

Preventive and Interceptive Orthodontic Treatment Needs of 6 to 9 Years Old Egyptian Children (Prevalence Cross-Sectional Study)

Manar Mousaad Ibrahim^{1*}, Amr Ezzat Abdel Latif² and Manal Ahmed El-Shiekh²

¹MSc Student, Pediatric Dentistry and Dental Public Health, Faculty of Oral and Dental Medicine, Cairo University, Giza, Egypt

²Associate Professor of Pediatric Dentistry and Dental Public Health, Faculty of Oral and Dental Medicine, Cairo University, Giza, Egypt

***Corresponding Author:** Manar Mousaad Ibrahim, MSc Student, Pediatric Dentistry and Dental Public Health, Faculty of Oral and Dental Medicine, Cairo University, Giza, Egypt.

Received: May 14, 2018; **Published:** June 19, 2018

Abstract

Back ground: The aim of this study was to determine orthodontic treatment needs among groups of six to nine years old Egyptian children using modified index for preventive and interceptive orthodontic needs (IPION) in the mixed dentition stage as to decrease the need for orthodontic treatment in adult dentition stage.

Methods: This study was performed on about 97 healthy Egyptian children were divided into two groups according to their gender (boys and girls), their ages in the range of six years to nine years old. Apparently medically free from any systemic diseases or genetic syndromes. No previous history of orthodontic treatment.

No serious illness or previous major surgery in the craniofacial region. The first permanent molar should be erupted. Upper and lower alginate impressions were taken after casting the Acceptable casts only were included in the study, measured for different scores for the criteria of the index using caliper.

Results: Need for Treatment was recorded in 43.8% of children were IPION value of score 5 or higher was included in this group (50.0% boys and 38.2% girls of examined children) (28.0% for 6 years, 35.7% for 7 years, 52.4% for 8 years, and 63.6% for 9 years) for different tested age groups.

Conclusion: The prevalence in this study group of certain variables (caries, premature loss of deciduous teeth, overjets, openbites, crossbites and overbites) in the early mixed dentition that could lead to malocclusions in permanent dentition was unacceptably high for a developing country such as Egypt.

Keywords: Modified Index for Preventive and Interceptive Orthodontic Needs (IPION); Prevalence of Orthodontic Treatment Needs in Egypt; Caries; Premature Loss of Deciduous Teeth; Overjets; Openbites; Crossbites; Overbites

Introduction

Dentistry is unique in utilizing objective indices to measure the deviation of oral health components from ideal. Examples include various plaque, caries experience, tooth wear and periodontal indices [1,2].

It is expected that the Index for Preventive and Interceptive Orthodontic Needs (IPION) will contribute greatly to the development of preventive and interceptive orthodontic programs and that it will serve to convince the authorities that orthodontics should form an integral part of primary oral health care. The importance of a normal and healthy primary dentition is well documented in the literature.

Citation: Manar Mousaad Ibrahim, et al. "Preventive and Interceptive Orthodontic Treatment Needs of 6 to 9 Years Old Egyptian Children (Prevalence Cross-Sectional Study)". *EC Dental Science* 17.7 (2018): 1009-1025.

A variety of epigenetic or environmental factors can influence the development of the permanent dentition during the long transition period from the primary dentition [3].

Malocclusion does not pose a risk to life, however its implications mandates the need for treatment, Where, preventive orthodontics are procedures to promote the development of a normal occlusion and aid in preventing malocclusion from developing. Interceptive orthodontics are procedures to restore a normal occlusion once a malocclusion has started to develop, early recognition of developing malocclusions and the potential for uncomplicated orthodontic treatment procedures can minimize or eliminate future costly treatment. The goal of The index for preventive and interceptive orthodontic needs IPION is to allow early detection of developing malocclusions, so that simple interceptive treatment can be undertaken to minimize or eliminate the need for more extensive and costly orthodontic treatment later [4].

Many young children were often left untreated until the age of 12. Forgetting that the young person sitting in front is in the growth phase and that, over the years, the expression of growth can be modulated, especially in regard to dysfunctions that have already led to the development of deformations at a young age. Since these causes were not detected or treated early, there is an even greater risk that existing dental malpositions and malocclusions will become worse over time. The severity of the problems can then be such that the extraction of permanent teeth with extended treatment time and more complicated treatment is frequently necessary. On the other hand, by waiting the therapeutic opportunities are lost that interventions and growth responses provide which are only possible when the growth potential is present. The possibility of obtaining these orthopedic responses is lost and in certain cases, orthognathic surgery can no longer be avoided. If this is the case, might ask, when faced with a young child presenting early signs of orthodontic problems, why is it that adopt a passive attitude rather than trying to intercept them and restore morphological and functional harmony as soon as possible, by initiating early treatment that is simultaneously corrective and preventative. From this perspective, orthodontics is probably the only discipline in the medical world where practitioners take the liberty of delaying treatment for several years, when confronted with pathology! [5].

Materials and Methods

Type of the study

This prevalence cross-sectional observational study was conducted in Cairo, Egypt.

A study to determine the prevalence of preventive and interceptive orthodontic treatment needs among a group of Egyptian children from six years to nine years old from the dental outpatient clinic at pediatric dentistry department, Cairo University.

Sample size

A Sample size calculator for prevalence studies was used: Statcalc. An epidemiologic calculator that produces statistics from summary data; Epi_Info/STATCALC.EXE

A sample of 97 of children included in the study; where a 95% confidence level (which is equivalent to $Z = 1.96$), the precision (d) is 10%, while the expected proportion is 50%. The equation was used.

Where n' = sample size with finite population correction,

N = population size,

Z = Z statistics for a level of confidence,

P = expected proportion (if the prevalence is 20%, $p = 0.2$), and

d =precision (if the precision is 5% then $d = 0.05$).

The sample of about 97 healthy Egyptian children were divided into two groups according to their gender (boys and girls) of different socioeconomic status, their ages in the range of six years to nine years old.

Inclusion criteria for Children Selection

- The children included within the study must be Egyptian in origin, till the third grandfather.
- Apparently medically free from any systemic diseases or genetic syndromes.
- No previous history of orthodontic treatment.
- No serious illness or previous major surgery in the craniofacial region.
- The children were divided into two groups according to their gender (boys and girls), their age ranging from six years to nine years old.
- The first permanent molar should be erupted.
- The study took place from May 2015 to April 2016.

Approval from the authorities

A written approval and permission from Faculty of Oral and Dental Medicine Cairo University, this study was approved by the Research Ethics Committee in Faculty of oral and dental medicine, Cairo University. A permission letter, explaining the aim of the study was applied to the committee.

Informed written consent

An informed Consent for inclusion in the study was obtained from the parents about the study prior to the examination.

Materials

The materials used were as follows:

- Disposable diagnostic sets.
- Perforated metal stock trays (size number:1) (Misr dental – Egypt)
- Multiple Plastic rubber bowels and spatulas.
- Fast set irreversible hydrocolloid (Alginate) impression material. (Tropicalgin Zhermack Italy).
- Extra hard stone (Zhermackelite®rock SANDYBROWN, Italy).
- Pink wax (Cavex Set Up Regular).
- Caliper, a sliding Vernier caliper, Accuracy (0.05 mm), Graduations 0.05 mm Material Steel (INSTRUMENT.COMPANY.GA-BROVO. BULGARIA.)

Methods

Setting and clinical examination

The selected children were seated in the dental outpatient clinic at pediatric dentistry department, Cairo University, on the dental unit.

Infection control procedure as outlined by centers of disease control and prevention was used (Summary of Infection Prevention Practices in Dental Settings, 2016).

Child age at the last birthday was considered as the child age at time of examination.

The examination chart was filled.

Medical history and dental history were taken from the care giver.

Examination extra orally was done, and then the intraoral examination started.

The teeth were examined in dental light on the dental unit if having posterior interproximal caries was recorded in the diagnostic chart while examination with inspection and by the use of dental mirror and dental explorer.

The recording of missed teeth in cases of premature loss of deciduous teeth was taken according to the chronological age of Egyptian children, and the past dental history.

The children were selected to have fully erupted first molars to record the molar relationship according to Angel's classification class I, class II, or class III).

Malocclusion according to Angle's classification falls into class II and III depending on the position of the upper first molar to the lower first molar:

In class II malocclusion, the mesiobuccal cusp of the upper first molar is mesially (anteriorly) positioned relative to the buccal groove of the lower first molar:

In class III malocclusion, the mesiobuccal cusp of the upper first molar is distally (posteriorly) positioned relative to the buccal groove of lower first molar:

According to the modified index for preventive and interceptive orthodontic needs (IPION) which was used to determine the need for such treatment in schoolchildren aged six years to nine years.

Clinical procedure

All children included in this study were subjected for the following:

Taking the alginate impression

Upper and lower alginate impressions were taken as follows: A suitable size plastic perforated tray was selected for upper and lower arch and the child was asked to rinse with water. Lower impression were taken first to avoid gagging sensation due to intra oral Stimuli that posterior part of palate and upper surface of the posterior one third of the tongue are the most sensitive regions in the entire oral cavity. Tactile stimulation of the oral tissues inevitably occurs when executing various dental procedures.

Not to be felt by the child at the beginning of the procedure that may occur when the upper impression is taken due touching of the soft palate, two scoops of alginate powder were mixed with water according to the manufacturer instructions. The tray was nearly filled with the alginate mixed, and then slowly placed in the mouth and gently guided and supported with fingers. The tray was removed with snap movement after ensuring the alginate set. The impression was washed under running water and kept moist in disposable paper napkin, repeating the steps for the upper arch and the upper alginate impression was taken.

Heating a sheet of pink wax then rolled and curved to accommodate the shape of the arches and introduced in the child's mouth to record centric occlusion, Centric relation occurs between the jaws, when the condyles are in a stable orthopedic position, while the mandibular position that relates to occlusion is at maximum intercuspation, centric relation and maximum intercuspation should be taken into consideration during orthodontic treatment and till its completion, the child was asked to put his tongue backward touching the hard palate, swallow and bite, then open suddenly to prevent distortion then the wax bite squinched in cool water in the rubber bowel.

Soft tissue assessment

Lip competency: Incompetent lip seal is scored if the lips are not in contact during rest.

Lips are assessed in the rest position. Incompetent lip seal is characteristic of patients with chronic nasorespiratory infections and associated mouth breathing.

Casting: Casting Was done in the pediatric dentistry laboratory Cairo University where excess water was removed from each tray before pouring the stone plaster; each impression was casted immediately in extra hard stone plaster which has small (0.08%) expansion factor. Which is mixed according to the manufacturer’s instructions, trimming of the dental casts was done for adequate casting bases. After casting the trays, each cast was examined for details and defects. Acceptable casts only were included in the study.

Taking the measurement’s from the study casts

The criteria for each measurement were as follows: For each child a chart of measurements was filled, each measurement taken and recorded according to the criteria of modified IPION to be included in the form of scores.

IPION measures various occlusal traits, and assigns a value depending on their severity. The trait scores are then added, yielding a total score that indicates the need for preventive or interceptive orthodontic treatment.

A score of 5 or higher was determined to be a reasonable indicator of the need for preventive and interceptive orthodontic treatment.

Occlusal traits	Score	Description
Caries	1	Unilateral inter-proximal decay.
	2	Bilateral inter-proximal decay.
Premature loss of deciduous teeth	2	Unilateral premature loss of deciduous teeth.
	3	Bilateral premature loss of deciduous teeth.
Molar relationship	1	Class I malocclusion.
	2	Class II or III malocclusion.
Overjet	2	Increases overjet greater than 3.5 mm but less than or equal to 6 mm with competent lip.
	3	Increases overjet greater than 3.5 mm but less than or equal to 6 mm with incompetent lip.
	4	Increases overjet greater than 6 mm.
Openbite	2	Anterior or posterior openbite more than 1mm but less than or equal to 4 mm.
	3	Anterior or posterior openbite more than 4 mm.
Crossbite	1	Anterior or posterior crossbite less than or equal to 2 mm discrepancy between reduced contact position and intercuspal position
	2	Anterior or posterior crossbite more than 2 mm discrepancy between reduced contact position and intercuspal position.
Overbite	1	Increased overbite greater than or equal to 3.5mm without gingival contact.
	2	Increased overbite greater than or equal to 3.5mm with gingival contact.

Table: The score of each trait for the measure of modified IPION.

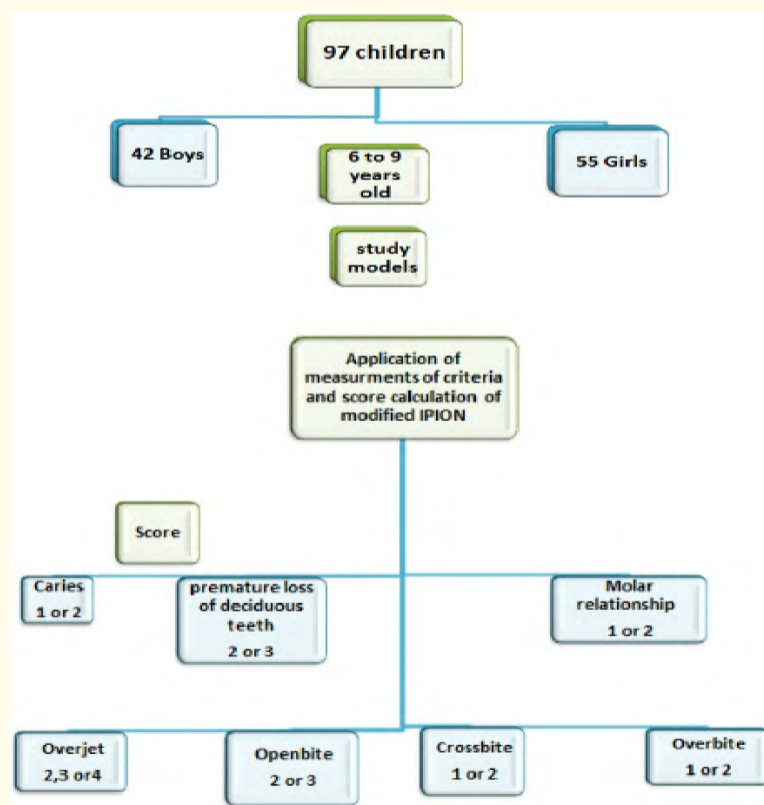


Figure: Schematic representation of the steps of materials and methods.

Example (1): 2+3+2+4=11 (Treatment Need, score > 5)

This indicates need for treatment because the total score is higher than 5.

Example (2): 1+1+2=4 (No Treatment Need, score < 5)

This indicates no need for treatment because the total score is lower than 5.

Molar relationship according to Angel's classification

Class I molar relationship

Class II malocclusion

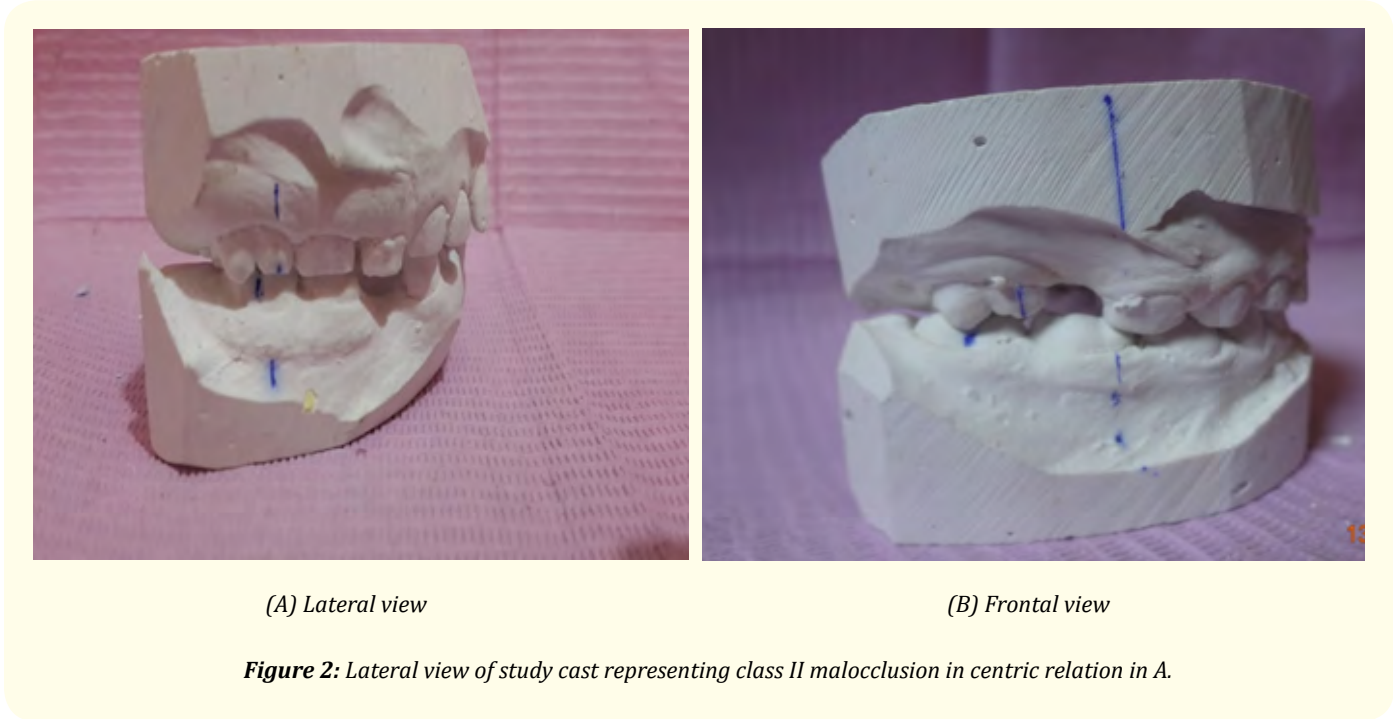


(A) Lateral view

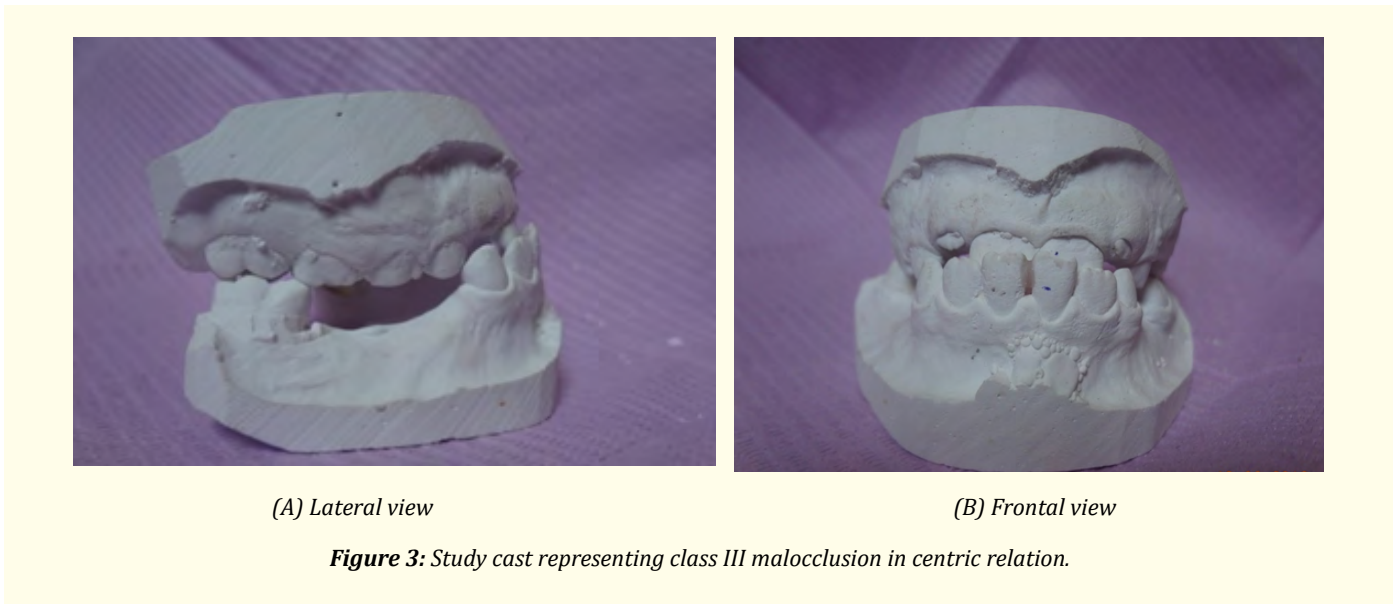


(B) Frontal view

Figure 1: Study cast representing class II malocclusion in centric relation recorded by wax bite in A, B.



Class III malocclusion



Overjet

Was recorded as the distance between the incisal edge of the upper central incisor and the labial surface of the lower central incisor which was measured in millimeters using caliper on the upper and lower study casts while they are in centric occlusion (Figure 4 and 5).



Figure 4: Study cast representing overjet in lateral view.



Figure 5: Study cast representing recording the measurement of overjet.

Openbite

An anterior open bite was recorded when there was no vertical overlap of the incisors, and the vertical separation was measured. The same was done for posterior open bite (Figure 6).



Figure 6: Study cast representing recording the measurement of Openbite.

Crossbite

Anterior crossbite: It was recorded when single tooth or more of the upper anterior teeth were in lingual relation to lower anterior teeth.

Posterior crossbite: It was recorded when the tip of the buccal cusp of one or more of the upper premolar or molar occluded in the central fossae of the lower premolar or molar (Figure 7-12).



Figure 7: Study cast representing anterior Crossbite in frontal view.



Figure 8: Study cast representing anterior Crossbite in a single tooth in frontal view.



Figure 9: Study cast representing recording the measurement of anterior Crossbite.



Figure 10: Study cast representing recording the measurement of anterior Crossbite of a single tooth.



Figure 11: Study cast representing posterior Crossbite in lateral view.



Figure 12: Study cast representing recording the measurement of posterior Crossbite.

Overbite

Was measured as the amount of vertical overlap between the maxillary and Mandibular incisors (Figure 13-16).



Figure 13: Study cast representing anterior Overbite in frontal view.

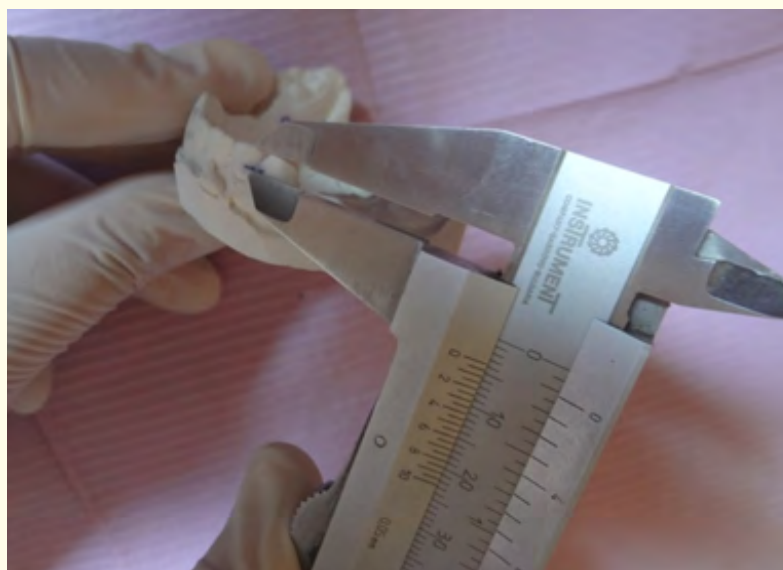


Figure 14: Study cast representing recording the measurement of Overbite.



Figure 15: Study cast representing of posterior deep Overbite.



Figure 16: Study cast representing recording the measurement of posterior Overbite.

Statistical analysis

Data presented as Mean, standard deviation (SD), Frequency and Percentage (%) when appropriate. Data explored for normality using Kolmogorov-Smirnov and Shapiro-Wilk tests. Age showed a parametric distribution, so Independent t-test used to compare between boys and girls. Chi Square test used to gender distribution.

Spearman's rho correlation Used to correlate between different parameters. The significance level was set at $P \leq 0.05$.

Statistical analysis was performed with IBM® SPSS® (SPSS Inc., IBM Corporation, NY, USA) Statistics Version 23 for Windows.

Results and Discussion

Preventive and interceptive orthodontic treatment in the mixed dentition implies several different possibilities, the guiding of erupting permanent teeth into an ideal position, using simplified procedure that produce a saving of time and effort, obtaining a more stable early results with less retention problem, avoidance of extraction of permanent teeth by utilizing the additional deciduous posterior teeth mass, distillation and/or expansion of posterior teeth [6].

In this study 97 Egyptian children was selected according to sample size calculation 55 girls and 42 boys both genders were selected to explore any sex differences in treatment need their age was of six years to nine years old to determine orthodontic treatment needs among using modified index for preventive and interceptive orthodontic needs (IPION) in the mixed dentition stage as to decrease the need for orthodontic treatment in adult dentition stage.

High prevalence of bilateral inter-proximal caries in deciduous dentition was found (70.1% total, 68% for 6 years, 75.9% for 7 years, 66.7% for 8 years and 68.2% for 9 years) (73.8% boys and 67.3% girls of examined children). while unilateral inter-proximal caries was found 24.7% of total sample where (for 6 years of 32.0%, 20.7% for 7 years, 28.6% for 8 years, and 18.2% for 9 years). (21.4% boys and 27.3% girls of examined children). More than the results showed in the previous study in Egypt in 2007 where inter-proximal caries in deciduous dentition was (32.1% for 6 years and 32.4% for 9 years) by Abdel Aziz., *et al.* 2007. Also high prevalence of caries in the deciduous dentition (30.4% for 6 year old; 20.6% for 9 year old) in the results of the study performed in Canada by Karaiskos., *et al.* 2005, this can be due to differences in sample size, the ethnic nature of Egyptians in these studies, And the sample is from dental patients.

The premature loss of primary teeth of 29.9% with no difference between unilateral or bilateral, the unilateral premature loss of deciduous teeth was (40.0% for 6 years, 37.9% for 7 years, 23.8% for 8 years, and 13.6% for 9 years) (31.0% boys and 29.1% girls of examined children) there was no significant difference between unilateral and bilateral premature loss for different tested gender, while the bilateral premature loss was (36.0% for 6 years, 17.2% for 7 years, 38.1% for 8 years, and 31.8% for 9 years). Which was very high than the results in the Egyptian study previously done by Hoda., *et al.* 2007 where premature loss of primary teeth was (13.6% for 6 years and 25.8% for 9 years) and was very higher than the early loss of primary teeth in the Canadian study (11.9% for 6 year old; 29.4% for 9 year old) was observed.

The frequency of class I was of total 87.6% (92.0% for 6 years, 93.1% for 7 years, 76.2% for 8 years, and 86.4% for 9 years) (85.7% for boys and 89.1% for girls) found to be higher than the previous Egyptian study done by Hoda., *et al.* 2007, for 6 year group which was 70.3%, and for 9 years group which was 67.5%, while Class II and III was of total 12.4% (8.0% for 6 years, 6.9% for 7 years, 23.8% for 8 years, and 13.6% for 9 years) where class II was found to be 9.3% of total cases examined (9.5% of boys and 9.1% for girls) and class III 3.1% of total children examined (4.8% of boys and 1.8% of girls) was found to be lower than that of the previous Egyptian study done by Hoda., *et al.* 2007 were The frequency of class, II and III for 6 year group which was 21.3% and 8.4% respectively while for 9 years group were 23.3% and 9.1% respectively.

The prevalence of Increases overjet greater than 3.5 mm but less than or equal to 6 mm with competent lip was recorded in 17.5% of children (0.0% for 6 years, 24.1% for 7 years, 23.8% for 8 years, and 22.7% for 9 years) (19.0% boys and 17.9% girls of examined children), increases overjet greater than 3.5 mm but less than or equal to 6 mm with incompetent lip was recorded in 4.1% of children (4.0% for 6 years, 3.4% for 7 years, 9.5% for 8 years, and 0.0% for 9 years) (2.4% boys and 5.4% girls of examined children), increases overjet greater than 6mm was recorded 1% of children (4.5% for 9 years) (1.8% girls of examined children). Nearly higher than In the Egyptian study done by Hoda., *et al.* 2007 previously in 2007 For 6 years group the prevalence of overjet was recorded in 11.4% of children, and for 9 years group the prevalence of overjet was 10.1%.

The openbite anterior or posterior more than 1mm but less than or equal to 4 mm was recorded 2.1% of children (4.8% for 8 years, and 4.5% for 9 years) (2.4% boys and 1.8% girls of examined children), Anterior or posterior openbite more than 4 mm was recorded in 4.1% of children (0.0% for 6 years, 3.4% for 7 years, 4.8% for 8 years, and 9.1% for 9 years) (4.8% boys and 3.6% girls of examined children). Lower than the records for 6 years open bite 7.2% and for 9 years 8.2% anterior open bite in the Egyptian study previously done by Hoda., *et al.* 2007.

Anterior or posterior crossbite less than or equal to 2 mm discrepancy between reduced contact position and intercuspal position was recorded in 5.2% of children (4.0% for 6 years, 7.1% for 7 years, 4.8% for 8 years, and 4.5% for 9 years) (2.4% boys and 7.3% girls of examined children).

Anterior or posterior crossbite more than 2 mm discrepancy between reduced contact position and intercuspal position was recorded in 12.5% of children (20.0% for 6 years, 10.7% for 7 years, 0.0% for 8 years, and 18.2% for 9 years) (21.4% boys and 5.5% girls of examined children).

Egyptian study previously in 2005, showed anterior cross bite 8.4% while posterior was 1.1% anterior cross bite 8.4% while posterior was 1.1% for 6 years group, and 7.2% showed anterior crossbite while 1.1% showed posterior crossbite for the 9 years group, which was near to the results of our study.

Increased overbite greater than or equal to 3.5mm without gingival contact was recorded in 8.3% of children (4.0% for 6 years, 3.6% for 7 years, 4.8% for 8 years, and 4.5% for 9 years) (7.1% boys and 9.1% girls of examined children).

Increased overbite greater than or equal to 3.5 mm with gingival contact was recorded in 4.2% of children (0.0% for 6 years, 3.4% for 7 years, 4.8% for 8 years, and 9.1% for 9 years) (2.4% boys and 5.5% girls of examined children). Nearly alike that In the Egyptian study done by Hoda., *et al.* 2007 previously in 2007 For 6 years group the prevalence of deep overbite was registered in 12.2% of children and for 9 years group the prevalence of deep overbite was 11.3%.

Need for Treatment was recorded in 43.8% of children were IPION value of score 5 or higher was included in this group (50.0% boys and 38.2% girls of examined children) (28.0% for 6 years, 35.7% for 7 years, 52.4% for 8 years, and 63.6% for 9 years). The results of the present study were supported by THE study was done in Egypt done by Hoda., *et al.* 2007 found 23.4% of 6-year-old children need treatment while the results for the age group of 9 years was of higher prevalence in this study than that found previously in the study in Egypt 26.2% of 9 years old children with need for treatment which showed an amount to over 24.9% for both groups of all children examined [6].

Results were also higher than the results of the study performed in Canada by Karaiskos., *et al.* 2005, which included 42 6-year-old children and 72 9-year-old children in the group of treatment need, this amounts to over 28% of all children examined.

While no need for treatment was recorded in 56.3% of children (50.0% boys and 61.8% girls of examined children) (72.0% for 6 years 64.3% for 7 years, 47.6% for 8 years, and 36.4% for 9 years).

Conclusions

1. This study can provide baseline data that demonstrates the need for the implementation of primary dental health care program to determine priority for orthodontic treatment as a part of comprehensive child oral health care in underserved communities in Egypt.
2. Categorizing malocclusions into various groups, according to the urgency and need for treatment could well help to assign priority to individuals with the greatest need when orthodontic resources are limited and when the availability of treatment is unevenly spread.
3. It could be used to record data objectively for many different kinds of populations and complement the existing objective data on other facets of the craniofacial complex. Epidemiologic studies of malocclusion offer a valid research tool for ascertaining the operation of distinct environmental and genetic factors in the aetiology of malocclusion.
4. Continued education should be given to general dental practitioners and pediatric dentists in orthodontic diagnosis and the use of removable appliances, habit breakers, and space maintainers.
5. More awareness should be created to treat patients who present for early treatment.
6. Patient education, fluoride, sealants, regular screenings and basic restorative work can enhance the preventive orthodontic approach. Also, important interceptive orthodontic work can be accomplished with relatively inexpensive removable appliances, such as expansion appliances, habit-breaking appliances, space maintainers and crossbite correction appliances.

Bibliography

1. Hooper SM., *et al.* "The development of a new index for measurement of incisal/occlusal tooth wear". *Journal of Oral Rehabilitation* 31.3 (2004): 206-212.
2. Acharya S. "Specific caries index: A new system for describing untreated dental caries experience in developing countries". *Journal of Public Health Dentistry* 66.4 (2006): 285-287.
3. Coetzee CE and de Muelenaere KR. "Development of an index for preventive and interceptive orthodontic needs (IPION)". International Association for Dental Research; XXXI Scientific Session of the South African Division; XI Scientific Session of the East and Southern African Section (1997): 83.
4. Karaiskos N., *et al.* "Preventive and interceptive orthodontic treatment needs of an inner-city group of 6- and 9-year-old Canadian children". *Journal of the Canadian Dental Association* 71.9 (2005): 649-654.
5. M Limme and A Bruwier. "Early interceptive treatment management". *Journal of Dentofacial Anomalies and Orthodontics* 17 (2014): 302.
6. Hoda M Abdel Aziz and Amr E Abdel Latif. "Preventive and interceptive orthodontic treatment needs of 6 and 9 years-old". *Egyptian Dental Journal* 53 (2007): 835-842.

Volume 17 Issue 7 July 2018

©All rights reserved by Manar Mousaad Ibrahim., *et al.*