Prevalence of Malocclusion in Adolescents in Urban Peshawar- First Orthodontic Survey of Pakistan Revisited

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Abstract

Aim: To conduct the baseline survey on Orthodontic Treatment need in Peshawar Pakistan. Up until September 1999 no study had been performed to evaluate orthodontic treatment need in Pakistan.

Methods: The sample consisted of 597 randomly selected school adolescents between the ages of 13 - 16 years. 51% males and 49% females were examined in a standardized manner. Orthodontic treatment need was assessed using Index of Orthodontic Treatment Need (IOTN)- Dental Health Component.

Results: The data shows that 51% of the population needs some sort of orthodontic treatment, with 22% definitely needing orthodontic intervention.

Conclusions: On reflection over the past 15 years and comparison with other international and national studies the results seem to stand out as similarities across the globe.

Keywords: IOTN; Orthodontic Index/Indices; Peshawar; Over Jet; Over Bite; Removable Appliances; Fixed Appliances

Introduction

Recently, there has been an upsurge to find treatment need in orthodontic patients worldwide especially in developing countries like Nigeria [1,2], Tanzania [3,4] etc. primarily aiming at finding need and demand of Orthodontic treatment due to the lack of specialists in the field and economic constraints associated. The absence of base line data prevents the profession from judging the future orthodontic need for the country. On the other hand indexing orthodontic problems helps the GDP for specialist referrals so that the patient gets the best possible Orthodontic treatment [5].

Several systems for classification of malocclusion do exist in Orthodontics. However, evaluating treatment need requires a special index that can gauge the severity of the malocclusion and be sensitive enough to pick up the cases that would most benefit from orthodontic treatment. The World Health Organization (WHO) defines an ideal index for epidemiological use as the one which is reliable, valid, acceptable to the profession and public, and been simple both technically and administratively. They have a role in resource allocation and planning, promoting treatment standards, identifying prospective patients, and informed consent [6].

Various orthodontic indices are available that help rank malocclusion according to severity [7]. Some of the widely used ones are Handicapping Malocclusion Assessment Record (HMAR) devised by Salzmann in 1968; Occlusal Index (OI) by Summers in 1971; Peer Assessment Rating (PAR) by Richmond., *et al.* in 1992; and Index of Orthodontic Treatment Need (IOTN) having two components:

a)   Dental Health Component (DHC) devised by Brook and Shaw in 1989.

b)   Aesthetic Component: Standardized Continuum of Aesthetic Need (SCAN) by Evans and Shaw in 1987.

The HMAR and the OI are mostly of academic interest while the PAR [8] helps evaluate the difference for a particular orthodontic case, pre- and post-treatment made in the quality of occlusion both functionally and aesthetically for the patient. The IOTN on the other hand has emerged as one of the most reliable index for measuring the severity of the malocclusion in epidemiological studies. Recent studies of various indices, has shown an overwhelming overall diagnostic accuracy with 98.6% for IOTN [9]. Although the SCAN shows improvement over time when used in adolescents, the DHC is seen to be reliable over time despite the changes in occlusal traits that comprise the index, that is the IOTN grading in early adolescent year is unlikely to change by the time the patient has entered into adult life [10]. Though IOTN

may show an exaggerated sensitivity to mixed dentition traits, many children remain in the same treatment category when assessed as a 10 year old and then as a 13 year old [11]. Thus, due to these factors 74.6% of all UK consultants routinely record DHC of IOTN for their new patient referrals [12].

The primary aim of this study conducted 15 years ago and presented as an abstract in the 22nd Pakistan National Dental Conference at Quetta, Pakistan was to find out what percentage of our adolescent population suffers from the different types of malocclusion and what percentage would benefit from orthodontic treatment; through the use of the internationally accepted index IOTN. After a series of subsequent similar studies published elsewhere, we found it prudent to publish the survey with relative detail to see if the trends have varied nationally and internationally.

Material and Methods

The sample to be examined was selected from six different schools in urban and suburban Peshawar, the capital of North West Frontier Province of Pakistan (the province has ever since been renamed as KPK: Khyber-Pakhtunkhwa). Two schools were selected each from the three urban divisions of Peshawar, trying level best to keep the sample as widely dispersed as possible. Written permission was acquired from the school administration prior to the survey.

A comprehensive standardized form (Figure 1) was used with four basic sections. The first section comprised of interview with personal and demographic details along with any history of past Orthodontic treatment. Presence or absence of habits was recorded. The second section was devoted to extra oral exam with a particular emphasis on skeletal pattern and symmetry. The third section was for intra-oral assessment with details for orthodontic diagnosis. In intra-oral exam any pathology, caries, restorations, broken down roots or trauma was recorded as well. The fourth and final section was dedicated to IOTN grading.
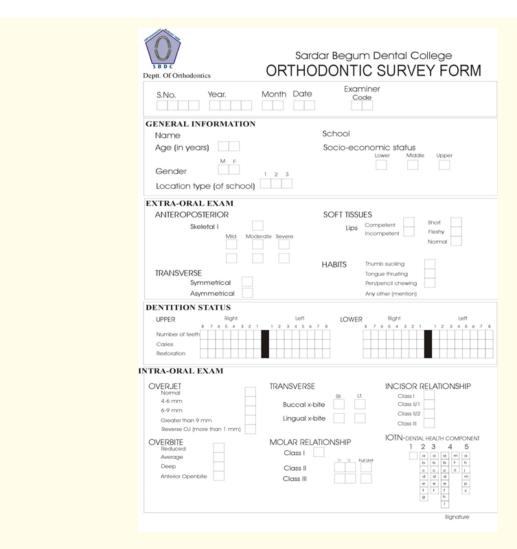

Figure 1: *Survey form used. Note the subdivisions for easy-to-use, one-glance fillings.*

Six examiners were selected including the authors and one dental assistant was employed. Three examiners were allocated intra oral exam while the other three for extra oral exam and interview. Each examiner was trained and calibrated prior to the actual survey in order to reduce intra- and inter-examiner variability and error factor.

The survey was conducted in the last week of September of 1999 with the slogan "Smile Away into the Next Millennium". The extra oral and intra oral exam was carried out doors using natural light. Intra-oral exam was carried out on a mobile dental unit. Typical examination instruments including a mouth mirror, probe, tweezers and a steel scale six inches in length were used to record over jet. All these instruments were sterilized in the portable ultraviolet sterilizer.

On an average, 100 students were examined per day. Oral health status was documented for each student and if they needed any probable restorations, scaling, root canal or extractions of broken down teeth and a prescription of the required dental procedure was handed to them for their parents' attention. Each student was also given oral hygiene instructions on an individual one to one level. Their queries and concerns were gladly answered, thus fulfilling the ethical aspect of the survey. Students with excellent oral hygiene were awarded with special dental gifts. A brochure detailing on malocclusion and its effects and how it can be corrected was distributed among the students.

Results

607 students were examined with an age range of 13 - 16 years. 597 forms were selected for data analysis while the rest were discarded for being inaccurate with overage or underage students. 51% males and 49% females participated in the survey. 13 year olds formed the biggest group with 31% representation, while 16 year olds formed the smallest group with a distribution of 16%.

The study showed 90% of the students had no orthodontic treatment, 7% had removable appliance therapy and only 3% had an ongoing or past fixed appliance therapy (Figure 2).
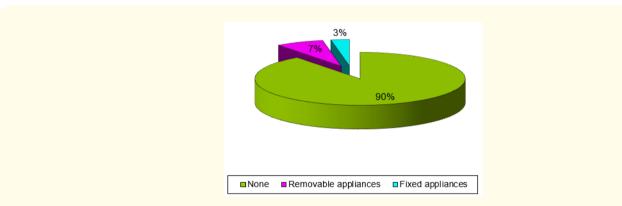

Figure 2: Past Orthodontic Treatment reported by survey sample in Peshawar, Pakistan.

Extra oral findings: A Class I skeletal pattern was exhibited in 67% of the subjects, 18% showed Class II skeletal pattern while 15% adolescents had Class III profile. Asymmetry was found in 5% individuals. Lip incompetence was found in only 4% of the population. In habits the most common habit noted was nail biting followed by pencil or pen chewing.

Intra oral findings: Most significant orthodontic features; the overjet and overbite were recorded.

Overjet was within the normal range for 69%. It was increased in 15% individuals. Severe reverse overjet of -9mm or more was found in 1% of the population. 15% showed some degree of reduced, edge-to-edge or negative overjet (Figure 3).

54% of the population showed average overbite, but it was reduced in 24% while deep and traumatic in 20% of the subjects. A small percentage showed anterior openbite (Figure 4).

Molar relationship according to Angle's classification was Class I in 64% of the individuals, Class II in 22% and Class III in 11%. Details were also reported for uncertain relationships, and ¼ and ½ Unit molar relationships. The incisor relationships according to British standards was found to be Class I in 80% while Class II/1 was found in 9% and Class II/2 in 3%. Class III incisor relationship was found in 5% of the population. Anterior Open bites were in 3% of the survey population.
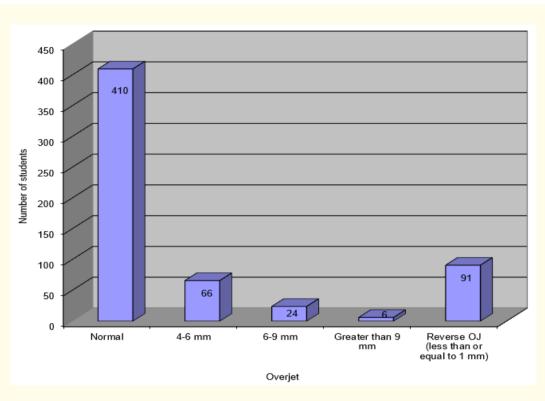
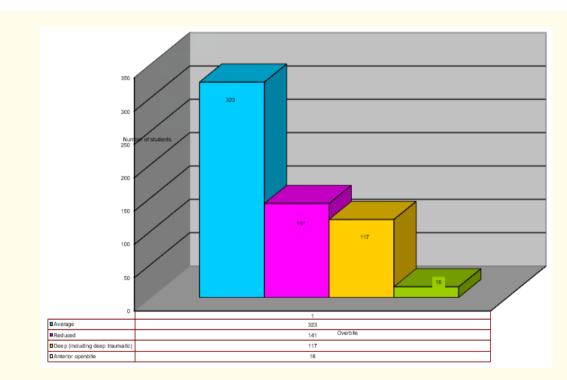*Figure 3: Overjet distribution in the population sample in Peshawar, Pakistan.*

Figure 4: Overbite distribution in the sample population in Peshawar, Pakistan.

IOTN findings: 49% of the individuals were placed in Grade 1, which meant no orthodontic treatment was needed. Only 2% were found in Grade 5, having an urgent need for Orthodontic intervention. While the remaining 49% were between Grade 2-4 needing some sort of orthodontic treatment in the future (Figure 5).
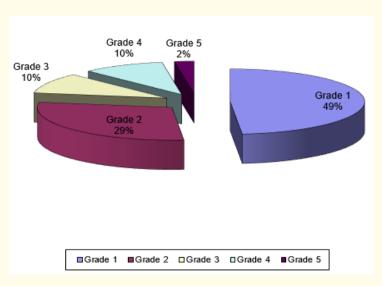

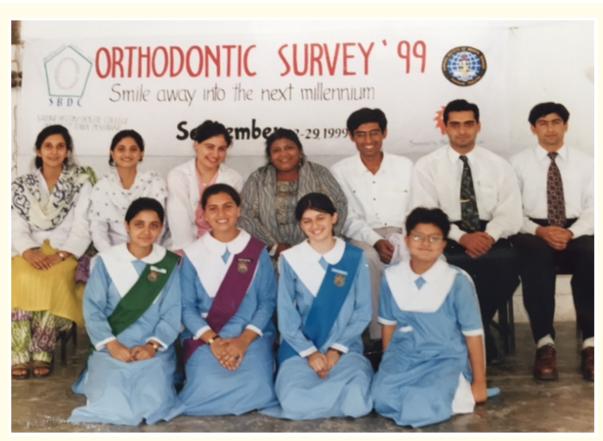*Figure 5:* IOTN distribution in survey sample in Peshawar, Pakistan.

Figure 6: Group photograph of the Survey Team at University Model School, Peshawar Pakistan.

Discussion

One must appreciate the shortcomings of any index system, that is the risk of insensitivity or misjudgment of the patient's perception to their condition. This is a dilemma that no system has been successful in solving in Orthodontics where minor irregularities may create excessive apprehensions and concerns in the patients or parents [13]. Malocclusion is complex and can be measured qualitatively and quantitatively [14]. IOTN is the only one encompassing both the features with AC component helping to assess in numerical scale patient's perception of the condition. According to Abdullah and Rock [15], the IOTN index was found to be efficient and fair; identifying children who required orthodontic treatment, when AC and DHC were used together. Again AC is dependent on several factors such as economic background and cultural factors to name a few [16].

Orthodontic surveys are important from two main aspects. Firstly, they help assess the need of the community thus helping prioritize treatment to the group most in need especially in teaching hospitals or funded clinics [17]. Secondly, it helps the fresh dental graduate to understand the spectrum of severity of orthodontic cases and apply appropriate referrals where deemed necessary [18]. Where arranging referrals, it is emphasized that certain recognizable traits will make a case easier or more difficult for most orthodontists [19]. We observed that IOTN seems to cover these traits very aptly. In the common indices used, there is a point below which the severity of a malocclusion is considered to be so minor that there is no need for treatment and all values above that point indicate malocclusion for which treatment is indicated. In effect, an index with a cutoff point functions as a diagnostic test for treatment need [20].

A study documented in the literature had the same protocol and regime as ours to assess the orthodontic treatment need in Jordanian school children. It had a low over all need due to dental health reasons at 28% [21].

This was the first ever, orthodontic survey of Pakistan and it set the base line for further surveys and research. It was interesting to note that our population has an increasing need for orthodontic treatment. Increasing awareness through media and other factors is making the adolescents more and more conscious about their dental outlook and hence more keen interest in orthodontic treatment was shown. Our findings are very similar to the one found internationally. In a study conducted in Hong Kong [22], Norway [23] and South Africa [24], following findings were documented. We have tabulated our results along with it other countries to get a global prospective (Table 1).

IOTN	Little or no need (1 - 2)			Moderate to Severe need (3 - 5)		
Hong Kong	30%			70%		
India	65.80%			15.6% (3)	18.6% (4)	
Jordan [21]	28%			72%		
Malaysia	22.0% (1)	26.9% (2)		51.1% (3 - 5)		
Norway	46.80%			53.20%		
Pakistan	49% (1)			51% (2 - 5)		
South Africa	54.90%			45.10%		
Spain	13.9% (1)	38% (2)		27.2% (3)	17.1%(4)	3.8 (5)
Turkey [25]	37.20%			62.80%		
UAE Dubai	14.5% (1)	40.3% (2)		38.8% (3)	9.9% (4)	4.5% (5)
Vietnam	52.8% (1 - 2)			22.5(3)	24.7% (4 - 5)	

Table 1: IOTN for different regions in the world.

It shows that like other developed or developing countries, Pakistan too has major orthodontic treatment needs. However, at present the demand is very low at only 10% with only 3% getting fixed braces in Peshawar urban area, but it is steadily increasing particularly in the larger cities of Pakistan where the socioeconomic condition is generally better. Two subsequent studies in major cities documented similar findings for Pakistan [26,27].

In comparison to international data our population has a higher percentage of Class III malocclusion, the authors feel this to be primarily due to two factors- the rural area hard coarse diet where the mandible gets more exercise during growth period as compared to the soft diet so often taken in the urban areas, and secondly the intermarriage in the rural getup, as the boys schools visited had many students coming from villages and staying as boarders in Peshawar.

Another interesting factor was the habits noted; nail biting and pen/pencil chewing were overrated and this is understandable in our age cohort of 13 - 16 years old, where stress is paramount with demands of the adolescents, peer pressure, and increased burden of studies. However, we do feel that thumb sucking was under reported due to social unacceptability of the condition.

Our pre-survey calibration exercises affirmed the observation that IOTN is easily accepted by dental examiners, and on average, can take less than 2 minutes to complete [28]. Because of being less time consuming, using IOTN makes the study of a large population group more practical [29].

Conclusion

This survey of historic significance showed that 49% of the population in Peshawar had good occlusion while 51% would require some sort of orthodontic intervention in the future, with 22% definitely needing it, being in severe grades of IOTN.

Some suggestions for future surveys and research for Pakistan are to conduct a survey at a larger scale including major cities of Pakistan which should preferably be school based programs rather than at a hospital walk in clinic -- as the latter is sought with bias. It would also be interesting to find out malocclusion in the older cohort to see if the modern diet is the culprit to increasing trend of malocclusion as we are passing through a transitional phase. IOTN should be taught at an undergraduate level and CAL programs can also be employed for the purpose for an effective teaching, which can ensure a proper selection and streaming of orthodontic patients [30].

New and simpler versions of the index are on their way to make assessment procedure easy and quick. MOCDO [31] and ICON [32] are perhaps the future and need to be applied in developing countries.

Since the writing of the original draft of the manuscript 15 years ago we can now document the interest in IOTN in contemporary Orthodontics [33] and the various surveys in different countries in major regions of the world [34-38]. Ofcourse Pakistan has also conducted several surveys since this initial one- the most latest one show that fairly similar need for treatment at 47.1% [39]. As orthodontic treatment becomes widely available globally and with increasing interest by adolescent and parents there is concern that even little or no need in IOTN will be treated. The big question is do we as health professional have the responsibility to educate our patients and prevent over prescription of Orthodontic treatment.

Acknowledgments

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