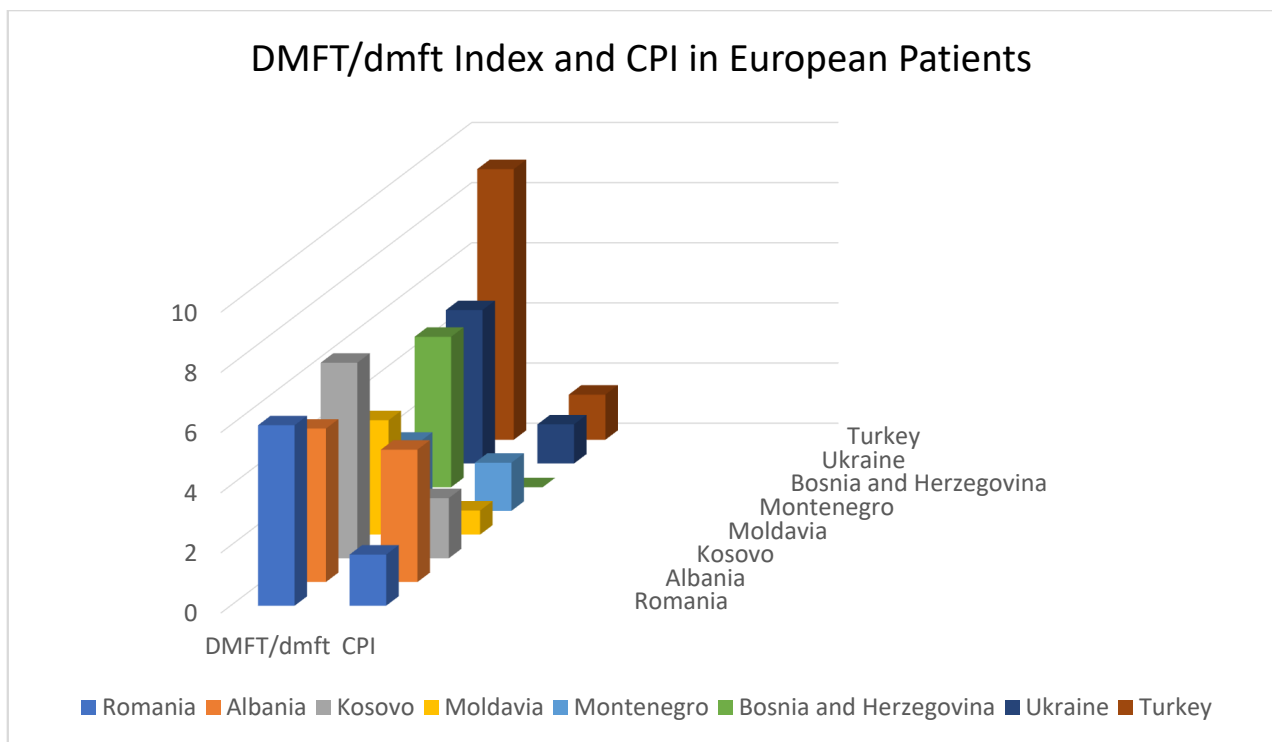


Figure 3. DMFT/dmft Index and CPI (means) in European patients.

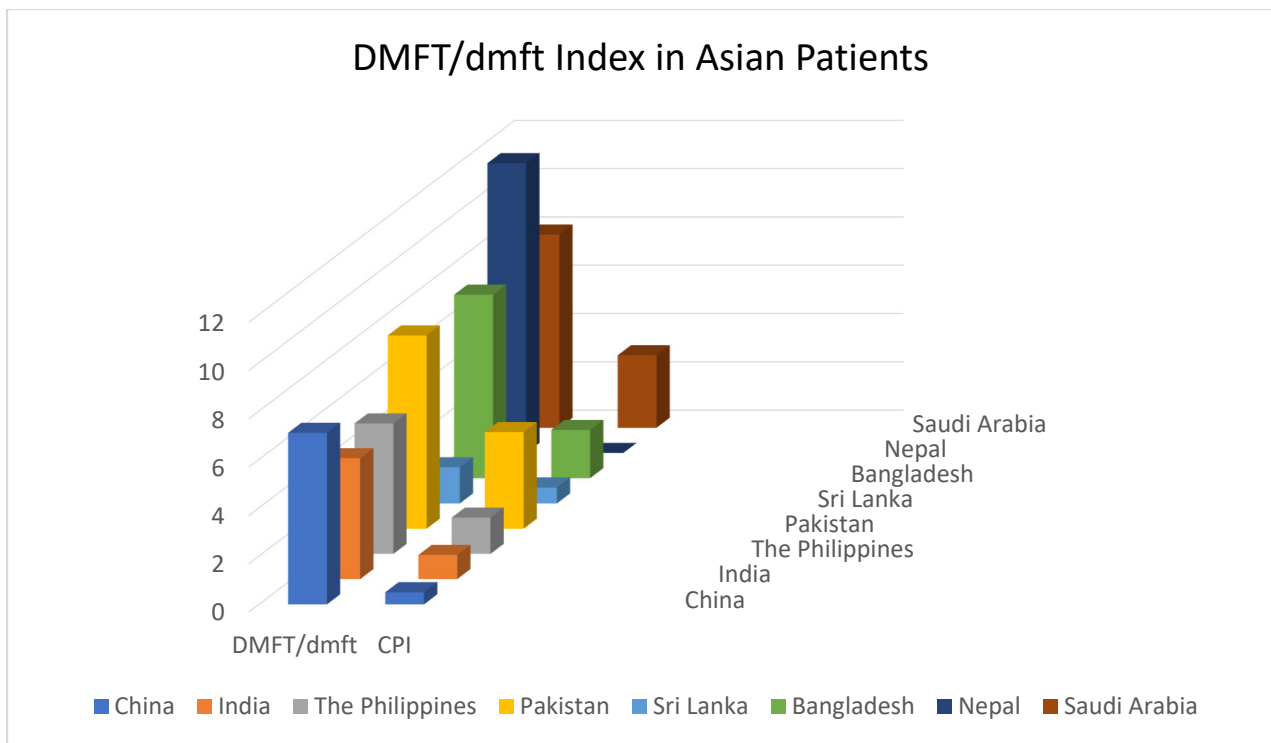


Figure 4. DMFT/dmft Index and CPI (means) in Asian patients.

Table 2. DMFT/dmft Index and CPI: Mean (M) and Standard Deviation (SD) according to the Country of Origin.

Country of Birth	Population Sample	DMFT/dmft (M)	DMFT/dmft (SD)	CPI (M)	CPI (SD)
Egypt	42	6.11	4.06	1.35	2.12
Morocco	10	4.6	4.29	0.4	0.66
Tunisia	4	2.5	1.5	3.5	2.29
Algeria	1	3	-	3	-
Senegal	3	3.66	0.94	0	0
Cameroon	1	3	-	1	-
Mauritius	1	4	-	0	-
Peru	36	3.805	2.83	1.08	1.73
Ecuador	13	3.61	2.09	1.69	2.39
Venezuela	1	5	-	5	-
Bolivia	1	6	-	0	-
El Salvador	7	5.42	4.74	1	1.60
The Philippines	12	5.41	4.03	1.5	1.89
China	6	7.16	3.43	0.5	1.11
India	3	5	1.41	1	1.41
Sri Lanka	6	1.5	1.5	0.66	1.49
Nepal	1	12	-	0	-
Albania	13	5.15	3.50	1.53	1.94
Romania	13	6	3.96	1.76	2.32
Ukraine	6	5.16	2.79	1.33	1.97
Moldavia	5	3.8	1.93	0.8	1.6
Turkey	2	9	3	1.5	1.5
Montenegro	3	2.33	0.47	1.66	2.35
Bosnia and Herzegovina	1	5	-	0	-
Kosovo	2	6.5	2.5	2	2
Pakistan	1	8	-	4	-
Bangladesh	5	7.6	3.38	2	1.26
Saudi Arabia	1	8	-	3	-
<b>Total</b>	<b>200</b>	<b>5.28</b>	<b>2.23</b>	<b>1.4</b>	<b>1.24</b>

Only 32 migrants out of 200 had attended university (DMFT/dmft mean value =  $4.7 \pm 2.8$ , CPI =  $0.8 \pm 1.5$ ), 35 subjects had a secondary school degree (DMFT/dmft mean value =  $5.7 \pm 3.4$ ,



CPI mean value =  $2.1 \pm 2.4$ ), while most of the included migrants had achieved a high school degree (DMFT/dmft mean value =  $4.8 \pm 3.7$ , CPI mean value =  $1.1 \pm 1.8$ ) (Table 3).

**Table 3.** DMFT/dmft Index and CPI: Mean (M) and Standard Deviation (SD) according to Age, Sex, and Education Level.

Age Range	Population Sample	DMFT/dmft (M)	DMFT/dmft (SD)	CPI (M)	CPI (SD)
3–6 years old	74	6.5	4.1	0.94	1.57
7–12 years old	98	4.6	3.01	1.45	2.20
13–20 years old	14	1.46	1.54	0.64	1.58
21–37 years old	14	3.8	2.45	3.4	2.77
Female	110	4.5	3.12	1.45	2.15
Male	90	5.61	4.10	1.15	1.67
Secondary School	35	5.7	3.4	2.1	2.4
High School	132	4.8	3.7	1.1	1.8
University	32	4.7	2.8	0.8	1.5

Significant statistical differences were found in the CPI after adjusting data for the educational level of the included participants ( $p$ -value < 0.01); on the contrary, the results regarding the DMFT/dmft Index were not significant at  $p$ -value < 0.01 (Table 4).

**Table 4.** DMFT/dmft Index and CPI adjusted for Educational Level: ANOVA Test.

Educational Level	DMFT/dmft (M)	DMFT/dmft (SD)	SS	df	MS	F	$p$ -Value
Secondary School	5.7	3.4					
High School	4.8	3.7	23.57	2	11.78	0.92632 *	0.397728 *
University	4.7	2.8					
	CPI (M)	CPI (SD)	SS	df	MS	F	$p$ -Value
Secondary School	2.1	2.4					
High School	1.1	1.8	35.90	2	17.95	4.85511 **	0.00874 **
University	0.8	1.5					

\* Results NOT significant at  $p$  value  $p < 0.01$ . \*\* Results significant at  $p$  value  $p < 0.01$ .

None of the participants presented lesions of the oral mucosa.

#### 4. Discussion

This study assessed the prevalence of dental caries and the health status of periodontal tissues among 200 migrants coming from developing countries and living in Northern Italy. To investigate the presence of dental caries we calculated the Decayed Missing Filled Teeth Index and decayed missing filled index for permanent and primary teeth, respectively. The DMFT/dmft represents the most important index used in epidemiological studies regarding the health status of the population, defining the number of decayed teeth, treated teeth, and the number of teeth missing due to carious lesions. It allows evaluation of the need for oral health interventions and strategies, to prevent dental decay [29,30]. The Community Periodontal Index of Treatment Needs was proposed in 1977 by the World Health Organization to measure periodontal disease and evaluate the treatment needs of populations [35–37].

Data obtained from the analysis reported, in general, a high prevalence of dental caries among the included patients, since more than half of them presented a DMFT/dmft  $\geq 4$ , and only 10.5% had no decayed, filled, or missing teeth. Most of the selected sample was represented by children (age range 3–17 years old). Most of them were born in Italy but had both parents whose nation of birth is considered a middle- or low-income country.

In order to compare our data with a control population, we took into consideration the epidemiological study by Severino et al. [38]: this research evaluated the presence of Early Childhood Caries (ECC), by analysing the dmft index, in a paediatric Italian population



composed of 76 children and aged up to 6 years. In the same study, the educational level of the parents was collected by using a questionnaire, recording that more than 36% and 22% of mothers and fathers, respectively, had attended college (university). The authors of this article reported that more than half of the selected patients (59.21%) had never experienced caries, and that the majority of the parents used to brush their teeth 3 or more than 3 times a day.

The control group for children older than 6 years could be represented by the population sample selected in the study by Campus et al. [39], in which the DMFT/dmft Index and the CPI were calculated in 5342 Italian children aged 12 years. The national mean DMFT was equal to 1.09% (95% CI 0.98–1.21), and 23.8% of the patients had gingival bleeding, while 28.7% had calculus.

On the basis of the data collected from the literature [38,39], and according to the results of our observational study, it can be stated that the prevalence of dental caries appears to be higher in the migrant subjects living in Italy and coming from middle- and low-income countries than in the native population.

Our results are in line with the data recorded by Ferrazzano et al. [40]: the authors of this paper studied the DMFT index among migrant children with low incomes in South Italy, demonstrating higher levels of dental caries compared to the non-migrant population and showing a higher Unmet Restorative Treatment Needs index in migrant children than that of the native population.

van Meijeren-van Lunteren et al. [41] analysed the oral health-related quality of life (OHRQoL) in migrant children (coming from Morocco, Indonesia, Suriname, and Turkey) resident in the Netherlands. This research highlighted that the prevalence of caries-free dentition was higher among native children than among migrant participants and suggested that the low OHRQoL was mediated by the oral health status and the socioeconomic position.

According to the data obtained in our research, higher mean values of DMFT/dmft Index were recorded in patients coming from Bangladesh, China, Romania, the Philippines, El Salvador, Albania, and Ukraine. Subjects coming from Sri Lanka had the lowest mean DMFT/dmft values. No correlation could be found between the prevalence of dental caries and annual sugar consumption per person; according to the latest research, sugar intakes in China, the Philippines, and Albania were equal to 6.5 kg, 21.1 kg, and 16.5 kg per capita in 2019, respectively, while the annual sugar intake in Sri Lanka was recorded to be equal to 27.6 kg in 2019 [42].

The oral health of children is influenced by the oral hygiene habits of the family members [43], since family represents the primary socializing agent for children, who consequently imitate their parents in their oral hygiene practices [44].

The literature reported that, aside from cultural habits, the oral health status of migrant children could be associated with the family's socioeconomic condition, parental occupation, parents' education level, and marital status [45]. Parental knowledge on oral health and oral-health related behaviour are crucial for the prevention of dental caries in children, and these mediating factors vary based on cultural and ethnic backgrounds [46]. It was also demonstrated that the social context of migrant families from middle- and low-human development countries may be unfavourable for children's oral health [46].

With regard to the CPI, significant statistical differences were found after adjusting data for the educational level of the included participants ( $p$  value  $< 0.01$ ), but the results regarding the DMFT/dmft Index were not significant at  $p$  value  $< 0.01$ . To support our data, a recent study conducted in the USA demonstrated the association between severe periodontitis among Whites and African Americans and a low income and low education level [47].

According to several studies, poor oral health in the migrant population may be associated with different factors: low socioeconomic status, unemployment, low education, ethnic background, language difficulties, and inequalities in access to oral healthcare facilities.

## 5. Limitations of the Study

Although the number of subjects included in the study was significant, the majority of the sample was represented by children and adolescents, and only 12 adults out of 200 patients were enrolled. This could be considered as a limitation of our study, in particular, in the analysis of the periodontal tissue condition.

Our research included the patients who visited the dental department of the Policlinico Tor Vergata (Rome, Italy). These subjects visited the hospital dental centre, since they experienced dental problems, but it is assumed that there are many migrants without dental problems, who consequently do not need dental care. This point could represent a selection bias.

## 6. Conclusions

This observational study recorded poor oral health conditions among 200 migrants, from middle- and low-income countries, resident in Italy. It was demonstrated that the selected sample presented a high prevalence of dental caries, and a higher level of CPI was associated with a lower educational level.

Patient-oriented strategies and programmes are needed to improve the oral conditions of the migrant population.

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**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** Not applicable.

**Conflicts of Interest:** The authors declare no conflict of interest.

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