

# Applicability of Moyers' Prediction Table in Orthodontic Patients Reporting to KCD Peshawar Population

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## Abstract

**Objectives:** The aim behind this research, is to determine the applicability of Moyers' table in Peshawar population.

**Materials and Methods:** A total 100 patients' casts who had complete details in their files, and were Pakistani nationals, having complete set of permanent teeth up to 1st molar; no proximal restorations and caries were included. Patients having dental anomalies, previous orthodontic treatment, craniomandibular dysfunctions, attritions of teeth and Syndromes were excluded. The mesiodistal widths of the maxillary and mandibular permanent incisors, canines, first and second premolars were measured using digital calipers. The predicted total, of the mesiodistal diameters of the canines and premolars, was evaluated from the Moyers tables at 75%. Pearson's correlation test was applied, to determine the relationship between the total sum of the actual width of the canines and premolars and the sum of the predicted width of the canines and premolars from the Moyers table. Analysis was performed by SPSS version 20.0.

**Results:** Most of participants were females 63(63%) as compared to males 37(37%). In maxilla the mean actual (23.76mm) and predicted mesiodistal width (22.76mm) of cupids and bicuspid were close to each other. But the correlation between actual and predicted mesiodistal width of cupids and bicuspid in maxilla was weak. It was weak in female ( $r=0.156$ ). In mandible for male the correlation was positive as well ( $r=0.8130$ ) but it was weak for females ( $r=0.334$ ). moderate correlation was found for overall.

**Conclusion:** Moyer's prediction table is not a very precise method for estimating tooth dimensions in a Peshawar-based sample.

**Keywords:** Prediction of tooth size, Moyers' table, Mesiodistal width, Mixed dentition analysis

## Introduction

Malocclusion is a very common problem in all people, the frequency of which is well known in modern countries. Mixed dentition is the phase where most of the cases of malocclusion begins. In mixed dentition cases, the main aim is to maintain arch integrity for the eruption of permanent teeth.<sup>1,2</sup>

An orthodontic assessment has to be performed before treating an orthodontic patient. In the mixed dentition patients, spacing or crowding of the developing dentition is of principal concern.<sup>3</sup> The collected sizes of every child's teeth may not correlate perfectly with the amount of space in the child's dental arches to accommodate teething. When the total sizes of the teeth and the perimeter of the arch are not closely matching a spaced or a crowded dentition results.<sup>4</sup>

Arch length is usually reduced in the mandibular arch, during the transition from diverse dentition to permanent dentition. Thus, the level of mandibular arch, is where the analysis of mixed dentition is performed.<sup>5</sup> Analysis of mixed dentition is also necessary to make decisions about eruption, serial extractions, space maintenance or recovery, among others.<sup>6</sup>

Three most commonly used methods to estimate the mesio-distal widths of unerupted permanent canine and premolars in mixed dentition are radiographic methods, based on periapical and cephalometric radiographs.<sup>7</sup> The non-radiographic techniques rely on correlations and prediction equations, in the form of prediction tables. A combination of the two methods can also be used.<sup>8,9</sup>

Out of these methods, Moyers prediction table is the most commonly used.<sup>10</sup> As no radiographs are required. It is argued that the Moyers prediction tables are the most widely used method to predict the size of permanent canines and premolars according to their correlation with the mesio-distal width of lower permanent incisors.<sup>6,11</sup> In this method the error is minimized and it can be used by both the trainee and expert as it does not require complicated clinical advice and is time saving method with the same level of reliability. Despite its

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advantages, this prediction table is based on the data derived from North American white children; therefore its applicability to other ethnic groups is questionable.<sup>10,12</sup>

The rationale for this study is; As in the analysis of mixed dentition, before eruption, we predict the mesiodistal width of canine and premolar to evaluate the difference in the arch length. We used Moyer's prediction table and the radiographs to predict the mesiodistal width of canines and also premolars, without rash. This specific study, will help us to find out the applicability of Moyer's prediction table in a sample of the population confined to Peshawar, whether it is applicable or not. We can therefore opt for other methods of estimating the mesiodistal width of the canines and premolars.

The main purpose of this study is to determine the applicability of Moyers' prediction table in Peshawar population.

## Materials and Methods

This cross sectional descriptive study was performed in Orthodontics department Khyber College of Dentistry, Peshawar. The ethical approval for this study was obtained from the ethical committee of Khyber College of Dentistry. A total 100 casts were used. Only those patients' casts were used which had complete details in their files. Pakistani citizens, with a complete set of permanent dentition, from the first molar to the opposite maxilla and mandibular, no close restoration and / or interim care were included. Patients with dental abnormalities volume, number and shape, previous orthodontic treatment, cranio mandibular dysfunction, fracture, operation and syndrome were excluded.

Meso-distal widths of both maxillary and mandibular permanent incisors, canines, first and second premolars with a minimum count of 0.01 mm was measured using digital vernier calipers.

These measurements were taken by two investigators separately. The expected sum total of the mesiodistal diameters, of canines and premolars was determined after the Moyers tables at 75%. The size of the teeth of 20 casts was measured by two individuals and the reliability of the inter observer was assessed using the paired t test. They were very precise.

Data entry and analysis was done, using SPSS version 20.0. Descriptive statistics showed as mean, standard deviation (SD), range and standard error of the mean were calculated in both arches. Pearson correlation test was used to evaluate the relation between the total of actual width of cuspids and bicusps and sum of predicted width of cuspids and bicusps from Moyers' table.  $P < 0.05$  was considered significant value.

## Results

A total of 100 patients' casts in which 37(37%) were males and 63(63%) were females. Interobserver correlation co-efficient was very high (0.949) showing high accuracy between the two examiners. Similarly paired t test was non-significant ( $P=0.068$ ) as shown Table 1.

**Table 1: Paired Samples Test for interobserver reliability**

	Paired Differences					T	df.	Sig. (2-tailed)
	Mean	Std. Deviation	St. Error Mean	95 % Confidence Interval of the Difference				
				Lower	Upper			
1st observer - 2nd observer	.10952	.26059	.05686	-.00909	.22814	1.926	20	.068

There was statistically profound dissimilarity, among the actual (23.06mm) and expected mesiodistal width (21.79mm) of cuspids and bicusps as shown in table 2 and 3 ( $p=0.00$ ),

**Table 2: Descriptive statistics for actual and predicted Mesiodistal width of cuspids and bicusps in maxilla**

	Mean	N	Std. Deviation
actual mesiodistal width of cuspids and bicusps in maxilla	23.0650	100	1.58378
Predicted mesiodistal width of cuspids and bicusps in maxilla	21.7910	100	.73293

**Table 3: Paired Sample test for actual and predicted Mesiodistal width of cuspids and bicusps in maxilla**

	Paired Differences			P-Value
actual mesiodistal width of cuspids and bicusps in maxilla	Mean	95% Confidence Interval of the Difference		
Predicted mesiodistal width of cuspids and bicusps in maxilla		Lower	Upper	
	1.27400	.99043	1.55757	.000

in the maxilla. But the correlation was moderate between actual and predicted mesiodistal width of cuspids and bicusps in maxilla (0.432) and for male it was also moderate (0.419). It was very weak for female ( $r=0.156$ ). (Table 4)

**Table 4: Correlation between actual and predicted mesiodistal width of cuspids and bicusps in maxilla**

Variable	Co-efficient of correlation
Overall mesiodistal width of cuspids and bicusps in maxilla	0.432
Male	0.419
Female	0.156

Where as in mandible, there was no statistically significant variance in the real and predicted Mesiodistal width of cuspids and bicusps as shown in Table 5 and 6 ( $p=0.416$ ).

**Table 5: Descriptive statistics for actual and predicted Mesiodistal width of cuspids and bicusps in mandible**

	Mean	N	Std. Deviation
actual mesiodistal width of cuspids and bicusps in mandible	22.0700	100	1.46167
Predicted mesiodistal width of cuspids and bicusps in mandible	21.9760	100	.77448

**Table 6: Paired Sample Test for actual and predicted Mesiodistal width of cuspids and bicusps in mandible**

		Paired Differences		P-Value
actual mesiodistal width of cuspids and bicusps in mandible		95% Confidence Interval of the Difference		
Predicted mesiodistal width of cuspids and bicusps in mandible	Mean	Lower	Upper	
	.09400	-.13456	.32256	.416

In male the correlation was very strong( $r=0.8130$ ) but it was weak for females( $r=0.334$ ).The details are given in Table 7.

**Table 7: Correlation between actual and predicted mesiodistal width of cuspids and bicuspid in mandible**

Variable	Co-efficient of correlation
Overall mesiodistal width of cuspids and bicuspid in mandible	0.623
Male	0.813
Female	0.334

## Discussion

In the current study we used Moyer's prediction table at 75% and found moderate correlation for mesiodistal width of canine and premolar in maxilla and very weak correlation for females. In mandible we found strong correlation for males (0.83) and very weak for females ( $r=0.334$ ).The applicability of Moyers table to predict mesiodistal width of canine and premolar greatly differs in international studies.<sup>6,12</sup>

The Moyers table was develop for population of Caucasian children of Northern European descent.<sup>13</sup> Applying these methods to a diverse population raises questions on the accuracy. A study from Saudi Arabia by Al-Khadra et al<sup>12</sup> showed an overestimation of the size needed. The study confirmed, that Moyer's probability table when applied to a sample is which is more limited in the Saudi Arabia population, they established the fact that 35% level was a more accurate determinant then 75% confidence level, which is more commonly used.

There are also significant differences between real values and Moyers predictive values in Kenya.<sup>14</sup>The variable results of

several international studies show that the extent of applicability of the method varies in different ethnic groups.<sup>4</sup> For clinical applicability these predictive tables should be validated in a more particular and confined population.<sup>15</sup>

Memon et al<sup>5</sup> compared the actual sum of canines and premolars and that predicted from three methods of finding out the mixed dentition, in orthodontic patients, at Aga Khan University Hospital (AKUH), Karachi. They reported that for males, the Moyers 50th percentile could give us the desired results, while for females the Moyers 75th percentile applied to the analysis of mixed dentition. These results are also in disagreement with the current study. This highlight that genetic and ethnicity have role in tooth size prediction.

Another study on Karachi population by Adnani et al<sup>1</sup> reported that significant difference was calculated between the measured MD dimension of the buccal segment in maxillary arch in both males and females, when compared with predicted width by Moyer's at the 75th percentile level. They concluded that Moyer's prediction table, is not an accurate method to calculate and find the tooth dimensions, in a Karachi based sample. These results are in consistent to the present study.

## Conclusion and Recommendation

Moyer's prediction table is not a very precise method for estimating tooth dimensions in a Peshawar-based sample

Large sample study required to derive new linear regression equations for each arch and gender

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### Author Contributions

1. Saira Bano- Proofreading and review of final draft
2. Asma Ahmad- Helped in data entry
3. Farhad Ali- Helped in data analysis in SPSS and the interpretation of the result
4. Sana Azal- Help in collection of data
5. Ghulam Rasool- Idea and conducted literature review and also help in the 1st draft of publication writing