The oral health situation and treatment need of schoolchildren Afghanistan: a cross-sectional study



M. Lambert[1*], M. Rezaie[1*], M. Jeannin[1], N. Sina[2], Z. Mahyar[2], L. Marks[1,3,4]

[1]*ELOHA (Equal Lifelong Oral Health for All) research group, Dental Public Health, Oral Health Sciences, Ghent University, Belgium*
[2]*University of Herat, Faculty of Stomatology, Herat, Afghanistan*
[3]*Faculty of Medicine & Health Sciences, University of Antwerp, Belgium*
[4]*Department of Cranio-Maxillofacial Surgery-Special Care in Dentistry, Antwerp University Hospital, Antwerp, Belgium.*
**These authors share the co-autorship of the manuscript*

DOI 10.23804/ejpd.2024.1902

Email: martijn.lambert@ugent.be

Abstract

Aim The present study explores the treatment need for dental caries in schoolchildren in Herat, Afghanistan.

Study design Cross-sectional observational study.

Methods A convenience sample of 13 schools were selected for the study. All schools were located in the urban areas near Herat and were selected through allocation by the Ministry of Health, which also approved the study protocol. In the schools, classes were allocated by the principal of the school. All the children in the allocated classes were included in the survey. Data collection was performed in the school setting by trained Afghan dentist examiners. To measure caries experience, DMFT/dmft scores were used, counting the number of decayed (measured at both white spot (D≥1) and cavitation level (D≥3), according to WHO criteria), missing and filled teeth. **Statistics** Exploratory data analysis was performed using IBM SPSS V25.0 (IBM Corp., NY, USA). Statistical comparison between boys and girls was done by means of an independent samples t-test.

Results The study sample consisted of 2,089 schoolchildren between 5 and 18 years old, selected from 13 schools. The mean age was 10.9. The overall mean DMFT score (D ≥ 1, measured at white spot level) was 4.39 (95%CI: [4.26-4.52]). A large majority (68.2%) of the children had untreated cavitated carious lesions ($D_{\geq 3}$), with an overall mean D_3-score of 2.07 (95%CI: [1.99-2.19]). Under the age of twelve, girls had significantly more white spot lesions than boys, whereas caries levels from the age of twelve were higher in boys, both at white spot and cavitation level. The general care level was low. Only 1.8% of the children had one or more restored lesions.

Conclusions Dental caries is a considerable oral health problem in the study population. The present sample has a high proportion of untreated carious lesions and a very low level of restorative care. Moreover, significant differences were shown in relation to gender and age groups. The present survey results confirm the need for professional operative and preventive oral health care in this region.

KEYWORDS dental caries (MeSH), Afghanistan (MeSH), Dental care for children (MeSH), global south, dental workforce.

Introduction

Afghanistan has been in conflict for over 40 years. From 1933 until 1978, there was a period of relative peace and prosperity. However, since 1978, there have been continuous wars, armed conflicts, and political turnovers, impeding the establishment and maintenance of a sustainable healthcare system. The oral health of Afghan children cannot be isolated from their broader living conditions. In the wake of widespread destruction and a fragmented recovery, the instability caused Afghanistan to be amongst the 20 least developed countries across the world in 2020, ranked 169th out of 189 countries according to the Human Development Index [United Nations, 2018]. The population in 2015 was approximately 32 million, after a population increase of more than 60% in the past 25 years. Life expectancy at birth doubled between 1960 and 2019 (from 32.5 years to 64.8 years) but is still under the global average of 72.7 years old. In 2010, the population over 60 years of age, even after having increased by almost 200% since 1990, represented less than 4% of the total population. Over the following 30 years, a population growth of 37% is predicted by the World Health Organization [World Health Organization, 2016]. In 2016, 75% of the Afghan population lived in rural settings and depended on agriculture cultivation. Large differences in access to health care exist between rural and urban areas [World Health Organization, 2016]. It was estimated that in 2020, 41% of the Afghan population would have a daily income below the World Bank international extreme poverty line of $1.90 per day [Crespo Cuaresma et al., 2018]. The prevalence of malnutrition in children (under five years old) is alarming: 32.9% underweight, 8.6% wasting (= 'acute undernutrition'), 3.5% severe wasting, 59.3% stunting (= 'chronic undernutrition'), and 4.6% overweight [World Health Organization, 2016]. Due to ongoing civil strife, it is questionable whether significant improvements in this respect can be expected in the near future. To create a sustainable healthy society, the Ottawa Charter for Health Promotion gave the following fundamental prerequisites: peace, shelter, education, food, income, a stable ecosystem, sustainable resources, social justice, and equity [World Health Organization, 1986]. Regarding Afghanistan, almost none of these prerequisites are met. Social inequalities harm vulnerable residents, primarily women [World Health Organization, 2016]. The Gender Development Index measures health, knowledge, and living standards disparities between women and men. Afghanistan was ranked 164th out of 166 countries [United Nations, n.d.]. In 2012, adult female literacy was 17.6% (adult male 31.7%, overall 27%), and female participation in the workforce was 15.7% [World Health Organization, 2016]. Regarding health care services, the total Afghan expenditure on health per capita at the international exchange rate was US$ 55 in 2013. The total expenditure on health was 8.1% of the gross domestic product. A high share of out-of-pocket spending (78.8% in 2013) characterises the health financing system, with concerns about the sustainability of this external support requirement. The hospital density in 2013 was 0.37 per 100 000 residents, 0.1 for provincial hospitals, and 0.09 for specialised hospitals [World Health Organization, 2016]. The burden of non-communicable diseases (also known as 'chronic

diseases') is rising. This increase is due to a higher prevalence of risk factors caused by increased life expectancy and socioeconomic and demographic transition. When oral health is considered, the dentist density is extremely low, with 0.7 dentists per 10,000 inhabitants [World Health Organization, 2022]. There is an urgent need for more oral health workers, particularly in rural and remote areas, although little is known about the specific oral health conditions of the Afghan population. A literature review identified only one eligible study, reporting a mean dmft of 4.88 (SD 3.11) in 6/7-year-olds, a dmft+DMFT of 2.57 (SD 2.16) in 12-year-olds, and 4.04 (SD 3.03) in 15-year-olds [Schwendicke et al., 2015]. Although data on oral health are incredibly scarce, some information can be provided by focusing on the causal factors of oral diseases. Evidence has demonstrated that sugar consumption is a critical factor in caries development [Moynihan, 2005; Paglia et al., 2016]. Sugar consumption per capita in Afghanistan is estimated at 46.8 g per day, which is almost half of the available sugar per person in the US (90.7) and the UK (81.7) [World Health Organization, 2022]. Reliable health information is essential for policy development, rational resource allocation, monitoring, and evaluation. Since there is almost no data regarding oral health in Afghanistan, the present study aims to collect, analyse and report oral health data collected from schoolchildren in Herat, Afghanistan.

Materials and methods

Sample selection

Because of the political instability throughout the country, a randomised sample selection at both school and individual level was impossible to perform. Accordingly, a convenience sample of 13 schools was selected. All schools were located in the urban areas near Herat and were selected through allocation by the Ministry of Health, which gave specific permission to undertake the study, as no independent research ethics committee exists in Afghanistan. In the schools, classes were allocated by the principal. All children in the allocated classes were included in the survey.

Data collection

Data were collected in 2017 in the school setting by trained and standardised dental clinicians. First, training and standardisation of the examiners were achieved through a theoretical exercise with clinical photos. Secondly, a supervised hands-on session on a small pilot sample of children was carried out. To measure caries experience, DMFT/dmft scores were used as one of the outcome variables, counting the number of decayed, missing, and restored teeth. To determine the severity of carious lesions, the D-component was subdivided into an initial stage of caries (white spot lesion), being reversible by adequate self-care (D1 level according to WHO criteria), and an irreversible cavitation stage requiring professional dental care (D3 level). The level of provided care was determined using the Restorative Index (RI=(FT/(D≥3+FT)) *100), ranging from 0 to 100%. After the oral health examination, all children received a bag containing basic information on oral health, a toothbrush, and fluoridated toothpaste. Children with urgent dental needs were also informed about the possibility of free dental care in the local university hospital. Participants also received a referral letter with all the necessary information. Exploratory data analysis was performed using IBM SPSS V25.0 (IBM Corp., NY, USA). Statistical comparison was made between boys and girls, using an independent samples T-test. In addition, a parametrical test was used based on the Central Limit Theorem.

Results

The study sample comprised 2,089 schoolchildren between 5 and 18 years of age, selected from 13 schools. The number of participants per school ranged from 36 to 336. In the total sample, there were 1092 girls (52.3%) and 997 boys (47.7%). The mean age of the children was 10.9 yrs (SD 1.8). Regarding oral health outcomes, the weighted overall mean D1MFT score (measured at white spot level) was 4.42 (95%CI: [3.19-5.65]) for the six-year-olds and 3.47 (95%CI: [3.21-3.74]) for the 12-year-olds. The D1MFT score in both age groups was almost exclusively determined by the D-component, with a mean value of 4.21 (95%CI: [3.01-5.41]) and 3.45 (95%CI: [3.19-3.72], respectively. The distribution of the mean D1 and D3 components for each age group is presented in table 1. The caries levels show a fluctuating pattern, with a peak at the age of 8 and 17 years. Regarding the severity of carious lesions, the weighted overall mean for the D1 component (reversible stage) was 2.23 and for D3 (irreversible cavitation stage) 2.07. The prevalence of children with D>1 at cavitation level was 68.2%, as an indicator of unmet professional treatment needs. On the other hand, only 1.8% of all children had one or more dental fillings, and 3.8% had missing teeth because of dental caries. Concerning differences between subgroups for reversible and irreversible caries lesions, gender differences could be demonstrated in different age groups (Table 2). Under the age of 12, girls had significantly higher white spot levels than boys, although caries levels at cavitation level were not statistically different. After the age of twelve, boys had more caries lesions than girls at both white spot and cavitation level.

Discussion

High dental caries experience was found in the present sample of schoolchildren in Herat. Nearly 70% had untreated carious lesions, with an average of two affected teeth with cavitated lesions requiring professional dental care (D3). The overall care level was low since less than 2% of the children had fillings. In the latest study on the Global Estimates of Burden of Oral Conditions [Bernabe et al., 2020], the global age-standardised prevalence of untreated tooth decay in deciduous and permanent teeth was 7.8% and 29.4%, respectively. When only low-income countries were considered, untreated caries had a prevalence of 7.5% in deciduous teeth and 33.4% in permanent teeth. It is crystal clear that the present Afghan sample reached much higher disease levels, even within low-income countries. Regarding previous research on caries experience in Afghanistan, only one previous publication can be cited [Schwendicke et al., 2015], whose analyses on cross-sectional data from 2013 determined a mean dmft score of 4.88 in 6/7-year-old Afghan schoolchildren, DMFT = 2.57 in 12-year-olds and DMFT = 4.04 in 15-year-olds. The study by Schwendicke et al. [2015] is comparable to the present research since both explored the oral health of schoolchildren in the province of Herat. To illustrate the evolution over time, the DMFT of the 12-year-old children can be used as a reliable indicator, both in terms of setting (schools in Herat) and sample size (n=300 vs n=375). Compared to the 12-year-olds mean DMFT score of 2.57 (SD 2.16) in 2013, the DMFT of the present sample (2017) was higher at 3.71 (SD 2.77). Although a meta-analysis is required to draw any conclusion, a putative increase in caries prevalence among 12-year-old Herat schoolchildren has occurred. The worldwide improvement in Human Development caused a rise in the burden of non-communicable diseases in low-income developing countries such as Afghanistan due to increased life expectancy and a

Age	N	D1	D3	M	F	D1MFT
5	19	1.42 [0.47-2.38]	1.26 [0.51-2.01]	0.00 [0.00-0.00]	0.00 [0.00-0.00]	2.68 [1.45-3.92]
6	19	0.63 [0.20-1.06]	3.58 [2.32-4.84]	0.21 [0.01-0.41]	0.00 [0.00-0.00]	4.42 [3.19-5.65]
7	32	1.72 [1.03-2.41]	3.31 [2.32-4.30]	0.09 [0.00-0.20]	0.00 [0.00-0.00]	5.13 [3.82-6.43]
8	75	1.81 [1.26-2.37]	3.68 [3.02-4.34]	0.19 [0.04-0.33]	0.05 [0.00-0.12]	5.73 [4.85-6.62]
9	182	2.15 [1.85-2.46]	3.03 [2.69-3.38]	0.12 [0.06-0.18]	0.03 [0.00-0.07]	5.34 [4.90-5.78]
10	529	2.43 [2.24-2.62]	2.49 [2.30-2.67]	0.05 [0.02-0.07]	0.08 [0.02-0.14]	5.04 [4.77-5.31]
11	574	2.28 [2.10-2.46]	1.81 [1.65-1.98]	0.03 [0.02-0.05]	0.01 [0.00-0.02]	4.13 [3.90-4.37]
12	375	2.09 [1.86-2.32]	1.36 [1.19-1.54]	0.01 [0.00-0.02]	0.01 [0.00-0.03]	3.47 [3.21-3.74]
13	164	2.42 [2.06-2.78]	1.16 [0.91-1.41]	0.02 [0.00-0.05]	0.02 [0.00-0.04]	3.62 [3.20-4.04]
14	57	2.12 [1.44-2.81]	1.54 [0.95-2.14]	0.00 [0.00-0.00]	0.02 [0.00-0.05]	3.68 [2.69-4.68]
15	30	2.73 [1.69-3.78]	2.00 [1.15-2.85]	0.00 [0.00-0.00]	0.00 [0.00-0.00]	4.73 [3.44-6.02]
16	8	2.38 [0.00-4.86]	1.75 [0.35-3.15]	0.63 [0.00-1.62]	0.25 [0.00-0.64]	5.00 [1.75-8.25]
17	14	1.71 [0.51-2.92]	3.14 [1.64-4.64]	0.29 [0.00-0.76]	0.57 [0.00-1.35]	5.71 [4.20-7.22]
18	11	1.36 [0.27-2.46]	3.27 [0.89-5.66]	0.73 [0.00-2.35]	0.00 [0.00-0.00]	5.36 [3.03-7.70]
All ages	2089	2.23 [2.13-2.32]	2.07 [1.98-2.16]	0.05 [0.04-0.07]	0.04 [0.02-0.05]	4.39 [4.26-4.52]

TABLE 1 Distribution of the mean D_1, D3, M, and F scores with their 95% confidence interval, for each age group.

<12 y old	Boys (n=655)	Girls (n=775)	Mean diff. [95%CI]	p
D1	2.07	2.39	-0.32 [-0.55;-0.09]	0.006
D3	2.45	2.29	0.16 [-0.07-0.40]	0.17
≥12 y old	Boys (n=342)	Girls (n=317)	Mean diff. [95%CI]	p
D1	2.39	1.97	0.41 [0.06-0.77]	0.02
D3	1.62	1.23	0.39 [0.10-0.67]	0.008

TABLE 2 Differences in the prevalence of dental caries between boys and girls under and above the age of 12 years old, at both white spot level (D1) and cavitation level (D3).

socioeconomic and demographic transition. As previously mentioned, this has increased exposure to risk factors for dental caries, such as higher sugar consumption. At the same time, there is neither adequate infrastructure nor health systems and a lack of an oral health workforce to treat oral diseases. As seen in Table 1, the 'wavy' pattern of the DMFT scores when plotted by age in the present study is unlikely to be attributable to coincidence/bias or a cohort effect (people of different ages having experienced different historical conditions) due to the large sample size of the present study and inclusion of all children in every class across multiple different schools. Instead, the pattern may be explained by viewing the global patterns in the prevalence and incidence of dental caries [Bernabe et al., 2020]. The peak prevalence and incidence of caries experience in primary teeth is at age 5 and in permanent teeth between the ages of 20 to 24. The gender differences which were found in the present survey are consistent with the systemic analysis of the Global Burden of Disease study [Qin et al., 2022]. They found a higher incidence of untreated caries in males from childhood till the age of 30. In older adults, women were more vulnerable to dental caries. Although the higher incidence in female adults can be declared by biological and hormonal differences, it is still unclear why boys at a younger age are more susceptible. Differences in oral health behaviour might be a factor, although this needs further investigation. There might also be cultural differences since Wang et al. [2020] found a higher likelihood of having caries for girls in a sample of 1055 children between 13- and 14-year-olds in Southern China. Typically, DMFT scores can only rise throughout life since a carious tooth can become a filled tooth or a missing one or remain with a carious lesion. However, the transition from primary to permanent dentition can declare a visible drop in the DMFT score between the ages of 9 to 14. Dental caries progresses faster in primary teeth because the enamel is less mineralized and thinner, possibly explaining the higher peak in prevalence and incidence in primary teeth compared to permanent teeth. Another explanation may lie in children's dependence on their parents for dietary intake and preventive care. Reducing childhood caries experience in Afghanistan will be achieved by changing its key determinants. An implementation manual was presented by the WHO to address early childhood caries in developing countries, emphasising primary health care, addressing the broader determinants of health and focusing on the comprehensive and interrelated aspects of physical, mental and social health and well-being [WHO, 2019]. Such an implementation requires "a whole-of-society approach to health and wellbeing centred on the needs and preferences of individuals, families, and communities." This implies the provision of comprehensive patient-centred care throughout the lifespan, rather than treating only a set of specific diseases. Furthermore, access to care should be enhanced, as it is a fundamental human right of the child. People should receive comprehensive care as close as feasible to their everyday environment. Due to the shortage of oral health workforce, it is unrealistic to use care models relying solely on dental clinicians, although professional counselling is certainly needed to access correct information and preventive advice [Ayala Aguirre et al., 2022]. Therefore, a multi-disciplinary team is needed,

including nurses, midwives, and community health workers. Oral health promotion should be integrated into existing primary care, and preferably target both children and their parents and caregivers, since caries, especially at younger age, is determined by various family factors [Colombo et al., 2019]. These interventions might be effective and achievable in the community and can be carried out by non-oral health professionals. Of course, suggestions for evidence-based interventions to improve public health are in vain when local and national policymakers do not facilitate them. In the light of the recent political turnover in Afghanistan, it is unclear whether a disruptive change in general and oral health care can be expected. Apart from a possible 'brain drain' due to the emigration of healthcare workers, changes in school systems and gender equality might impact the number of healthcare workers and the individual health outcomes. In accordance with the study by Schwendicke et al. [2015], gender was, until now, not withheld as an oral health determinant in Afghan schoolchildren. Only future research can provide answers on the impact of the recent political change on the general and oral health of the Afghan population. The present survey can be of particular interest as baseline data since it is probably the latest epidemiological survey on oral health in Afghanistan before the political changes in August 2021. Other strengths of the present study include the large sample size. Compared to the article of Schwendicke et al. [2015], the present data were collected from a larger sample (n = 2,089 vs. n = 1,059) in more schools (13 vs 10) and were more recent (2017 vs 2013). This sample size makes the current study the most extensive and recent survey published on child oral health in Afghanistan. Nevertheless, there are also limitations to report. Since a convenience sample was used in a specific area, there is a potential selection bias, potentially making the data not representative of the entire country (merely regional and urban). Because of the political instability and the lack of ethical committees in Afghanistan, schools were assigned by the Ministry of Health. Such method of assignment leads to possible selection bias at the school level. No selection bias is expected at the individual level since all children present at the assigned schools were included in the survey. Although the survey was purely epidemiological and free of risk, the lack of individual informed consent and free choice of the children should be mentioned as an ethical concern. On the other hand, it should be noted that there are heavy restrictions currently present in Afghanistan - a randomised sample selection at both school and the individual level was not allowed. A final limitation of the study relates to the training and calibration process, where only a supervised hands-on session on a small pilot sample of children was conducted to test measurement reliability without further inter and intra-reliability testing.

Conclusions

Dental caries was a considerable oral health problem among school children in Herat, Afghanistan, in 2017. The present sample has high levels of untreated carious lesions and very low operative care levels. Moreover, significant differences were shown in relation to gender and age groups. The present survey results confirm the need for professional curative and preventive oral health care.

Acknowledgements

The authors would like to express their gratitude to Fida International, a Finnish mission and development organization focusing on extreme poverty. It supported the development of dental clinics and dental schools in the region. The non-profit organization Shelter Now International (Germany) was an indispensable partner throughout the data collection. They have established dental clinics in Herat to provide aid according to European medical and hygienic standards. They handed their first clinic over to the Afghan government in 2014. In 2016 they set up a university dental clinic in collaboration with the dental faculty of the University of Herat. Lastly, the authors want to thank Prof. David Manton (UMCG – the Netherlands) for his support of the manuscript.

References

› Ayala Aguirre PE, Aníbal I, Strieder AP, Lotto M, Lopes Rizzato V, Pereira Cruvinel AF, Rios D, Cruvinel T. Online quality and readability assessment of Early childhood caries information available on websites from distinct countries: A cross-sectional study. Eur J Paediatr Dent. 2022 Mar;23(1):15-20. PMID: 35274537.
› GBD 2017 Oral Disorders Collaborators; Bernabe E, Marcenes W, Hernandez CR, Bailey J, Abreu LG, Alipour V, Amini S, Arabloo J, Arefi Z, Arora A, Ayanore MA, Bärnighausen TW, Bijani A, Cho DY, Chu DT, Crowe CS, Demoz GT, Demsie DG, Dibaji Forooshani ZS, Du M, El Tantawi M, Fischer F, Folayan MO, Futran ND, Geramo YCD, Haj-Mirzaian A, Hariyani N, Hasanzadeh A, Hassanipour S, Hay SI, Hole MK, Hostiuc S, Ilic MD, James SL, Kalhor R, Kemmer L, Keramati M, Khader YS, Kisa S, Kisa A, Koyanagi A, Lalloo R, Le Nguyen Q, London SD, Manohar ND, Massenburg BB, Mathur MR, Meles HG, Mestrovic T, Mohammadian-Hafshejani A, Mohammadpourhodki R, Mokdad AH, Morrison SD, Nazari J, Nguyen TH, Nguyen CT, Nixon MR, Olagunju TO, Pakshir K, Pathak M, Rabiee N, Rafiei A, Ramezanzadeh K, Rios-Blancas MJ, Roro EM, Sabour S, Samy AM, Sawhney M, Schwendicke F, Shaahmadi F, Shaikh MA, Stein C, Tovani-Palone MR, Tran BX, Unnikrishnan B, Vu GT, Vukovic A, Warouw TSS, Zaidi Z, Zhang ZJ, Kassebaum NJ. Global, Regional, and National Levels and Trends in Burden of Oral Conditions from 1990 to 2017: A Systematic Analysis for the Global Burden of Disease 2017 Study. J Dent Res. 2020 Apr;99(4):362-373.
› Colombo S, Gallus S, Beretta M, Lugo A, Scaglioni S, Colombo P, Paglia M, Gatto R, Marzo G, Caruso S, Paglia L. Prevalence and determinants of early childhood caries in Italy. Eur J Paediatr Dent. 2019 Dec;20(4):267-273. doi: 10.23804/ejpd.2019.20.04.02. PMID: 31850767.
› Crespo Cuaresma J., Fengler W., Kharas H., Bekhtiar K., Brottrager M. and Hofer M. Will the Sustainable Development Goals be fulfilled? Assessing present and future global poverty. 2018. Palgrave Communications, 4(1).
› Moynihan PJ. The role of diet and nutrition in the etiology and prevention of oral diseases. Bull World Health Organ. 2005 Sep;83(9):694-9. Epub 2005 Sep 30. PMID: 16211161
› Paglia L, Scaglioni S, Torchia V, De Cosmi V, Moretti M, Marzo G, Giuca MR. Familial and dietary risk factors in Early Childhood Caries. Eur J Paediatr Dent. 2016 Jun;17(2):93-9. PMID: 27377105
› Qin X, Zi H, Zeng X. Changes in the global burden of untreated dental caries from 1990 to 2019: A systematic analysis for the Global Burden of Disease study. Heliyon. 2022 Sep 21;8(9):e10714.
› Schwendicke F, Doost F, Hopfenmüller W, Meyer-Lueckel H, Paris S. Dental caries, fluorosis, and oral health behavior of children from Herat, Afghanistan. Community Dent Oral Epidemiol. 2015 Dec;43(6):521-31.
› United Nations. (n.d.) Gender Development Index. [online] hdr.undp.org. Available at: https://hdr.undp.org/gender-development-index#/indicies/GDI. [Accessed 9 Dec. 2022].
› United Nations. (2018). Human Development Data (1990-2018). [online] Available at: https://repository.chds.hsph.harvard.edu/repository/3449/ [Accessed 9 Dec. 2022].
› Wang K, Pang L, Tao Y, Li X, Zhang J, Cui T, Zeng B, Lin H. Association of genetic and environmental factors with dental caries among adolescents in south China: A cross-sectional study. Eur J Paediatr Dent. 2020 Jun;21(2):129-136. doi: 10.23804/ejpd.2020.21.02.07. PMID: 32567944.
› World Health Organization (1986). Ottawa Charter for Health Promotion. [online] Available at: https://www.euro.who.int/__data/assets/pdf_file/0004/129532/Ottawa_Charter.pdf . [Accessed 9 Dec. 2022].
› World Health Organization. (2016). Afghanistan health profile 2015. Regional Office for the Eastern Mediterranean apps.who.int. [online] Available at: https://apps.who.int/iris/handle/10665/250375 . [Accessed 9 Dec. 2022].
› World Health Organization. (2019). Ending childhood dental caries: WHO implementation manual. [online] Available at: https://apps.who.int/iris/handle/10665/330643?show=full . [Accessed 9 Dec. 2022].
› World Health Organization. (2022). Oral Health Country Profile Afghanistan. [online] Available at: oral-health-afg-2022-country-profile.pdf (who.int) . [Accessed 9 Dec. 2022].