

Oral health status and healthcare system in I.R. Iran

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Objective Oral and dental health has substantial impact on physical, social and mental well-being of all peoples. The aim of this study was to report the oral health status and system in Iran.

Methods The latest WHO oral health survey methodology and criteria was used to perform the first comprehensive national oral health survey in Iran. All suggested 5 age groups of children and adults were recruited from all provinces in Iran. The use of such information is mostly needed for planning appropriate interventions necessary to control and improve the oral health of nation. Although oral healthcare services are provided by both public and private institutions, the focus of this report is to describe the current public infrastructure that can have a greater impact on the oral health status nationwide.

Results The national survey revealed that dental caries, periodontal diseases and tooth loss are increasing compared with previous data. Caries-free status is sharply declining from 12 to 15 years old (27%) and number of edentulous people is exceeding 50% in 65–74 years old age groups. These data indicate the urgent need for proper interventions in all age groups, especially in children. The declaration of “2015-ORAL HEALTHCARE REFORM” by the Ministry of Health and Medical Education has paved the way for oral health promotion in children under age 14 at the national level. The target is to halt the progression of oral diseases and maximize the promotion of oral health and quality of life by the year 2025 for the target population.

Conclusion Although the trends of oral diseases are still increasing in almost all areas over the past two decades, the necessary policy has been ratified and evidence-based strategies have been implemented to overcome the identified obstacles. Although the decline in the rate of dental caries in 12-year-old children is reported recently, caution must be exercised to safeguard quality of care and supervision to observe the expected outcomes by the target deadline.

Keywords oral health status, children, adult, iran, healthcare system, promotion

Introduction

Oral health is closely associated with overall health. Any evidence-based intervention for oral health promotion and oral disease prevention is less expensive and more cost-effective than treatment of such conditions. On the other hand, oral diseases are among non-communicable diseases (NCDs) with great public-health importance. Based on the global strategy for prevention and control of NCDs, it is highly important to develop a national policy, establish programs, share regional and global experiences and build capacity to address burden of oral as well as other NCDs at the local, the national and international level.

Availability of reliable current information is greatly needed for achieving adequate improvement in oral health status among the general as well as vulnerable and at-risk population groups in Iran. Likewise, modification of dental infrastructure, augmentation of productivity and skills improvement of the dental workforce as well as increasing the population's oral health literacy are the other national priorities. Conducting the Iranian National Oral Health Survey (INOHS-2012) as a cornerstone was successfully accomplished by using the World Health Organization's recommended guidelines, methodology and criteria for assessing the current oral health status of population groups and future needs for oral interventions.¹ The reported results of this survey demonstrates that oral health disparities are rather extensive due to children, adults and elderly having many carious and missing teeth that are still considered as an “aging process norm” by many people among the Iranian population. Internationally, it has been recognized that oral diseases

including dental caries and the curative dental care needed to restore teeth to normal function are considered as significant economic burden for individuals as well as the communities at large. Oral health is more important than healthy teeth; it is an integral part of overall health and well-being and the needs of Iranian citizens must be addressed accordingly.

Declaration of the 2015 National Oral Healthcare Reform in Iran was another major event that can potentially improve the nation's oral health status for years to come. The policy is covering all children up to age 14 nationwide. All resources have been mobilized for these preventive dental services for the priority target groups, aiming for them all to become caries-free by the year 2025.

Country Profile

Geographically, Iran with about 80 million populations, spanning in an area over 1,648,000 km². Being the 18th largest country in the world, Iran is located in southwest Asia, in the Middle East region. The country is bordered by Turkmenistan, the Caspian Sea and the Republic of Azerbaijan to the north, Turkey and Iraq to the west, the Persian Gulf and the Sea of Oman to the south, and Pakistan and Afghanistan to the east. About 74% of the country is urban and 26% is considered as rural areas. Iran is divided into 31 provinces, 336 districts and over 66,000 villages.

Historically, Persia (now Iran) has been the conduit of knowledge from China and India in the East to Greece and

Rome in the West. The Iranian civilization along with several 1000 years and great indigenous capacities of scholars and philosophers, have permanent records of achievements and contributions in developing world in understanding of nature, medicine, mathematics, chemistry, physics and philosophy. Among many people, Avicenna, Biruni, Khayyam and Rhazes (Razi) are internationally well-known scientists and philosophers whose statutes are currently standing in the "Persian Scholars Pavilion" in Vienna International Center. In a short description, Avicenna has substantial writings on different aspects of medicine (800 AD). Biruni was an astronomer; he wrote astronomical encyclopedia in 1000 AD and suggested the possibility of earth's rotation around the sun. Razi was the inventor of alcohol and practical physics; he defined the special or net weight of mater in 10th century. His student Abu Bakr Joveini, wrote the first comprehensive medical book in the Persian language. Many of those physician's approaches in medieval Persia are still accepted in modern medicine.³ The "Gundishapur Academy" in Persian Empire was the first known teaching hospital, where students methodologically mentored and supervised to practice medicine on patients.² Based on expert opinion, the credit for whole hospital system has been given to Persia.² Khayyam was an extraordinary mathematician and poet with many metaphysical poems. Nevertheless, despite numerous political unrests, Iran has made significant scientific advances to date.⁴

Public Healthcare System

The public healthcare system in Iran is composed of a healthcare network called "Health and Treatment Network" (HTN) covering most of the urban and rural areas in the country. The health facilities providing basic healthcare in the rural areas, are called Health Houses (HH); and similar facilities in the urban areas are called Health Posts (HP). There are over 17,000 HH providing preventive care to villagers. At the next or mid-level in the HTN, there are over 5000 Health Centers (HC) providing care by general physicians, dentists as well as other healthcare providers. Hospitals are located in the top level of the network. The chain of referral naturally starts from HH to HC and continues to hospitals when necessary.⁵ The primary healthcare service facilities includes: 17,325 Health Houses, 1666 HP, 2407 Rural Health Centers, 2186 Urban Health Center, providing close to 100% of primary healthcare coverage in the urban and about 95% coverage in the rural areas.

Family as a unit of society is the main focus of the healthcare system in Iran. Since 1972, major health improvements have been achieved through HTN. Preventive oral healthcare has been integrated into the HTN since 1996. Many foreign health administrators have shown interest and have taken the opportunity to visit and become familiar with the operational management and effectiveness of the healthcare system in Iran. The level of prevention for preventive oral healthcare at each healthcare network component is described in the following section.

Level I-a: Health Houses

The HH is the most peripheral rural healthcare units of the national public healthcare system that provides health services to villagers. Each HH covers a village population of about 1500 individuals. If the population is less, satellite villages may be

covered by an HH. "Behvarz" is a native young male or female, in charge of the HH. She/he is selected from village applicants. These individuals with high-school degree are trained for 2 years to provide primary healthcare services for village residents before they are given the responsibility. Oral health evaluation and oral hygiene instructions is one of the services provided by the Behvarz at the HH, villager's home or local school.

Level I-b: Health Posts

A similar healthcare services provided at the HHs, are available in the urban healthcare units called HP. Therefore, the oral healthcare services provided by urban HPs are performed by all health technicians. Oral healthcare is provided at all HPs as one of the elements of integrated health services.

Level II-a: Rural Health Centers

The rural HC is an independent medical unit covering multiple villages with the population of about 10000 individuals in remote areas. The oral healthcare personnel, including dentists and other healthcare providers working in the HCs are supervised by a Family Physician. Aside from supervising responsibilities, the physician is monitoring all HH activities, as well as treating the referred patients from HHs or send referral to the next level, the city hospital, when specialist services are required.

Level II-b: Urban Health Centers

This center covers one or more urban HPs depending on the local population. Duties of urban health centers are similar to those of rural health centers. Duties and scope of services for dentists working in urban and rural health centers are also the same.

The dental workforce (dentists, dental hygienists and oral health technicians) in urban and rural health centers provide preventive oral healthcare services such as oral hygiene instructions, topical fluoride therapy, fissure sealant therapy, prophylaxis and restorative services, for all patients especially the target populations groups (children, pregnant and lactating mothers) in the community according to their job descriptions.

In accordance with new policies of the 2015 Oral Healthcare Reform, level I preventive dental services are mainly provided during the morning shifts in order to comply with new regulations and level II or therapeutic services are provided during the afternoon shifts. Dentists can use the public facilities in order to provide dental treatments with no limitation of services in the afternoon shifts, as long as, the dental materials and dental assistants are provided by the dentist. The government established fee schedules are used at these facilities, and from each payment 20% is deducted by the government and the rest is considered provider's income. For the morning shift contract, there are additional fee incentives based on remoteness of assigned location and deprivation category of the geographical area. Using these payment models, the combination of income from morning and afternoon shifts have been well accepted and considered satisfactory by most recruited dentists. These assignments are usually given to new dental graduates who need to fulfil 2 years of duty service for government in return for free dental education (before being able to have a private practice).

Oral Healthcare System

The integration of oral health in the Primary Health Care (PHC) system was implemented about 20 years ago (1996), with the aim of oral health promotion at the community level. However, the integration of oral health was revisited in the “2015-Oral Healthcare Reform” for further improvements. As a result, the integration of oral health is now actively executed in all medical science universities throughout the country.

The prevention of common oral diseases is the main evidence-based strategy currently used by the Ministry of Health and Medical Education in Iran. There are two target groups selected to provide regular preventive services, primarily in the HHs, HPs and HCs. The two major priority target groups are: (1) pregnant women and lactating mothers as well as (2) children under age 14. As a result of active integration, all non-dental health personnel are required to provide the following preventive oral health services throughout the national health network:

- Oral examination, recording oral health status, oral health education, oral hygiene instruction, application of fluoride varnish for target children and referral to dentist if further preventive care or treatment needed.
- All children are required to have biannual screenings and receive preventive care. Similarly, all women are required a visit before conception and three visits during pregnancy as well as biannual visits over the 2 years after delivery. Referral to dentist (at the health center) is made if any preventive care is necessary.
- Recording all daily services provided to target populations (women and children) in electronic databases.

The dentists, dental hygienists and oral health technicians supervise and support all oral health activities and services provided by the Behvarz and other healthcare providers such as Family Health Technician staff at HHs and HPs, local schools screening program, etc., in designated geographic areas. Other duties are:

- Providing preventive oral healthcare and treatment services for all patients visiting the center, with special priority given to target populations.
- Creating records, generating reports for all new patients; accepting referrals from HH and HPs.
- Conducting face to face oral health education for all patients.
- Coordination and supervision of school management for proper implementation of different projects such as oral health screening, supervised tooth brushing and fluoride varnish application at primary schools.
- Referring complicated cases requiring specialist services.
- Supervising and controlling sterilization and infection control procedures for dental units and equipment.
- Active participation in local and regional oral health-related projects and activities.
- Supporting inter-sector coordination, advocating for cooperation.
- Using the available electronic information technology system for reporting the daily activities.

- Conducting training sessions for health personnel, parents, teachers, etc.
- Preparing appropriate training material and educational packages for each group.
- Providing finger toothbrushes designed for infant age group.
- Program evaluation and publication of reports.
- Close supervision, critical system and outcomes analysis for providing constructive feed-back.

Workforce Development

Training of dental specialist, dentist, as well as other allied dental health technicians has now been done locally for over six decades. Over this time period, the number of dental schools has increased from five schools that were initially established, to 66 dental schools that are currently fully functional. The numbers of local graduates are about 1500 annually. Additionally, about 500 foreign graduates begin practicing in Iran each year. The workforce development is rather very fast in Iran and the total numbers of graduates are expected to increase by 8–10% annually (Table 1).

The role of the dental hygienists and oral health technician are the keys to success of the National Oral Healthcare Reform. The initiative for training hundreds of such mid-level personnel is currently underway, to provide level-1 preventive services in local communities, focusing on target population groups.

National Oral Healthcare Reform

This reform is mainly focused on all three levels of preventive care, the primary, secondary and tertiary prevention. The initial target population is the 7 million primary school students at the national level. The plan is to screen students and provide primary preventive care to all school children. The major objective is the prevention and early diagnosis of dental caries, periodontal diseases and provision of early treatment for any existing conditions by referral to dentist. Usually, the first oral health screening for children start at age 6, within the school property right before children begin schooling and continues every 6 months afterward. In 2015, through a formal ceremony in one of the primary schools in Tehran, a memorandum of understanding (MOU) was signed between the Minister of Health and the Minister of Education to facilitate the initiation of free preventive oral healthcare in all primary schools nationwide. Based on this reform plan, all students will be checked two times a year for receiving intraoral examination, oral health education, oral hygiene instruction, fluoride varnish application, as well as referral to dentist if sealant therapy or other treatments are needed.

Due to resource limitation, the permanent dentition of the primary school children has been the primary focus of the

Table 1. Dentist-population ratio in I.R.-Iran 1997–2017

Year	Dentists	Population	1 Dentist
1997	10,000	60,000,000	6000
2007	20,000	70,000,000	3500
2017	30,000	80,000,000	2667

National Oral Healthcare Reform at this time. Although it will be expanded later, the screening of children under age 5 for assessment of possible early childhood caries, is conducted mostly in nurseries based on availability of local/provincial resources.

General Objectives

Improving the oral health status of all children under age 14.

Specific Objectives

- Enhancing knowledge and improving oral healthcare habits.
- Decreasing caries incidence in primary and permanent dentition.
- Improving oral healthcare service coverage for target populations.

Strategies

- Adopt evidence-based oral disease preventive methodologies.
- Improve access to oral health education and preventive healthcare services.
- Use electronic information technology system for process and outcome monitoring and evaluation.
- Adopt necessary adjustments when reorientation was necessary.

Activities

- Establishment of MOU between the Ministry of Health and Ministry of Education.
- Monitoring and evaluation of the process as well as the outcomes at the national level.
- Expansion of activities aiming at 100% coverage of the target populations.
- Providing annual executive report on achievements and impediments for further improvements.

Manpower

The public health dentists, dental hygienists and oral health technicians who are employed in the national health network are responsible to visit the local primary schools and provide preventive oral healthcare. However, in urban areas, the number of dentists, dental hygienists and oral health technicians are not sufficient to cover all the primary school children. Therefore, dental students are helping to provide such preventive care to school children. Before starting any school oral health activity, all dental students are trained and calibrated for oral examination, oral health education, oral hygiene instruction and fluoride varnish application to assure the quality and standards of care provided nationwide.

As the provision of preventive care expands, more manpower is obviously needed. Ideally, it would be best if private

dental practitioners will be involved. About 90% (27,000) of the dentists in Iran are in private practice. Through public-private-partnership more primary school children can receive early dental restorations (level I preventive care) if proper policy is in place. There is still very low interest among the private dentists to sign a contract with insurance companies. The main problem for such outlook is the low rate of insurance reimbursement and delay in payments for services provided by dental practitioners.

Funding

Although historically dental insurance coverage has been very minimal and mainly limited to tooth extraction and denture construction in the past; for the first time ever the insurance companies agreed to cover the cost of preventive dental care. The services specified in new dental benefit coverage are: (1) Oral examination/screening, (2) Oral health education, (3) fluoride varnish application, (4) fissure sealants therapy for posterior permanent teeth, (5) Scaling and tooth polishing, (6) Dental restorations, (7) PA/BW X-rays, (8) extraction of untreatable primary and permanent teeth. These services are also included as a component of a national plan called the "Family Physician plan" that provides full medical coverage to populations living in the remote and underserved areas of the country. Therefore, anyone with rural insurance coverage can obtain all covered dental services free of charge in the rural areas. Similarly, urban citizens can benefit all covered services by paying 30% copay. At this time although participation is not remarkably high, few number of "private dentists" in each province are testing the newly developed program by signing contract with insurance companies for providing dental care to insured children.

Dental Records and Surveillance System

The students' unique national identification card (ID) card number is used for creation of electronic dental records. When using the ID number, students' demographic information is automatically obtained from the national database and therefore, the dental records will be attached to individuals' health records. The children's base-line oral health status is updated biannually. Likewise, all preventive care and other treatment services provided will be recorded on a daily basis. All these records are accumulated in the provincial database and at the same time a copy is being sent to the database at the Ministry of Health for monitoring and evaluation purposes. Such data is crucial for sustainable quality control and effectiveness evaluations. Currently, the children up to age 14 are defined as the target population. However, the future plan is to gradually expand preventive healthcare services to high school students (through age 18).

Oral Disease Epidemiology and Oral Health Research

In this section, the current oral health status is explained by reviewing dental caries, caries-free status, periodontal diseases, tooth loss and dental prosthesis used, dental fluorosis, dental erosion, dental trauma, treatment needs indices as well as smoking cessation activities in dental office. Controlling tobacco as a common risk factor is one of the WHO recommended priorities for oral health promotion globally.

Dental Caries Experience in Children

The DMFT index as a measure of oral health can demonstrate the proportion of children who have decay (d), missing (m) due to caries or filled (f) deciduous teeth (dmft) and/or in their permanent dentition (DMFT). The dmft index for 5–6-year-old children was 5.16 at the national level (Table 2). The analysis showed that 85.93% of this index was related to d-component, while the m- and f-components were 4.86% and 9.19%, respectively. The mean number of decayed, missing and filled teeth in this sample was 4.5, 0.26 and 0.39, respectively. This means that when conducting a random screening of 100 children, it is expected to see 450 decayed teeth, 26 missing and 39 filled teeth in this age group. When considering distribution by sex and place of residence, this index was higher in rural (5.78) than urban (4.94) areas; and it was also higher among girls (5.24) than boys (5.09), although the difference was not statistically significant ($P = 0.384$).

The DMFT index in 12-year-old children was 2.09 at the national level (Table 2). The analysis showed that 81.83% of this index was related to D-component, while the M- and F-components were 2.94% and 15.22%, respectively. The distribution of D-component showed higher score among boys (85.6%) when compared with girls (78.5%) (Fig. 1). Also, the rate was higher among the rural dwellers (91.8%) when compared with their counterpart children living in the urban areas (77.5%). The DMFT index in 12-year-old children by sex and place of residence, showed significantly higher value in rural (2.29) when compared with urban (2.02) areas ($P = 0.032$); and it was greater among girls (2.24) when compared with boys (1.94) in the same age group ($P = 0.015$).

The average DMFT score in 15-year-old children were reported as 3.29 at the national level (Table 2). About 75% of this index was related to D-component and the M- and F-components were 5.46% and 19.75%, respectively. Children who

lived in urban and rural areas demonstrated an index of 3.26 and 3.42, respectively. The corresponding index for 15-year-old boys and girls were 3.27 and 3.31, respectively. Although the index was not statistically significant by sex ($P = 0.864$) and place of residence ($P = 0.542$). This score was less than the national average in 12 provinces and the lowest was 1.86 in the province of Khuzestan.

The D-component in 15-year-old boys and girls were 76.3% and 73.9%, respectively. The score was higher in children living in rural areas (85.2%) when compared with their urban living counterparts (72%). The extracted teeth were higher in girls (5.8%) compared to boys (5%). Likewise, this statistic was higher among rural living children (7.4%) when compared with children living in urban areas (4.9%). Additionally, the number of restored teeth was higher among girls (20.3%) when compared with boys (18.8%). This figure was also higher among urban living children (23.1%) when compared with rural living counterparts (7.4%).

Caries-free Status

About 12.7% of the 5–6-year-old children had no dental caries, restoration and/or extraction of only their primary dentition. The index by place of residence showed higher caries-free children living in urban areas (14.1%) when compared to rural areas (10.3%). Likewise, the ratio was higher among boys (13.1%) when compared with girls (12.3%). About 13 provinces had a score higher than the national average and the best caries-free score was reported from *Bushehr* province (23.4%).

The caries-free rate for permanent dentition among 12-year-old children was 35% (Fig. 2). The distribution by sex and place of residence showed a higher score in boys (36.3%) compared to girls (33.7%) ($P = 0.227$); and a

Table 2. DMFT index by age and gender among Iranians (INOHS-2012)

Age group	DMFT	Urban	Rural	Male	Female	D/DMFT (%)	M/DMFT (%)	F/DMFT (%)	CF (%)
5–6	5.16	4.94	5.78	5.09	5.24	85.93	4.86	9.19	12.7
12	2.09	2.02	2.29	1.94	2.24	81.83	2.94	15.22	27.4
15	3.29	3.26	3.42	3.27	3.31	74.79	5.46	19.75	0.4
35–44	13.20	12.99	13.98	13.51	13.07	32.65	39.81	27.52	—
65–74	25.71	25.29	27.25	26.84	24.84	11.72	84.22	4.05	—

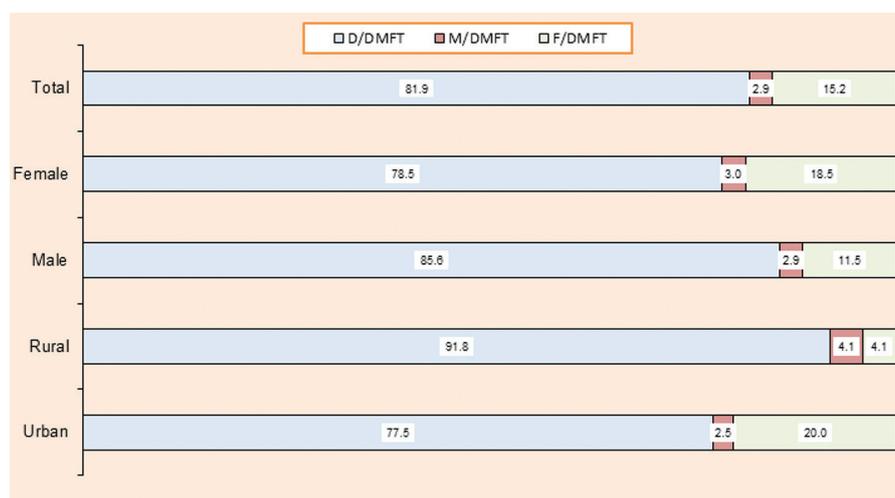


Fig. 1 DMFT components in 12-year-old children by sex and place of residence (INOHS-2012).

significantly higher rate in urban citizens (36.5%) when compared to rural dwellers (32.5%) ($P < 0.001$). About 13 provinces reported higher rates than the national average and the highest rate was reported from Khorasan Razavi province (50.5%).

The rate of caries-free in 15-year-old children was reported to be 0.4% at the national level only. The highest value was reported for Khozestan province by 1.8%.

Dental Caries Experience in Adults

The DMFT index for 35–44-year-old adults was 13.2. The index was significantly ($P = 0.037$) higher among rural (13.98) dwellers when compared with urban residents (12.99). The index for male (13.51) was higher than females of the same age group (13.07) ($P = 0.210$). In 9 out of 31 provinces the index was less than national average for this age group. The lowest figure with 8.63 was reported from Bushehr province.

The D-component in 35–44-year-old adults was 32.65%, while the M- and F-components were 39.81% and 27.52%, respectively. The distribution of the D-component showed higher scores among the males (35%) when compared with females (31.6%). Also, the rate was higher among the rural dwellers (41.6%) when compared with counterpart group living in the urban areas (30.2%). The distribution of the M-component showed 50.4% in rural areas and 37% in urban areas.

The DMFT index for 65–74 years old age group was 25.71 at the national level (Table 1). The index for eight provinces was less than the national average and the lowest record with 18.16 was reported from Bushehr province. The analysis showed that only 11.72% of the index was related to the D-component, while the M- and F-components were 84.22% and 4.05%, respectively. Obviously, this record shows that majority of permanent teeth have been lost in this age group either due to dental caries, periodontal diseases or both. The distribution by sex and place of residence, showed that the index was significantly higher among male (26.84) than female (24.84) ($P = 0.008$); and

greater in rural dwellers (27.25) than urban residents (25.29) ($P = 0.001$) (Fig. 3).

The mean number of decayed, missing and filled teeth in this sample was 2.44, 22.56 and 0.71, respectively. This means that when conducting a random screening of 100 adults, it is expected to observe 244 decayed teeth, 2256 missing and 71 filled teeth in this age group.

Fig. 4 demonstrates the status of DMFT index in all age groups with break-down by sex and place of residence.⁶

Root Surface Caries

The DFT index for root caries was reported as 0.78% in 35–44-year-old adults at the national level. The distribution by sex and place of residence showed a higher score in male (1.05%) when compared with females (0.67%). Likewise, a higher value was reported for rural living adults (1.15%) when compared with urban living (0.68%) counterparts. Total of 15 provinces demonstrated higher than the national average. The highest score was reported from Sistan and Balochistan province with 3.03 mean roots DFT.

Mean number of decayed and filled roots in 65–74 years old age group was reported 0.79. The DFT index by sex and sex and place of residence was higher in female (0.83) than male (0.73); and higher in rural (1.22) than urban areas (0.67). About 21 provinces showed lower and 10 provinces demonstrated higher values. The highest score was reported from Sistan and Baluchestan province (2.68).⁶

Periodontal Diseases

Bleeding score was 9.7% for 5–6-year-old children at the national level. The distribution by sex and place of residence was 9.4% in boys and 10.1% in girls ($P = 0.178$), while the score was significantly lower in urban dwellers (8.5%) when compared to residents of rural areas (11.8%) ($P = 0.002$) (Table 3).

The national value for bleeding score in 12-year-old children was 26.9%. The distribution by sex and place of residence was 26.9% in boys and 27% in girls ($P = 0.263$), however, the score was significantly lower in urban living

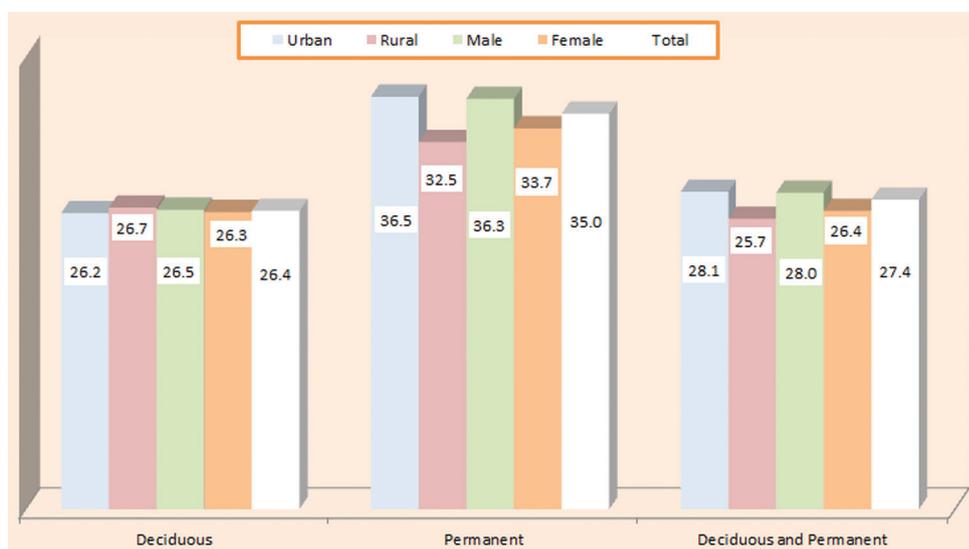


Fig. 2 Percentage of 12 years old caries-free children by sex and place of residence (INOHS-2012).

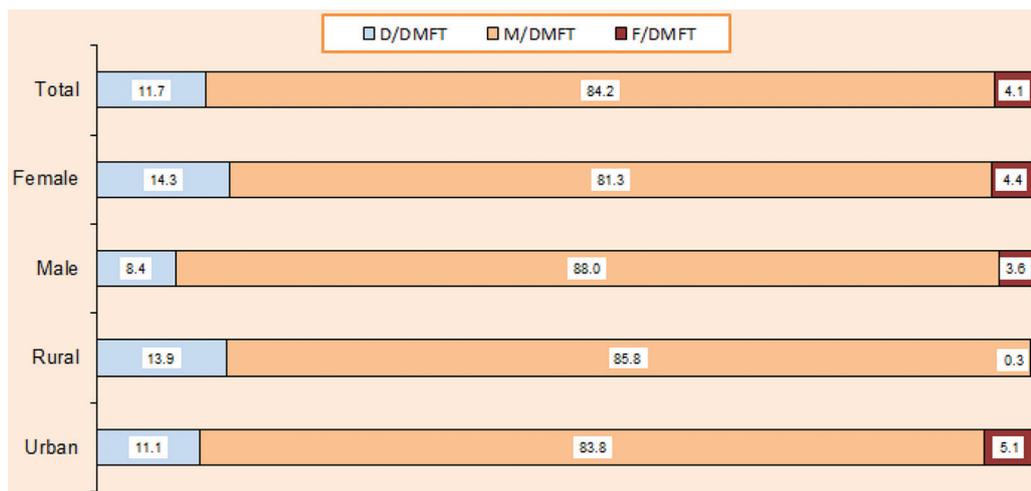


Fig. 3 DMFT components in 65-74 years old adults by sex and place of residence (INOHS-2010).

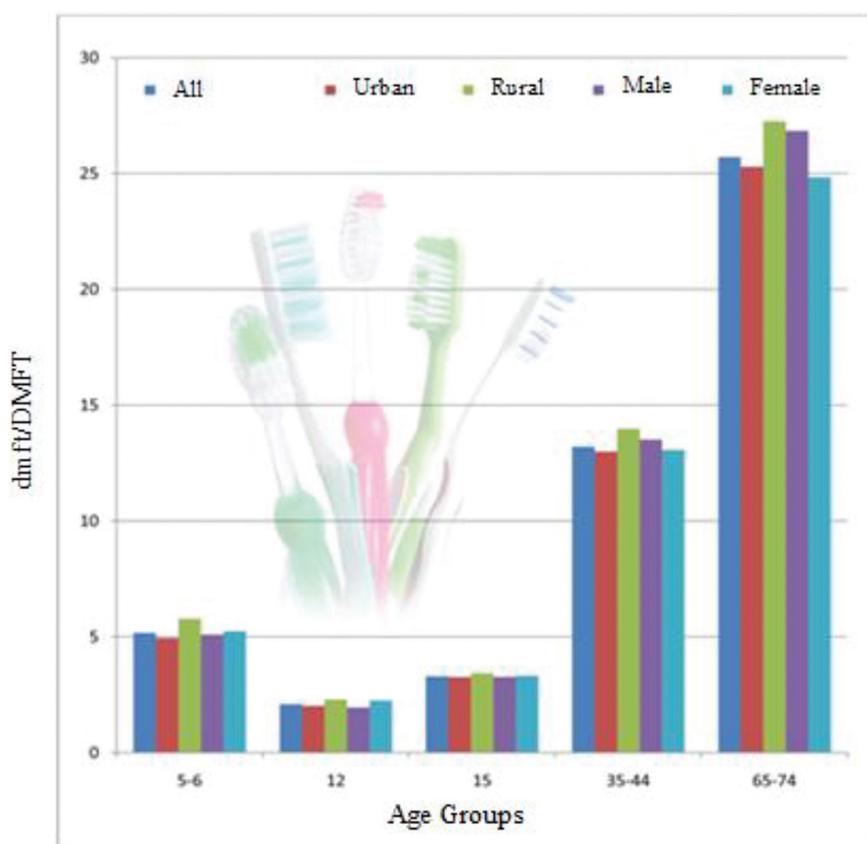


Fig. 4 The dmft/DMFT index among the 5 WHO suggested age groups by sex and place of residence (INOHS-2012).

Table 3. Periodontal indices by age, sex and place of residence (Percentage) (INOHS-2012)

Age group	Bleeding					Pocket		LOA
	Total	Urban	Rural	Male	Female	4-5 mm	6+ mm	4+ mm
5-6	9.7	8.5	11.8	9.4	10.1	—	—	—
12	26.9	25.7	28.8	26.9	27.0	—	—	—
15	33.8	31.8	37.3	35.3	32.6	0.3	4.6	4.0
35-44	55.5	52.0	61.4	57.0	54.7	3.1	25.6	22.9
65-74	60.9	60.0	62.3	61.5	60.3	8.8	34.6	47.6

children (25.7%) than their counterparts in rural areas (28.8%) ($P = 0.028$) (Table 3). Note: Values of recorded bleeding among children under age 15 was evident during

the examination. No pocket depth was performed in children of these age groups.

The national value for bleeding score in 15-year-old children was 33.8%. The distribution by sex and place of

residence was 35.3% in boys and 32.6% in girls ($P = 0.216$). However, the score was significantly lower in urban (31.8%) versus rural areas (37.3%) ($P = 0.003$) (Table 3).

Although over 90% of the 15-year-old children at the national level had no periodontal pocket, about 7% had 4–5 mm pockets and 0.4% showed 6+ mm pockets at the national level. The loss of attachment (LoA) 4–5 mm was 3.6%; LoA 6–8 mm was 0.4%; and LoA 9+ was 0% in this age group.

As demonstrated in Table 3, the national score for bleeding was 55.5% in 35–44-year-old adults. The distribution by sex and place of residence was 57% in male and 54.7% in females ($P = 0.001$), however, the score was significantly lower in urban (52%) versus rural areas (61.4%) ($P = 0.001$) (Fig. 5). Although 71.3% of the 35–44-year-old adults had no periodontal pocket, about 25.6% had 4–5 mm pockets and 3.1% showed 6+ mm pockets at the national level. The rate of periodontal pockets 6+ mm was very close to each other in both sex (male = 3.2%; female = 3%) which were close to the national average (3.1%) as well. However, the distribution by place of residence showed a significantly higher score in rural area (5.4%) when compared with adults living in urban areas (1.8%) ($P < 0.001$).

The loss of attachment with 4+ mm was reported as 22.9% in the 35–44-year-old age group at the national level (LoA 4–5 mm = 19.7%; 6–8 mm = 2.8%; 9–11 = 0.3%; 12+ mm = 0.1%). The distribution of index by sex and place of residence showed

higher score among male (25.5%) than female (21.6%) and significantly higher values in rural dwellers (30.8%) compared with urban residents (18.3%) ($P < 0.001$). Although the sex difference was not significant, a significantly higher difference was detected in rural residents when compared with city dwellers ($P < 0.001$).

The bleeding score was 60.9% in 65–74-year-old adults at the national level (Table 3). The distribution by sex and place of residence was 61.5% in male and 60.3% in females ($P = 0.668$). However, the score was lower in urban (60%) than rural areas (62.3%) ($P = 0.302$). The highest score was reported from Sistan and Baluchistan provinces with 80.5% in 65–74 years old age groups.

Over 56.6% of 65–74-year-old adults did not have any periodontal pockets. However, about 34.6% had 4–5 mm pockets and 8.8% showed 6+ mm pockets at the national level. The distribution of periodontal pocket of 4–5 mm by sex and place of residence showed higher score in male (35.9%), than females (33.3%) ($P = 0.686$); and 34% in urban compared to 35.5% in rural areas ($P = 0.131$) (Fig. 6).

The distribution of periodontal pocket of 6+ mm by sex and place of residence showed close score values among male (8.8%) and female (8.7%); while the score was higher among rural residents (10.9%) when compared to urban counterparts (8.8%).⁶

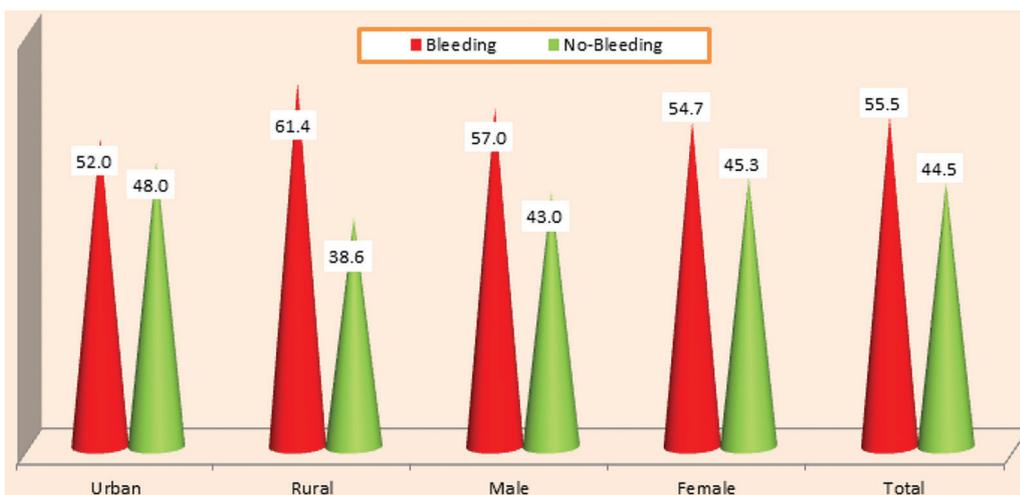


Fig. 5 Bleeding on probing among 35–44-year-old samples by sex and place of residence (INOHS-2012).

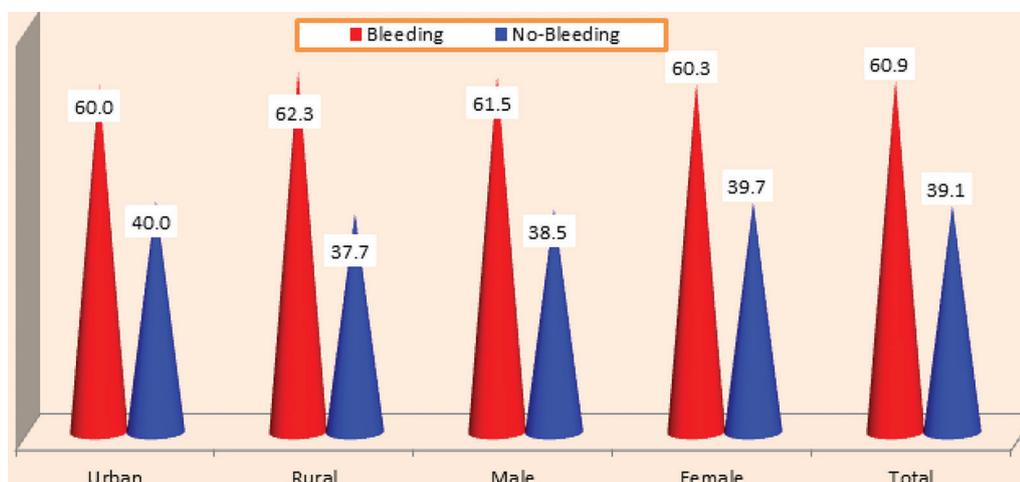


Fig. 6 Bleeding on probing among 65–74-year-old samples by sex and place of residence (INOHS-2012).

Tooth Loss and Dental Prosthesis

About 40% of 35–44-year-old adults have reported tooth loss with 4% of them being complete edentulousness at the national level. Two provinces reported no edentulous cases, while 18 provinces reported a score less than the national average. The highest score was reported 13.4% from Zanjan province. The analysis showed that 6.3% of 35–44-year-old adults had partial dentures and 5.1% had complete dentures in lower jaw; and 4.4% had partial dentures and 4.1% had complete dentures in upper jaws. The highest rate of adults with partial denture in this age group was reported from Alborz province with 16% in the upper jaw and Fars province with 12% in lower jaw. Although the highest rate of adults with maxillary and mandibular complete dentures were reported 14.4% and 13.4% both in Zanjan province, respectively.

About 84% adults of 65–74 years old had extracted teeth with 52.2% of them being complete edentulous at the national level. There were 13 provinces with less ratio and 18 provinces with the score above the national average. The highest score was reported from Zanjan province with 84% complete edentulousness.⁶

Dental Enamel Fluorosis

Although fluorosis of dentin can occur, it requires sophisticated equipment and methods; in oral health surveys. The fluorosis lesions recorded are assessed by visual examination, therefore, the recorded values are the status of enamel fluorosis only.

Although, 91% of all children had no fluorosis, the national score for 5–6 year old children was 0.8%. While there was not much sex difference (male = female = 0.8%), the distribution by place of residence showed 1.2% of children living in rural areas and 0.6% in their counterparts living in the city affected by fluorosis ($P = 0.005$) (Table 4). Although reported rates were over the national average in 10 provinces; eight provinces reported no fluorosis in children of both sexes who were living in urban or rural areas. The highest score was reported from Kerman, Kohkiloyeh and Boyrahmahd provinces both with score of 3.7%.

The national score for dental enamel fluorosis in 12-year-old children was 1.6%. While the sex difference was minimal between boys (1.7%) and girls (1.5%) ($P = 0.394$), the distribution by place of residence showed 2.6% in children living in rural areas and 0.9% in their counterparts living in the city ($P < 0.001$) (Table 4). Although five provinces reported no fluorosis, 12 provinces reported rates over the national average. The highest provincial score was

reported from Kohkiloyeh and Boyr-Ahmad with 7.1% and Bushehr with 5.4%.

The dental enamel fluorosis score in 15-year-old children were 2% at the national level. The distribution by sex showed 2.1% for boys and 1.9% for girls, the difference by place of residence showed 1.3% in children living in rural areas and 3.1% in their counterparts living in the city (Table 4). However, the differences in sex ($P = 0.070$) and place of residence ($P = 0.337$) were not statistically significant. Although the reported rates were over the national average in 19 provinces; five provinces reported no fluorosis in both sex and children living in urban or rural areas. The highest score was reported from Kohkiloyeh and Boyr-Ahmad (8.1%), and Bushehr (7.6%) provinces.

The fluorosis score in 35–44-year-old adults was 3.3% at the national level. The distribution by sex showed 2.9% for male and 3.5% for females, the difference by place of residence showed 4.1% in adults living in rural areas and 2.8% in their counterparts living in the city (Table 4). However, the differences in sex ($P = 0.322$) and place of residence ($P = 0.106$) were not statistically significant in this age group. Although three provinces reported no fluorosis, 10 provinces reported rates over the national average in both sex and for adults living in either geographical (urban/rural) area. The highest score was reported from Bushehr province with 21%.

The fluorosis score in 65–74-year-old adults was 3.5% at the national level. The distribution by sex showed 3.3% for male and 3.8% for females, the difference by place of residence showed 4.1% in adults living in rural areas compared with 3.1% in their counterparts living in the city (Table 4). However, no statistical significance was detected in sex ($P = 0.441$) and place of residence ($P = 0.708$) in this age group. Although 10 provinces reported no fluorosis, seven provinces reported rates more than the national average. The highest score was reported from Bushehr province with 28.6%.⁶

The calculated age-specific Community Index of Enamel fluorosis by region demonstrated eight provinces with records above the national average concentration of fluorosis in all age groups. These rates in these provinces may be considered as an alert for a public health problem. Geographically, they are located in the North-West to South-West and South-East of the country. In this case potential recommendations are the use of de-fluoridation system, changing the food or water sources at the community level or using individual (maternal and child) level approaches during tooth development periods when appropriate.

Dental Erosion

The national score for dental erosion in 5–6-year-old children was 9.5% with mean number of 4.64 affected teeth (Table 5). The distribution by sex and place of residence showed 9.2% in girls, 10.3% in boys ($P = 0.001$); 12.6% in rural and 7.6% in urban areas ($P < 0.001$). The highest rate of erosion was reported from Kohkiloyeh and Boyr-Ahmad province with 45.5% with a mean number of 5.23 teeth involved.

The national score for dental erosion in 12-year-old children was 4.5% with a mean number of 3.55 affected teeth (Table 5). Although no sex difference was detected (male = female = 4.5%) ($P = 0.558$), the distribution by place of residence showed 4.8% in children living in rural area and 4.3% in urban living counterparts ($P = 0.501$). The difference

Table 4. Percent Age-specific Community index of Enamel Fluorosis (INOHS-2012)

Age group	Total (national)	Place of residence		Gender	
		Urban	Rural	Male	Female
5–6	0.8	0.6	1.2	0.8	0.8
12	1.6	0.9	2.6	1.7	1.5
15	2.0	1.3	3.1	2.1	1.9
35–44	3.3	2.8	4.1	2.9	3.5
65–74	3.5	3.1	4.1	3.3	3.8

Table 5. Prevalence of dental erosion and trauma in different age groups (INOHS-2012)

Age group	Dental erosion		Dental trauma	
	% of individuals with erosion	Mean number of teeth with erosion	% of individuals with trauma	Mean number of teeth with trauma
5–6	9.5	4.64	1.5	1.6
12	4.5	3.55	4.9	1.29
15	6.5	3.0	6.0	1.2
35–44	27.1	4.8	5.5	1.64
65–74	49.7	6.25	4.0	1.29

was not statistically significant. The highest rate of erosion reported from Kohkiluyeh and Boyr-Ahmad province with 24.2% and mean number of 2.01 teeth involved.

The national score for dental erosion in 15-year-old children was 6.5% with a mean number of three affected teeth (Table 5). The erosion score was higher among girls (6.6%) than boys (6.4%) ($P = 0.154$); while, the distribution by place of residence showed a statistically significant higher rate in children living in rural areas (7.8%) compared with urban (5.8%) living counterparts ($P < 0.001$). The highest rate of erosion was reported from Kohkiluyeh and Boyr-Ahmad province with 28.4% with a mean number of 2.3 teeth involved.

The national score for dental erosion in 35–44-year-old adults was 27.1% with a mean number of 4.8 affected teeth (Table 5). The distribution by sex and place of residence showed statistically significant differences between male (29.4%) and females (26%) ($P < 0.001$); as well as urban (26.2%) and rural (28.7%) dwellers ($P < 0.001$). The highest rate of erosion reported from Kohkiluyeh and Boyr-Ahmad provinces with 61.7% and a mean number of 6.64 teeth involved.

The national score for dental erosion in 65–74-year-old adults was 49.7% with a mean number of 6.25 affected teeth (Table 5). The distribution by sex was 49.5% in male, 50.5% in females ($P = 0.174$). However, the difference between places of residence was significantly lower in urban (48.7%) versus rural (51.3%) populations ($P < 0.006$). The highest rate of erosion was reported from Ghazvin province with 72.9% and a mean number of 6.81 teeth involved.⁶

Dental Trauma

The national score for dental trauma in 5–6-year-old children was 1.5% with a mean number of 1.6 affected teeth (Table 5). The highest rate of trauma was reported from Fars province with 3.4% with a mean number of 1.7 teeth involved. The distribution by sex and place of residence showed 1.1% in girls and 1.9% in boys ($P = 0.033$); and 1.2% in rural and 1.7% in urban areas ($P < 0.201$). The highest reported mean number of teeth involved in trauma was 7.5 in 1% of 5–6-year-old children from Kurdistan province.

The national score for dental trauma in 12-year-old children was 4.9% with mean number of 1.29 affected teeth (Table 5). The distribution by sex and place of residence showed 3.4% in girls and 6.5% in boys ($P < 0.001$); and 4.6% in rural versus 5.1% in urban areas ($P = 0.428$). The highest rate of trauma was reported from Kohkiluyeh and Boyr-Ahmad province with 10.4% and mean number of 1.13 teeth involved.

The national score for dental trauma in 15-year-old children was 6% with a mean number of 1.2 affected teeth

(Table 5). The distribution by sex and place of residence showed 4.8% in girls and 7.5% in boys ($P < 0.001$); and 5.7% in rural and 6.2% in urban areas ($P = 0.350$). The highest rate of trauma was reported from Kohkiluyeh and Boyr-Ahmad province with 11.2% and mean number of 1.2 teeth involved.

The national score for dental trauma in 35–44-year-old adults was 5.5% with a mean number of 1.64 affected teeth (Table 5). The distribution by sex and place of residence showed 5.1% in females and 6.3% in males ($P = 0.381$); and 5.2% in rural and 5.6% in urban areas ($P = 0.026$). The highest rate of trauma was reported from Tehran province with 11.9% and a mean of 1.61 teeth involved. Interestingly, males in the Sistan and Baluchistan province had the highest number of teeth involved in trauma reported at 3.71 teeth in 8% of 35–44 year age group.

The national score for dental trauma in 65–74-year-old adults was 4% with a mean number of 1.29 affected teeth (Table 5). The distribution by sex and place of residence showed 3.5% in females and 4.5% in males ($P = 0.090$); and 3.7% in rural and 4.2% in urban areas ($P = 0.366$). The highest rate of trauma was reported from Kurdistan province with 18.9% and a mean number of 4.94 teeth involved. Although Khorasan Jonubi province reported the highest number of teeth (9.1) involved in 2.9% of the 65–74-year-old adult populations.⁶

Treatment Needs

Only about 15.7% of the 5–6 year old children did not need any treatment. Which means that, about 84.3% of 5–6 year old children were reported to be in need of treatment (Table 6). The need was almost equal in both sex (male = 84.0%; female = 84.5%), while children living in rural areas (88.2%) had more need compared to children living in urban areas (81.9%) ($P < 0.001$). The treatment needs in 6 provinces were reported to be more than 90% of children 5–6 years old. Of all those who need treatment, 2.5% were in need of scaling and

Table 6. Treatment needs by age, sex and place of residence (INOHS-2012)

Age group	Total	Urban	Rural	Male	Female
5–6	84.3	81.9	88.2	84	84.5
12	75.1	72.3	79.6	75.8	74.3
15	76.0	73	81.2	75.9	76.2
35–44	86.1	84.4	88.9	87.0	85.7
65–74	45.9	43.7	49.4	46.8	45.0

prophylactic treatment (cleaning of teeth); 69% needed immediate restoration for asymptomatic cavities; 12.3% had emergency treatment need for relief of pain and/or infection; and 0.5% needed referral for specialty evaluation (Figure 6).

About 75% of 12 year old children were in need of treatment (Table 6). The treatment need was very close in boys (75.8%) and girls (74.3%) ($P = 0.173$). While children living in rural areas (79.6%) had significantly more needs compared to children living in urban areas (72.3%) ($P < 0.001$). The treatment needs in 10 provinces were reported to be more than 80%. Of all those who needed treatment, 11% were in need of scaling and prophylactic treatment (cleaning of teeth); 57.7% needed immediate restoration for asymptomatic carious teeth; 5.7% had emergency treatment for relief of pain and/or infection; and 0.7% needed referral for more comprehensive evaluation.

About 76% of 15 year old children were in need of treatment (Table 6). The treatment need was very close in boys (75.9%) and girls (76.2%). While children living in rural areas (81.2%) had significantly more needs compared to children living in urban areas (73%) ($P < 0.024$). Of all those who need treatment, 12.2% were in need of scaling and prophylactic treatment (cleaning of teeth); 56.3% needed immediate restoration for asymptomatic carious teeth; 7.1% had emergency treatment for relief of pain and/or infection; and 0.6% needed referral for more comprehensive evaluation.

About 86% of the 35–44 year old adults were in need of treatment (Table 6). The treatment need was very close in male (87%) and females (85.7%) ($P = 0.250$). While adults living in rural areas (88.9%) had significantly more needs compared to adults living in urban areas (84.4%) ($P < 0.001$). Of all those who need treatment, 9.4% were in need of scaling and cleaning of teeth; 60.8% needed immediate restoration for asymptomatic carious teeth; 13.4% had emergency treatment need for relief of pain or infection; and 2.5% needed referral for more comprehensive evaluation by specialists.

About 45.9% of the 65–74 year old adults were in need of treatment (Table 6). The treatment need was higher in male (46.8%) compared with females (45%) ($P = 0.485$). While adults living in rural areas (49.4%) had significantly more needs compared to adults living in urban areas (43.7%) ($P < 0.001$). Of all those who need treatment, 4.5% were in need of scaling and prophylactic treatment; 24% needed immediate restoration for asymptomatic carious teeth; 8.2% had emergency treatment need for relief of pain and/or infection; and 9.2% needed referral for more comprehensive evaluation.⁵

New Initiative on Smoking Cessation in Dental Office

Tobacco use is a common risk factor and is one of the main root cause of many oral- and systemic diseases. The harmful effect of tobacco starts in the mouth, it can affect dental, periodontal as well as overall health, well-being and quality of life in smokers and anyone around them. Since there are about 30,000 dentists practicing in Iran, it is a unique opportunity to provide smoking cessation program by the dental team in dental clinics. Based on the local studies conducted in Iran,⁵ large numbers of dentists have expressed interest in providing consultation and cessation services for patients who smoke. These dentists mostly expressed the need for learning the necessary skills for effective patient communication and counseling. So far, more than a dozen of Training of the Trainer (TOT) workshops has been conducted at the national level. As a result, more than 200 volunteer dentists from all 30 provinces have successfully completed the training program and developed effective communication and consultation skills for smoking cessation. These trainers are running the local workshops at the provincial level. When necessary, referral from dentist to cessation specialist for additional consultation and support can be arranged. Further expansion of such trainings can be facilitated by collaborative activities of the WHO Collaborating Center for Training and Research in Dental Public Health; and the WHO Collaborating Center for tobacco control, both located at Shahid Beheshti University of Medical Science and health services, in Tehran, Iran. At the same time, NGOs Collaboration (www.dentii.info) has been instrumental over the past decade to accomplish greater achievements in smoking behavioral change.

Dental and Oral Health Research Activities

Numbers of dental research projects have been substantially increased over the past 30 years. Priorities in dental research have been evaluated by three different institutions independently. Although government support has been increased substantially but, funding has not reached to the expected level yet. The research projects supported by the Ministry of Health have been very effective in leading to great discoveries such as the CEM-Cement an internationally well-known dental material that was developed as a result of local investigation. It has been successfully used for saving the primary as well as permanent dentitions from early tooth loss both in adults and children. Using this material in oral health units of

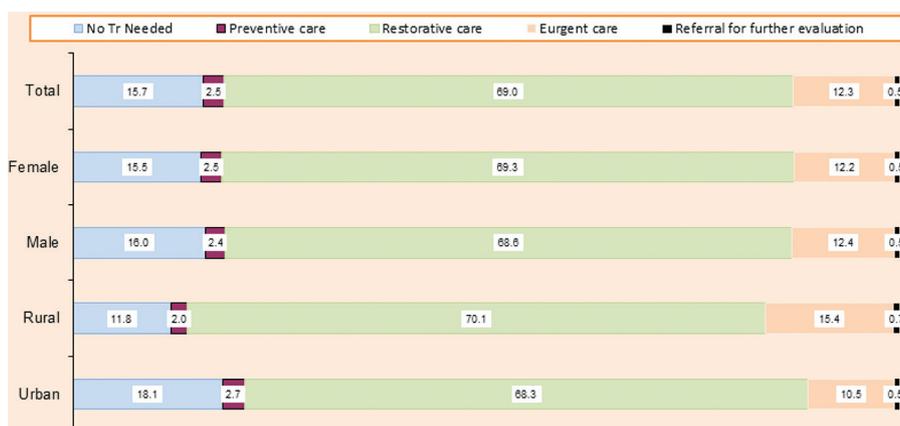


Fig. 7 Distribution of treatment needs among 5–6-year-old children by sex and place of residence (INOHS-2012).

the national healthcare network was instrumental in preventing several thousand teeth from early extractions each year. This is an example of knowledge translation into practice, using evidence-based interventions.

Dental Equipment, Instruments and Materials

Although many imported goods are still being used in Iran, the move for local production of considerable number of dental equipment, instruments and materials have been started decades ago. The numbers of local products are ever increasing. Many of these items with the successful local market are being exported to other countries as well. Today, many dental professionals prefer to use local dental products due to good quality, pricing and after sales services available nationwide.

Discussion and Conclusion

For many years it has been a problem to bring a deeper understanding of Oral and Dental Public Health to the attention of decision makers on what could be done about oral disease prevention and oral health promotion and protection in Iran. Such diseases not only affecting individuals by pain, infection, discomfort, early tooth loss and eventually cause disability and negative systemic health effects, but also can have greater impact on the community and health system through ever-increasing associated costs. The overall treatment cost far exceeds any assumptions, when considering the systemic diseases caused or aggravated by oral conditions. It has been reported that the cost of treatment in such cases are even higher than the cost of cancer, cardiovascular diseases and stroke to name a few. At the same time, it is extremely disturbing to know that these are all happening while oral diseases are preventable through simple cost-effective measures; but it is still being neglected in most parts of the world.

Lack of supportive oral health promotion Policies for allocation of appropriate resources (money and manpower) has

been the major reason for the current challenging situation in the country. At the same time, robust data was needed for proving the need for proper policy as well as preventive program development. Such data is also needed for evaluation of any intervention and demonstration of preventive program effectiveness. Otherwise, the escalating cost of treatment will greatly impact low income individuals and communities. There is strong evidence that the cost of preventive care is much less than the treatment, for both individuals and governments.

The declaration of the National Oral Healthcare reform, as a fully integrated program in PHC, has greatly facilitated better public access to preventive oral care. Given the availability of strong evidence-based methods and best practice measures for dental caries and periodontal disease prevention; everyone, especially the designated priority target groups in Iran are expected to benefit the most, for all the years to come. The current policy with appropriate investment of resources can be instrumental in increasing awareness, enhancing patient education to encourage healthy life style and self-care. All these good practices are necessary for our nation to become a "Caries free nation" by 2025 as it is particularly evident in many Scandinavian countries.

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Conflict of Interest

None ■

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