

Oral health status and risk determinants in adult Syrian refugees in Jordan

Nesreen A. Salim,¹ Wajid A. Maayta,² Yazan Hassona³ and Mohammed Hammad⁴

¹Prosthodontic Department, University of Jordan, School of Dentistry, Jordan University Hospital, Jordan; ²Oral and Maxillofacial Surgery, Jordan University Hospital, Jordan; ³Department of Oral and Maxillofacial Surgery, Oral medicine and Periodontics, University of Jordan, Jordan University Hospital, Jordan; ⁴Conservative Dentistry and Endodontics Department, the University of Jordan, School of Dentistry, Jordan University Hospital, Jordan

Objectives: Lack of data regarding the oral health of Syrian refugees represents a crucial gap in the literature. This study aimed to investigate the oral health status of Syrian refugees and related socio and behavioral factors. **Basic Research Design:** Cross-sectional study from June to September 2019 at Zaatari refugee camp, Jordan. **Methods:** An experienced, calibrated field investigator performed an oral clinical examination of 505 Syrian refugees (18-60 years) using the WHO criteria. DMFT, SiC, oral health indices and socio-demographic variables were recorded. **Results:** A total of 264 males and 241 females were included. The prevalence of caries was 96.0%, of which 76.0% had 4-17 carious lesions. The mean number of decayed, missing and filled teeth was 5.76, 2.55 and 1.88 respectively. The mean DMFT score was 10.19 (100% had DMFT>0), SiC was 17.09, and the mean simplified Oral hygiene index score was 2.18. The most common chief complaint was pain (92.7%). Nearly half of the participants were smokers (45.7%). There was a negative association between level of education and oral health ($P=0.011$). Most participants did not brush their teeth regularly (87.5%). Females had better oral hygiene practices than males ($P=0.015$). **Conclusions:** Syrian refugees had a high prevalence of caries, high unmet dental treatment needs and poor oral hygiene practices. Preventive programs and focused interventions may reduce the burden of disease in this underprivileged population, on funding agencies and host countries as well.

Keywords: education, oral health, SIC, Syrian Refugees, Zaatari camp, OHI-S

Introduction

Since 2011, Syria has endured a catastrophic civil war, leading Syrian refugees to seek shelter in neighboring countries such as Turkey, Lebanon, and Jordan (UNHCR, 2018). Jordan hosts about 656,733 Syrian refugees (the second highest number in the world) in three main refugee camps: Zaatari, Azraq and Emarati (UNHCR, 2018). Zaatari camp is the largest Syrian refugee camp in Jordan and the second largest camp in the world, hosting around 76,989 refugees (UNHCR, 2018).

The vast majority of households in the Zaatari camp are made of caravans, but tents are used to a lesser extent. Refugees have access to adequate quantities of free, safe, chlorinated, non-fluoridated water through improved water systems (UNHCR, 2018). Water and food are provided by the Jordanian government, United Nations, NGOs and humanitarian relief organizations. Rice, bulgur, and lentils are the main food supplies available (UNHCR, 2018; UNHCR, 2019). Unfortunately, the refugees also have access to cariogenic foods, beverages, cigarettes and hubble pipes. Only basic medical and dental treatments are available, provided free of charge by NGOs and volunteering medical and dental practitioners (UNHCR, 2018; UNHCR, 2019).

Oral diseases are among the most common chronic diseases, and are important public health concerns because of their prevalence, impact on quality of life, and expense of treatment (Sheiham, 2005). Dental caries is

responsible for a high burden of oral disease, affecting 60% to 90% of schoolchildren and a significant proportion of the world's adults (WHO, 2013). Additionally, periodontal diseases contribute to the global burden of chronic diseases (Melvin, 2006). Treatment of dental caries and periodontal disease have been classified as the most essential dental needs (Sheiham, 2005).

Refugees are at increased risk of oral and dental diseases because of difficulties in accessing organized dental services in their home or hosting countries and poor nutrition quality before and during resettlement (Davidson *et al.*, 2006; Hoover *et al.*, 2017; Salim *et al.*, 2020a; Salim *et al.*, 2020b). Common oral health problems among refugees include dental caries, periodontal diseases, malocclusion, oro-facial trauma, missing or fractured teeth, and oral cancer (Makan *et al.*, 2019; Salim *et al.*, 2020b; Solyman and Schmidt-Westhausen, 2018). Caries is the second most commonly reported health problem among refugees after the common cold (Barazanichi *et al.*, 2018).

Stress and anxiety associated with migration and settlement in hosting countries might trigger behavioral coping mechanisms, such as smoking (Kassel *et al.*, 2003; Slopen *et al.*, 2013). Smoking causes discoloration of teeth and dental restorations, alteration of taste and smell, and delay or impairment of wound healing after extraction (Reibel, 2003).

According to the World Health Organization (WHO, 2010), the lack of information on refugees' oral health

status constitutes an urgent knowledge gap. Most refugees' oral health studies were conducted in developed countries and only a few have been conducted in developing countries that host the majority of Syrian refugees. Therefore, the aims of this study were to examine the oral health status of adult Syrian refugees in Jordan and to investigate associated risk factors.

Methods

The research protocol was approved by the Ethics Review Committee of the Faculty of Dentistry of the University of Jordan (75/2020/71). The study was conducted in full accordance with the world medical Declaration of Helsinki and conformed to STROBE statement for observational studies. Written informed consent was obtained from all participants, accompanied by a cover letter explaining the aims of the research and that participation was totally voluntary, this was also explained verbally.

This cross-sectional study was conducted between June and September 2019. Clinical oral assessments for 505 Syrian refugees attending dental clinics in Zaatari camp were performed by a trained field investigator. Included participants were residents of Zaatari camp, seeking dental treatment, aged more than 18 years, and registered as refugees in Jordan.

The dental team comprised a leading senior dentist (prosthodontist) and 4 junior dentists in vocational training. The prosthodontist carried out all oral examinations, while the juniors collected personal and demographic data in interviews (i.e. age, gender, smoking behaviour, educational level, years in the camp). Examination was carried out according to the standardized diagnostic criteria outlined by the WHO (2013). Patients were examined in a dental clinic, using a disposable oral mirror and a WHO periodontal probe. Clinical variables were documented on a dental screening form based on the WHO (2013) Oral Health Assessment Form.

The following formula for sample size calculation for cross sectional studies was used (Pourhoseingholi *et al.*, 2013):

$$n = (Z^2 P (1-P)) / d^2$$

where n represented the required sample size, $Z = 1.96$ at a level of confidence of 0.05, P represented the expected proportion of the population with caries, which was 50% and d was the required level of precision (5%). A minimum sample of 384 participants was required.

The examiner was calibrated for intra-rater reliability by examining a group of 30 patients (not part of the study sample) on two different occasions. Both examinations were then compared showing an intra-class Cohen's kappa correlation coefficient of 0.95.

Clinical examination included the following:

1. Decayed, missing, and filled permanent teeth (DMFT). The significant caries index (SiC) was obtained by calculating the mean DMFT score of the third of the population with the highest DMFT scores (WHO, 2001).
2. Oral hygiene status was examined using the simplified oral hygiene index (OHI-S) on the labial surfaces of 11, 26, 16, 31 and the lingual surfaces of 36 and 46 (Greene and Vermillion, 1964).

Data were analysed using SPSS statistical package software version 23.0 (Armonk, NY: IBM Corp., 2015). A replica template of the original data was made in Microsoft Excel® to perform SiC calculations. SiC scores were calculated for different independent samples using Microsoft Excel® by obtaining the mean of the upper third of the sample with the highest DMFT scores. All variables were normally distributed, and parametric tests were used for analysis.

Correlation between groups was examined using Pearson's r. In addition, detection of differences in numeric variables was assessed using the independent samples t-test for comparing variables containing 2 independent subgroups, and ANOVA for comparing variables with 3 or more independent subgroups. A P value of <0.05 was used to determine statistical significance.

Results

The sample comprised 505 participants, of whom 52.3% were male and 47.7% female. Ages ranged between 18 to 60 years, and participants had been in the camp for at least 7-8 years. Nearly half of participants (45.7%) were smokers, and most (89.7%) had only school level education. Almost half, (40.2%) did not brush their teeth at all, 47.3% brushed on an occasional basis and only 10.5 % brushed their teeth every day. (Table 1)

Table 1. Demography, behaviours and oral health of 505 refugees in Zaatari Camp

	Total	Male %	Female %
Total sample	505	52.3	47.7
Age group (Years)			
18-36	261	50.6	49.4
37-60	244	54.1	45.9
Smoking			
Yes	231	64.1	35.9
No	274	42.3	57.7
Frequency of tooth brushing			
None	203	54.2	45.8
Occasional	239	55.6	44.4
Once	53	34.0	66.0
Twice	10	30.0	70.0
Education			
None	29	55.2	44.8
School	453	51.0	49.0
College	23	73.9	26.1

Pain was the most common chief complaint (92.7%, 46.6% females and 53.4% males), followed by unsatisfactory dental appearance (5%) and requesting a regular dental checkup (2.4%) (equally divided between genders). Two thirds of patients (68.0%) seeking esthetic treatment were females and most (82.4%) aged between 18 and 36 years. In contrast, only 32% of males sought treatment for aesthetic reasons.

The prevalence of caries was 96.0%, of which 76.0% had 4-17 carious lesions (51.0% males, 49.0% females). More than half of participants (53.0%) had no fillings and 54.3% had missing teeth. The number of missing teeth per individual ranged between 1-28 teeth and mean number of missing teeth was 2.55 per participant.

The mean DMFT score was 10.19. Mean D, M and F were 5.76, 2.55 and 1.88 respectively. All participants had DMFT>0. The SiC score of the sample was 17.09. (Table 2)

Both DMFT and SiC scores were higher in males than females, however, the difference was only significant for the DMFT scores ($P=0.037$, *t* test). (Table 2)

Participants aged more than 37 years had higher mean scores for both DMFT and SiC. The missing and filled components largely accounted for this difference as decayed teeth was the largest component of DMFT in patients aged 18 to 36 years. (Table 2)

Occasional brushers and individuals who did not brush their teeth had higher DMFT scores ($P<0.05$, ANOVA). The difference was greater for mean SiC scores ($P<0.01$, ANOVA). (Table 2)

DMFT and SiC scores were inversely related to greater educational levels ($P<0.05$, Pearson's *r*), confirmed by a negative correlation between level of education, DMFT and SiC scores ($P<0.05$). (Table 2)

Non-smokers had lower DMFT and SiC scores. However, only the difference in DMFT scores reached significance ($P=0.017$, *t* test) (Table 2).

The mean simplified (OHI-S) score was 2.19, of which 1.18 comprised the debris index (DI) and 1.01 the calculus index (CI) (Tables 2 and 3). Oral hygiene scores were higher in males than in females ($P<0.01$, *t* test, for OHI-S, DI and CI). OHI-S was also correlated with DMFT ($r=0.183$, $P<0.001$, Pearson's *r*).

Individuals who brushed occasionally had greater OHI-S scores than those who brushed once per day ($P<0.001$, ANOVA). Older participants had lower oral hygiene indices ($P=0.009$, *t* test) (Table 2). Smokers had higher OHI-S ($P<0.001$, *t* test) (Table 2).

Participants who complained of pain had higher OHI-S scores but lower DMFT (as they had fewer missing teeth) than participants who sought treatment for aesthetic concerns ($P=0.01$, ANOVA). (Table 2)

Table 2. Dental status and oral hygiene by gender, age group, tooth brushing frequency, education, and chief complaint

Score	D Mean	M Mean	F Mean	DMFT Mean	SiC Mean	OHI		
						Debris Index (Mean DI)	Calculus Index (Mean CI)	Simplified oral hygiene index (Mean OHI-S)
Total sample	5.76	2.55	1.88	10.19	17.09	1.19	1.00	2.18
Gender								
Male	5.9	2.7	2.13	10.73	17.92	1.28	1.22	2.48
Female	5.61	2.37	1.61	9.59	16.1	1.08	0.79	1.87
Age (Years)								
18-36	6.33	1.98	1.27	9.58	15.37	1.24	1.12	2.36
≥37	5.16	3.16	2.53	10.85	18.78	1.13	0.87	1.99
Tooth brushing								
None	5.89	3.66	1.48	11.03*	19.5*	1.18	0.96	2.14
Occasional	5.65	1.98	2.13	9.77	15.64	1.25	1.15	2.39
Once	5.92	0.94	2.15	9.02	14.44	0.99	0.55	1.54
Twice	5.00	2.10	2.40	9.50	13.33	0.70	0.60	1.30
Education								
None	7.45	3	2.52	12.97*	21.4*	1.33	0.91	2.16
School	5.69	2.59	1.81	10.08	16.838	1.17	1.00	2.16
College	5.17	1.17	2.48	8.83	14.00	1.41	1.17	2.57
Chief complaint								
Pain	5.76	2.20	1.93	9.90*	16.43*	1.20	1.03	2.22
Esthetics	5.52	9.24	0.48	15.24*	26.50*	0.85	0.53	1.38
Checkup	6.25	2.00	2.92	11.17	18.50	1.38	0.83	2.22
Smoking								
No	5.70	2.26	1.63	9.59	16.49	1.12	0.78	1.91
Yes	5.84	2.88	2.18	10.9	17.65	1.26	1.25	2.50

* = $P<0.05$ (ANOVA).

Table 3. Dental status and oral hygiene by gender, age and brushing frequency

	Scores	Age group (Years)		Brushing frequency			
		18-36	≥37	0	1	2	3
Males	D	6.52	5.29	6.16	5.71	5.89	5.00
	M	1.49	3.92	3.99	1.94	0.83	0.67
	F	1.43	2.82	1.97	2.13	2.56	5.00
	DMFT	9.44	12.02	12.13	9.77	9.28	10.67
	SiC	14.77	20.41	20.84	15.70	14.83	14
	DI	1.33	1.23	1.26	1.35	0.94	1.33
	CI	1.34	1.09	1.02	1.44	0.67	1.67
	OHI-S	2.66	2.31	2.26	2.77	1.61	3.00
Females	D	6.15	5.00	5.57	5.58	5.94	5.00
	M	2.47	2.26	3.26	2.03	1.00	2.71
	F	1.10	2.20	0.90	2.14	1.94	1.29
	DMFT	9.72	9.46	9.73	9.75	8.89	9.00
	SiC	15.98	16.24	17.39	15.69	14.08	13
	DI	1.13	1.03	1.10	1.14	1.00	0.43
	CI	0.94	0.63	0.94	0.80	0.51	0.14
	OHI-S	2.05	1.65	2.01	1.94	1.51	0.57

Discussion

Although the international community identifies oral diseases among health priorities for refugees and asylum seekers (WHO, 2010), the scientific literature lacks information regarding oral health status of adult Syrian refugees. To our knowledge, this is the first study to investigate the oral health status of adults' Syrian refugees in a developing country. The oral health of our participants compares poorly with that of the general population and other refugee populations (Davidson *et al.*, 2006; Solyman and Schmidt-Westhausen, 2018), with a very high level of unmet oral health needs (96%). OHI-S scores were much higher than that previously reported by Hoover *et al.* (2017).

WHO (2013) regards DMFT values above 6.5 as very high. The mean DMFT in our sample was around 10.19, mostly comprised of decayed teeth (5.76), followed by missing teeth, with few filled teeth. These findings are consistent with or higher than other reported studies (Davidson *et al.*, 2006; Solyman and Schmidt-Westhausen, 2018). Caries and oral hygiene scores at earlier ages are higher and DMFT scores are lower than their older aged counterparts, again in line with Syrian refugees in Germany (Solyman and Schmidt-Westhausen, 2018).

The DMFT index has traditionally been used to measure the prevalence of caries, but it provides an incomplete view of disease for the most affected individuals. The SiC index describes the severity of caries in these individuals (Marthaler *et al.*, 2005). The mean SiC score was 17.09, which is higher than reported in other studies (Marthaler *et al.*, 2005; Riatto *et al.*, 2018).

Despite the availability of dental services, most people sought treatment only when experiencing acute symptoms such as pain. Seeking treatment late in the course of

disease may be attributed to several psychosocial factors such as dental anxiety, financial cost, attitude towards treatment, perception of need and poorly accessible care (Barazanchi *et al.*, 2018; Davidson *et al.*, 2006; Salim *et al.*, 2020b).

In a previous study of former refugees from Syria, half of the participants reported that they had lost one or more of their teeth because they could not afford treatment, despite being told the teeth could be saved (Barazanchi *et al.*, 2018). Many missing teeth and fewer filled teeth were observed in our participants, which was in line with other reported studies (Barazanchi *et al.*, 2018; Davidson *et al.*, 2006). The number of filled teeth may reflect access to general dental services (Davidson *et al.*, 2006). Additionally, this pattern of seeking dental care at late stages of diseases or only to relieve pain or infection was seen in children indicating adult oral health behaviours may relate to those in children (Salim *et al.*, 2020a).

Experience of dental caries was associated with refugees' behaviours, including poor dental hygiene methods (87.5% did not brush or brushed occasionally), smoking (45.7 % were smokers), and level of education (almost 90% had primary school education). Unhealthy eating habits, lack of dental services and prevention programs are also contributing factors (Barazanchi *et al.*, 2018). Moreover, the high number of untreated decayed teeth supports the assertion that refugees have poor dental care, where dental health is not a priority and services are sought only when there is a serious problem (Barazanchi *et al.*, 2018; Davidson *et al.*, 2006). In an earlier study, only 0.77% of children attended for a dental checkup and extraction was the most provided treatment in Zaatari camp (Salim *et al.*, 2020a; Salim *et al.*, 2020b). Of note,

community-based water or salt fluoridation programs have not been implemented in Syria to date, which may partly be the higher caries rate of this population (Joury, 2019).

Educated individuals had less caries than less educated participants. Smoking prevalence decreased with increasing education. As reported in other studies, higher education levels provided a better understanding of oral and general health were associated with a lower prevalence of smoking (Jiang *et al.*, 2013).

More Syrian refugees appear to smoke than non-refugees (Abdulrahim and Jawad, 2018). This may be explained by many factors such as the exposure to traumatic events, hardships associated with travel, poor living conditions and limited life opportunities (Miller and Rasmussen, 2010). Refugees often arrive at their host countries with poor health, limited finances, linguistic barriers, and greatly-reduced family and community support (Davidson *et al.*, 2006; Hoover *et al.*, 2017). Bearing in mind that usually the underprivileged in any country are more likely to end up as refugees in refugee camps in conflict situations, they are severely disadvantaged when entering a new cultural and political system, and are vulnerable to multiple health risks (Hoover *et al.*, 2017). Such stress factors may trigger or exacerbate mental health conditions, thereby increasing the risk of tobacco use to alleviate stress (Kassel *et al.*, 2003). In addition, our data associated smoking, dental caries and periodontal health, where smokers had greater DMFT and OHI-S scores. These results were in agreement with previous studies, where smoking has been reported as a risk factor for periodontal health (Abdulrahim and Jawad, 2018; Reibel, 2003).

Males showed higher DMFT and oral hygiene scores than females. This could be attributed to the better oral health practices in females than males concerning brushing frequency and men opting to have teeth extracted more readily than women. These findings are consistent with a previous study, where females had fewer missing teeth than males (Solyman and Schmidt-Westhausen, 2018). In addition, more men were smokers, which is a risk factor for caries and periodontal health. This finding is in agreement with the results of a previous study (Abdulrahim and Jawad, 2018).

The main limitation of the present study was the lack of radiographic diagnostic aids. This may have resulted in underestimating the prevalence of caries, especially when attempting to detect proximal caries. In addition, a cross-sectional study allowed only assessment at one point in time, which may have resulted in an over- or under-estimation of the actual situation. Moreover, our target group was patients seeking dental treatment, thus, it is not representative of the broader camp population. Despite these limitations, this study is the first to report on the oral health status of adult Syrian refugees and their oral health needs and highlighting some of the challenges that are faced by this underprivileged population. Moreover, to provide a preliminary reference for dental practitioners, researchers and policy makers to develop and implement community-based services and preventive programs for this population. Nonetheless, further population-based studies are warranted in the future.

Conclusion

Oral health status for refugees remains a major concern and dental treatment needs remain unmet in this underprivileged population. It is important to employ community-based refugee oral health promotion programs, implement targeted preventive health services, and provide guidance on how to access oral healthcare services in refugees' host countries in a timely manner.

References

- Abdulrahim, S. and Jawad, M. (2018): Socioeconomic differences in smoking in Jordan, Lebanon, Syria, and Palestine: A cross-sectional analysis of national surveys. *PLoS One* **13**, e0189829.
- Barazanchi, A., Nabhani, A., Chen, A., Smith, M. and Broadbent, J. (2018): Oral Health Care Needs Among Former Refugees of the War in Syria. *New Zealand Dental Journal* **114**, 117-123.
- Davidson, N., Skull, S., Calache, H., Murray, S.S. and Chalmers, J. (2006): Holes a plenty: oral health status a major issue for newly arrived refugees in Australia. *Australian Dental Journal* **51**, 306-311.
- Greene, J.C. and Vermillion, J.R. (1964): The Simplified Oral Hygiene Index. *Journal of the American Dental Association* **68**, 7-13.
- Hoover, J., Vatanparast, H. and Uswak, G. (2017): Risk Determinants of Dental Caries and Oral Hygiene Status in 3-15 Year-Old Recent Immigrant and Refugee Children in Saskatchewan, Canada: A Pilot Study. *Journal of Immigrant and Minority Health* **19**, 1315-1321.
- Jiang, Y., Okoro, C.A., Oh, J. and Fuller, D.L. (2013): Sociodemographic and health-related risk factors associated with tooth loss among adults in Rhode Island. *Preventing Chronic Disease* **10**, E45.
- Joury, E. (2019): Syria Profile of the Epidemiology and Management of Early Childhood Caries Before and During the Time of Crisis. *Frontiers in Public Health* **7**, 271.
- Kassel, J.D., Stroud, L.R. and Paronis, C.A. (2003): Smoking, stress, and negative affect: correlation, causation, and context across stages of smoking. *Psychological Bulletin* **129**, 270-304.
- Makan, R., Gara, M., Awwad, M.A. and Hassona, Y. (2019): The oral health status of Syrian refugee children in Jordan: An exploratory study. *Special Care in Dentistry* **39**, 306-309.
- Marthaler, T., Menghini, G. and Steiner, M. (2005): Use of the Significant Caries Index in quantifying the changes in caries in Switzerland from 1964 to 2000. *Community Dentistry Oral Epidemiology* **33**, 159-166.
- Melvin, C.S. (2006): A collaborative community-based oral care program for school-age children. *Clinical Nurse Specialist* **20**, 18-22.
- Miller, K.E. and Rasmussen, A. (2010): War exposure, daily stressors, and mental health in conflict and post-conflict settings: bridging the divide between trauma-focused and psychosocial frameworks. *Social Science & Medicine* **70**, 7-16.
- Pourhoseingholi, M. A, Vahedi, M. and Rahimzadeh, M. (2013): Sample size calculation in medical studies. *Gastroenterol Hepatol Bed Bench* **6**, 14-17.
- Reibel, J. (2003): Tobacco and oral diseases. Update on the evidence, with recommendations. *Medical Principles and Practice* **12 Suppl 1**, 22-32.
- Riatio, S.G., Montero, J., Perez, D.R., Castano-Seiquer, A. and Dib, A. (2018): Oral Health Status of Syrian Children in the Refugee Center of Melilla, Spain. *International Journal of Dentistry* **2018**, 2637508.

- Salim, N.A., ElSa'aideh, B.B., Maayta, W. and Hassona, Y. (2020a): Dental services provided to Syrian refugee children in Jordan, a retrospective study. *Special Care in Dentistry*, 1-7.
- Salim, N.A., Maayta, W. and ElSa'aideh, B.B. (2020b): The oral health of refugees: Issues and challenges arising from a case series analysis. *Community Dentistry Oral Epidemiology* **48**, 195-200.
- Sheiham, A. (2005): Oral health, general health and quality of life. *Bulletin of the World Health Organization* **83**, 644.
- Slopen, N., Kontos, E.Z., Ryff, C.D., Ayanian, J.Z., Albert, M.A. and Williams, D.R. (2013): Psychosocial stress and cigarette smoking persistence, cessation, and relapse over 9-10 years: a prospective study of middle-aged adults in the United States. *Cancer Causes Control* **24**, 1849-1863.
- Solyman, M. and Schmidt-Westhausen, A.M. (2018): Oral health status among newly arrived refugees in Germany: a cross-sectional study. *BMC Oral Health* **18**, 132.
- United Nations High Commissioner for Refugees (UNHCR). UNHCR Jordan Factsheet [Internet]; 2019, December. Available from: <https://data2.unhcr.org/en/documents/download/64690>. Accessed 23 August 2020.
- World Health Organization, WHO. (2010). The Health of Migrants: The Way Forward. Report of a Global Consultation, Madrid, Spain, 3-5 March 2010: Geneva, Switzerland; Available online: http://www.who.int/hac/events/consultation_report_health_migrants_colour_web.pdf. Accessed on 15 August 2019.
- World Health Organization, WHO. (2013). Oral Health Surveys: Basic Methods, World Health Organization, Geneva, Switzerland, 5th edition.
- World Health Organization, WHO. (2001). WHO Collaborating Centre. Faculty of Odontology, University of Malmö, Sweden. PDF Vers. 1.0; 2001-03-6. <http://www.whocollab.od.mah.se/exp/siccalculation.xls>.