

Caries prevalence in Chikar, Kashmir, post-earthquake: implications for service provision

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Aim: To conduct a preliminary assessment of the level of dental caries among school children in Chikar. **Design:** A cross sectional epidemiological survey (following WHO standard protocol) of children in Chikar with convenience sampling from five schools was utilised. **Setting:** Schools in Chikar. **Participants:** 311 school children (boys and girls); 35 5-9 year-olds, 41 10 year-olds, 39 11 year-olds, 48 12-year-olds, 65 13 year-olds, 35 14 year-olds, 21 15 year-olds, and 27 16-20 year-olds were examined. **Results:** Overall, children had a Decayed, Missing, Filled Tooth (DMFT) mean of 3.3; girls had a DMFT of 3.0, while boys had a DMFT of 3.4. Since the October 2005 earthquake in Chikar, oral health services had not been functionally restored. With limited equipment and materials, the local dental technician was treating, on average, 112 patients monthly since January 2006; he was performing approximately 50 extractions and providing 62 medication prescriptions and referrals to dentists in the main city of Muzaffarabad every month. **Conclusions:** Traditional curative oral health care is in demand in Chikar; health care authorities should integrate basic oral health care into Chikar's health services. The pilot survey suggests that Chikar children have a high caries rate; oral disease prevention and oral health promotion programmes should be created and encouraged throughout the community and be integrated into school curricula.

Key words: Basic oral care, caries, DMFT, earthquake

Currently there is no published data on the oral health status of Kashmiris. Neither the World Health Organisation (WHO) nor the World Dental Federation (FDI) has any statistics with respect to the oral health status or oral health related resources/manpower in Azad Jammu Kashmir (AJK). Data are available on neighbouring Pakistan that can be extrapolated to AJK and the recent National Oral Health Report of Pakistan from 2003 describes the number of dental personnel in AJK¹⁻³.

In Pakistan, 69.3% of the population live in the rural areas and do not have access to basic dental/oral health care¹⁻⁵. Rural Pakistanis have many oral health problems; there is a higher caries rate and greater gingivitis and periodontal disease in every age range compared to their

urban counterparts¹⁻³. Although there are no formal studies on oral cancer, it is the second most common cancer in Pakistan and there is a lack of preventive fluoride at a consistent level throughout the country's water supply¹⁻³. Poverty, a high illiteracy rate, and the lack of access to oral health services contribute to the burden of oral disease. The total government expenditure on health (2003) was \$4US per capita or 0.57% of the GNP, one of the lowest in the world^{1,6}. No portion of this expenditure was allocated specifically towards oral health.

The primary source of medical care for rural Pakistanis is the basic health unit (BHU)^{1,7}. There are no dental personnel or dental services available at the 5,290 BHUs

in Pakistan. Dental care is available at the next level of health care: the rural health centre (RHC). Most RHCs have inadequate or no dental materials or instruments, and 40% have inoperable equipment. Most lack dental drugs, as these are not on the RHC drug list. This indicates the low priority of oral health in the national health program. *Table 1* shows that a publicly employed Pakistani government dentist working in a rural post serves twenty-two times the population the average Pakistani dentist would expect to serve nationwide^{1,7}.

In AJK, the situation for rural oral health services is poor (*Table 1*). Of the 148 Dentists located throughout AJK, 58 are employed by the public sector of the AJK Government and all are located in the cities - with no oral health coverage for the rural population.

In Chikar, a rural AJK town of about 15,000 people that was hit hard by the 2005 earthquake, the basic health unit was destroyed and the only dental clinic was left inoperable.⁸⁻¹³ The Ministry of Health (MoH) of AJK set up a Rural Health Center (RHC) in Chikar to provide health services from two physicians (a general practitioner and a pediatric specialist) and outreach to the community via 57 lady health workers (LHWs); the United Nations Family Planning Agency (UNFPA), in collaboration with the MoH, hired two full-time female physicians for maternal issues and pregnancies. In partnership with the MoH's RHC, a basic health unit (BHU) was also set up in Chikar by the Pakistani NGO Comprehensive Disaster Response Services (CDRS). The local dental technician was hired by the MoH RHC to take care of oral health concerns. The RHC's dental clinic was very small and contained a wooden chair for the dental technician and a wooden table for the patient; there was no electricity to the clinic or running water for procedures and dental supplies and instruments were at a minimum.

Chikar's oral health system has similarities to the Pakistani oral health system: there is no oral health care available at the BHU level (at the CDRS health clinic) and the RHC dental clinic is running with very limited supplies, instruments, dental medicines/drugs and personnel.

Despite all of the local, national, and international relief efforts throughout Kashmir, as of May 2007, 20 months after the earthquake, Chikar still had no functional dental clinic or dentist (the local Chikar dentist moved to the city of Muzaffarabad). There was, howev-

er, need for a dental unit/clinic and dental professionals that could provide comprehensive oral health care: since the earthquake, the dental technician in the Chikar AJK RHC has been treating, on average, 112 dental patients monthly, performing 50 extractions and providing 62 medication prescriptions per month.

The purpose of this pilot project was to conduct a preliminary assessment of the level of dental caries in Chikar school children since there is no information on oral health status in Kashmir. The results of such an assessment would help to initiate the establishment a long term oral health education, promotion, and services strategy for Chikar.

Methods

Caries assessment survey

Convenient sampling of school children in five Chikar schools was undertaken. The principals of each school were approached and permission was granted to do clinical oral examinations on the children. At one of the schools, only boys were permitted to participate, as the clinical examiners were only men, permission to clinically examine the girls was not granted.

Caries prevalence was conducted using the criteria for caries described in WHO Oral Health Surveys Basic Methods; the Dental Status/Caries Recording Form version WHO CC 02/DB from the WHO Collaborating Centre in Malmo, Sweden was utilised and 314 students were examined; 311 students (boys and girls) completed the clinical examinations and three elected not to complete the examination.

The surveys at the different schools were conducted under similar field conditions. Two examiners (a dentist and a dental hygienist) conducted the surveys; the examiners were not formally calibrated and tester reliability was not established. An assistant from the CDRS BHU accompanied each field examination visit and recorded the students' demographics. Student participants were seated in a chair, asked to recline their heads, and examined by gloved and masked examiners wearing headlamps.

Table 1 Dentist distribution in Pakistan and Azad Jammu Kashmir (AJK)

Area	Number of dentists	Population	Dentist/Population Ratio
Pakistan: National	6,761	154,000,000	1: 22,777
Pakistan: Rural	200 (541 RHUs-341 empty RHU posts)	104,000,000	1: 500,000
Kashmir: National	148	3,500,000	1: 23,649
Kashmir: Urban	58 (in public sector of AJK)	1,050,000	1: 18,104
Kashmir: Rural	0	2,450,000	0: 2,450,000

The data collected were entered into Microsoft Office Excel spreadsheets for analysis. Primary outcomes included:

- The overall proportion of surveyed students that had caries and the proportion of students with dental decay by school (Table 2). 95% confidence intervals for the proportions were determined by the dichotomous outcome one sample test.
- The mean DMFT of all the surveyed students and the mean DMFT for surveyed girls and boys at each school (Table 3). Means and 95% confidence intervals for the means were calculated using the descriptive analysis tools in excel.
- A comparison of the DMFT means by age group and sex (Table 4).

Table 2 Comparison of percentage of examined students with dental decay by school

School	Estimated Total Number of Students in School	Number of Students Examined	Number of Students with examinations completed	Number of examined Students with dental decay	Percentage of Examined Students with dental decay
Kohsar Public School	80	20	20	20	100.0*
Islamia Public School	415	124	122	91	75.0 ±7.7 (67.3-82.7)*
Fatima Foundation Public School	128	75	74	63	85.0 ±8.1 (76.9-93.1)*
Read Foundation Public School	113	66	66	57	86.0 ±8.4 (77.6-94.4)*
Government Pilot Boy's High School	500	29	29	16	55.0 ±18.0 (37.0-73.0)*
Total	1236	314	311	247	79.0 ± 4.5 (74.5-83.5)*

* 95% CI

Table 3 Comparison of DMFT means for boys and girls by school

School	Boys Examination Completed			Girls Examination Completed			Combined	
	n	Age	DMFT Mean	n	Age	DMFT Mean	n	DMFT Mean
Kohsar Public School	20	10-15	6.2 ±2.7 (3.5-8.9)*				20	6.2 ±2.7 (3.5-8.9)*
Islamia Public School	77	7-17	3.1 ±0.6 (2.5-3.7)*	45	10-16	2.6 ±0.8 (1.8-3.4)*	122	2.9 ±0.5 (2.4-3.4)*
Fatima Foundation Public School	44	6-17	3.6 ±1.0 (2.6-4.6)*	30	6-16	2.7 ±0.9 (1.8-3.6)*	74	3.2 ±0.6 (2.6-3.8)*
Read Foundation Public School	36	6-17	4.4 ±1.4 (3.0-5.8)*	30	5-16	3.9 ±1.2 (2.7-5.1)*	66	4.2 ±0.7 (3.5-4.9)*
Government Pilot Boy's High School	29	9-20	1.0 ±0.5 (0.5-1.5)*				29	1.0 ±0.5 (0.5-1.5)*
Total	206		3.4 ±0.4 (3.0-3.8)*	105		3.0 ±0.6 (2.4-3.6)*	311	3.3 ±0.3 (2.7-3.6)*

*95% CI

Table 4 Comparison of DMFT scores for boys and girls by age category

Age (Years)	Boys Examination Completed		Girls Examination Completed		Combined	
	n	DMFT Mean	n	DMFT Mean	n	DMFT Mean
5-9	21	5.3	14	4.2	35	4.9
10	28	4.2	13	4	41	4.1
11	26	5.0	13	3.8	39	4.6
12	37	4.0	11	3.2	48	3.8
13	43	2.1	22	2.5	65	2.2
14	20	2.6	15	1.5	35	2.1
15	11	1.8	10	2.2	21	2.0
16-20	20	1.9	7	3.1	27	2.3
Total	206		105		311	

Results

Caries experience

Overall, 25% of the population of the four schools was surveyed through a convenience sample. Selection bias is a concern and these surveyed children may not be an accurate representative of all children in the school district of Chikar which has more than 20 schools. Furthermore, close to twice as many boys were surveyed (206) than girls (105).

The proportion of surveyed students that had caries was 79%. *Table 2* shows the percentages of examined students with dental decay by school; four of the five schools surveyed had high percentages (over 70%) of examined students with decay, the exception being Government Pilot Boy's School where 55% of examined students had decay, although it should be noted that 6% (29 out of 500) of that school's population was examined (due to summer holidays, only a handful of students were available at the school to participate).

Table 3 shows the mean DMFT of the surveyed children to be 3.3. At schools where boys and girls were examined, the mean DMFT for boys was consistently higher than for girls: 3.1, 3.6, and 4.4 as compared to 2.6, 2.7, and 3.9 respectively. For data analysis purposes, certain age groups were combined to create adequate sample sizes in each category: ages 5, 6, 7, 8, and 9 were combined into the 5-9 category and ages 16, 17, 18, 19, and 20 were combined into the 16-20 age category.

Table 4 compares the DMFT means by age group and sex. Younger children had higher DMFT means, while elder children displayed lower DMFT means. *Figure 1* illustrates the DMFT means per age group of the surveyed Chikar school children and *Figure 2* compares the DMFT means of boys and girls per age surveyed. In most age categories, except ages 13, 15, and 16-20, boys displayed higher DMFT means than girls.

Due to time constraints, the community periodontal index was not recorded in this survey. However, each participant's soft tissue was examined and periodontal status (normal, mild inflammation, moderate inflammation, severe inflammation) and calculus build-up (none, mild, moderate, heavy) were noted. 100% of the subjects had some degree of periodontal inflammation and calculus build-up; the majority had never had a scaling or prophylaxis.

Discussion

This pilot study confirms that Kashmiri rural oral health care, like Pakistani rural oral health care, is lacking in dental infrastructure and manpower. The oral health survey reveals that Chikar school children have a mean DMFT of 3.3. This is high compared to the 2003 Pakistani DMFT and the 2004 Global DMFT for 12-year-olds of 1.38 and 1.64, respectively^{14,15}.

Pathfinder surveys, whether pilot or national, recommend survey index ages and age groups of 5 years for primary teeth and 12, 15, 35-44, and 65-74 years for permanent teeth¹⁶. Most scientific studies assessing caries in children focus on the 12-year-old category as it is the global monitoring age for caries for international comparisons¹⁶⁻¹⁹.

This pilot survey examined forty-eight 12-year-olds whose mean DMFT was 3.8. Furthermore, the study examined a range of ages, not 12-year-olds exclusively, and a broader picture of caries experience and disease trend within Chikar's community of children was revealed: younger children in the 5-9, 10, and 11 year-old age groups had higher mean DMFTs at 4.9, 4.1, and 4.6 than older children in the 13, 14, 15, and 16-20 year-old age groups whose mean DMFTs were 2.2, 2.1, 2.0, and 2.3 respectively. As such, prioritisation of oral health education, disease prevention, and curative dental treatment should be targeted at the youngest of school children.

A reason for younger children having higher DMFTs than older children could be due to the presence of chronic decayed primary teeth in young children, where as, older children displayed erupting permanent teeth that had not had a chance to become carious and their possible chronic primary teeth probably exfoliated recently. As such, this natural dentition change could play a factor in younger children appearing to have higher DMFTs than older children.

The study also revealed that in most age categories boys had higher DMFTs than girls; an evaluation of oral hygiene habits of boys versus girls and their respective dietary habits could shed light on this finding. Another interesting finding is that the boys of the Government Pilot High School had an average DMFT of 1.0, the lowest of all the sampled children. Further inquiry into their diet and oral hygiene habits could reveal why their DMFT was so low compared to other schools. It is important also to reflect on the fact that only 29 of the 500 boys at Government Pilot High School were examined. An examination of a larger sample size would verify if this DMFT of 1.0 was accurate.

The principal of each school was given a list with every student examined and how many teeth were decayed per student; schools were encouraged to contact the parents of these students and arrange for curative/preventive care at a new dental clinic that was recently installed in the CDRS BHU. Although there were 311 total participants in this study, a limitation is the varying sample size in the age groups; for example, the 15 year-old group had 21 participants while the 13 year-old group included 65 participants. An improved study design would include larger and consistent age and sex group sample sizes.

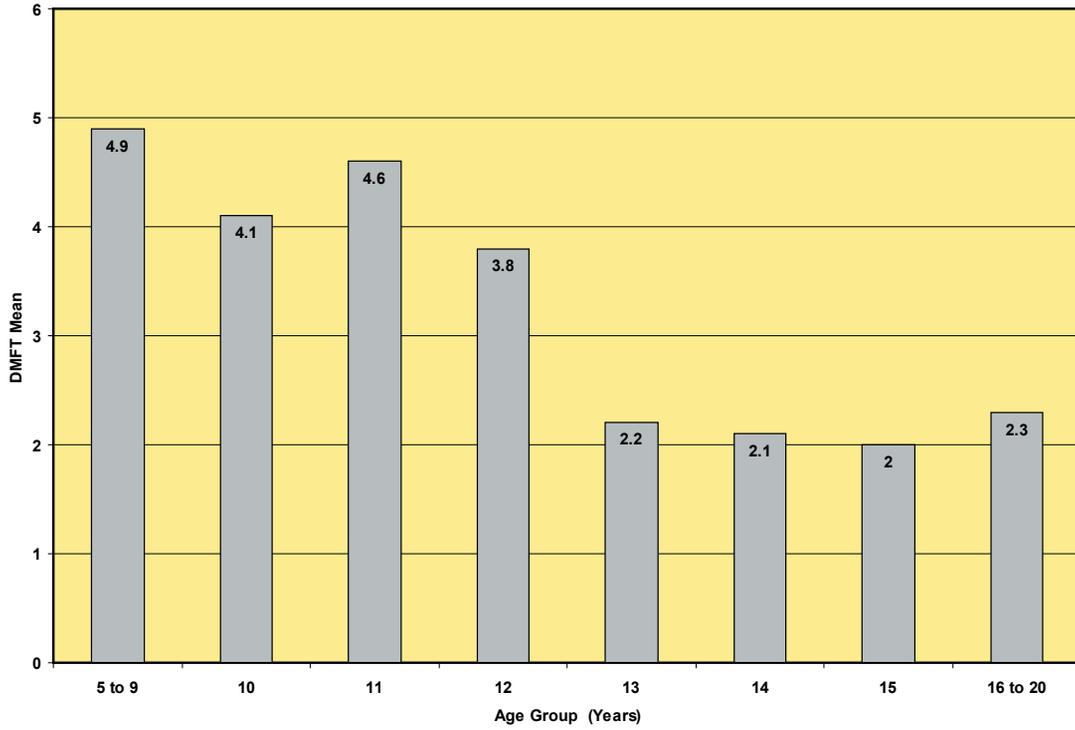


Figure 1. DMFT Mean per age group of Chikar School Children

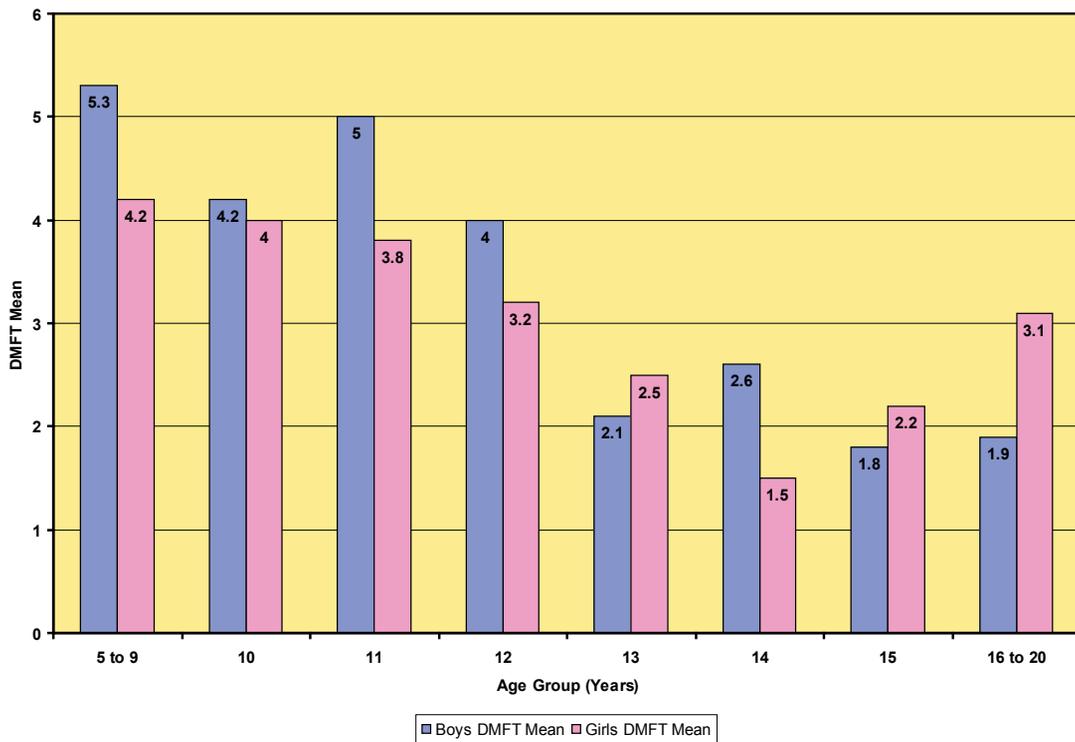


Figure 2. DMFT Mean comparisons of boys and girls per age group

Sustaining oral health care in Chikar

Several options below explore how to achieve sustainable oral health care in Chikar.

Increase the number of dental schools and dentists

The logistics and infrastructure development of new dental schools would be costly to the health sector. At present, there are 16 dental schools in Pakistan, 10 of which are private institutions²⁰. There is currently a paucity of well-trained instructors to teach at these dental schools, furthermore, a dental education is expensive, and training time is lengthy¹. Increasing the number of dentists does not guarantee that more of them will provide service in the rural areas; 70% of current dentists work in private practice (urban) and 20% work in public service (mostly urban)²⁰. A lack of proper facilities contributes to low morale among dentists currently working in the public sector and reduces the appeal of rural dental work. These infrastructural issues must be addressed in order to fill even the existing positions. Consequently, an increase in the number of dentists would have little impact on the provision of oral health services in rural areas.

Integrate Primary Oral Health Care into general health care by lady health workers

Utilising a large non-dental labour force, such as the lady health workers (LHW) in Pakistan, is a key strategy in the incorporation of oral health into general health^{21,23}. LHW are an integral component of the community work force in Pakistan and deliver a range of services including, childhood immunisation promotion, growth monitoring, family planning, and health promotion and education. They also treat minor ailments and injuries, and are trained to identify and refer more serious cases to physicians²².

The LHW training programme is a three month class-room course followed by a full year of on-site clinical care. Each LHW is allocated 1,000 people to treat²². A dental curriculum that reviews Primary Oral Health Care (POHC) with Basic Package of Oral Care (BPOC) and emphasises referrals to the dental clinic could be incorporated into the existing LHW education module. The content and duration of education to LHW needs to be substantial enough to effectively have an impact and not overburden their workload²³⁻²⁶. Since dentists are stationed at the RHC, where LHW receive their training, these dentists could be employed as the supervising educators for this curricular addition.

LHW already disseminate health education messages on general hygiene and sanitation and could become competent in oral health education; with appropriate training^{27,28}, Chikar's LHW could become an important resource in oral health care.

Pakistani dental students fulfil clinical field rotation in rural areas before graduating or recent graduates complete 'Rural Residencies'

There are many benefits to having dental students participate in rural dental placements. They will be exposed to underserved areas and populations that they otherwise may not seek out. It will engage them in a wider variety and range of experiences that will enhance their clinical repertoire and sense of professionalism. The experiential 'field training' will provide real world scenarios to complement their classroom/theoretical training. The experience may inspire some students to pursue specialty careers in rural oral health services. Most of all, a successful community based programme with senior dental students or recent graduates serving in remote rural areas will provide care to people who might not otherwise receive any treatment.

Recognising the importance of preparing dental professionals with the right educational and clinical tools to manage the population's oral health needs has inspired Vietnam to modify the curriculum in all three of its dental schools to focus on teaching community based preventive treatment²¹. Moreover, these dental schools are requiring dental graduates to work in government postings for up to three years.

The logistics of a dental school outreach by students necessitates a full and functioning BHU and dental health unit. Dentist supervisors, either from the dental school or independently from the community would be required to supervise and evaluate student work. Another challenging issue includes patients who consider students inexperienced and may not want students working on them. Moreover, students or recent graduates may resent being 'forced' to work in the rural areas. Despite these aspects, the aforementioned benefits of broadening the scope of dental education to address oral health disparities and treat those with limited access are greater and ultimately will create a dental professional who is ready to promote health and treat individuals irrespective of socio-economic status or geography.

Conclusions

- The pilot survey reveals that Chikar children have a high rate of tooth decay; a comprehensive epidemiological oral health survey should be conducted on Chikar's child (5, 12, and 15 year-old) and adult population.
- Curative oral health care is in demand in Chikar; the introduction of primary oral health care into LHW training and the establishment of rural externship programmes for dental students/recent graduates to provide services in the Chikar clinic would be a step toward sustaining rural oral health care.
- Oral health care should be incorporated into Chikar's general health strategy and oral health education and promotion programmes should be created, encouraged throughout the community and be integrated into school curricula.

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