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Distribution of Primate Space in the Primary Dentition

A Project

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Declaration

This is to certify that the organization and preparation of this thesis had been made by graduate student **sumaya turkey rokan ward** under my supervision in the College University of Dentistry, of Baghdad in partial fulfillment of the requirement for 5th the Grade.

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Dedication

This project is dedicated to my family and friends.

For their endless love, support and encouragement

Acknowledgment

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Abstract

The occlusion in primary dentition will reflect the occlusion in the permanent dentition, in which the properly placed teeth in dental arch help in maintaining the better health of oral cavity and the supporting structures as well as influence the personality of the children.However, malocclusion can lead to behavioral (psychological),facial, speech, mastication and social problems.

Also spaces from characteristic important in primary dentition such as primate space or developmental space.

Aims of the study

This study was carried out to determine the distribution of primate space in the primary dentition in preschool children in order to expect the occlusion in the permanent teeth.

Materials and methods

A total sample of 70 preschool child (37 boys and 33 girls) of(4and5) years collected from teaching hospital of College of Dentistry / University of Baghdad, each child was seated in up right position ,the examination was done by asking the child to occlude in central occlusion , then the primary space in upper and lower arch was examined in both sides.

Results

The percentage of primary space in maxillary arch was equal in right quadrant with left quadrant while the percentage of primary space in mandibular arch was higher in left quadrant than right quadrant and the percentage in left quadrant was higher than right quadrant and in total sample, The percentage of primary space in both genders and in total sample was higher in maxillary arch than mandibular arch , concerning gender differences the percentage primary spaces was higher in boys than girls.

Conclusion

The conclusion of this study showed that the percentage of primate space in maxillary arch was more than in mandibular arch.

List of Contents

subject	*Page No.*
Acknowledgment	**I**
Abstract	**II**
List of contents	**IV**
List of table	**V**
List of figures	**V**
List of abbreviations	**V**
Introduction	**1**
Aims of the study	**1**
Chapter One: Review of Literature	
1.1 Occlusion in primary dentition	**2**
1.2 Characteristics of ideal occlusion in primary dentition	**2**
1.3 Factors effect on primary spaces	**6**
1.4 Distribution of primate spaces	**11**
Chapter Two : Materials and Methods	
2.1 Materials	**14**
2.2 methods	**14**
Chapter Three : Results	
3.1 Sample	**16**
3.2 Primary space in relation to age	**16**
3.3 Primary spaces distribution with dental arch	**17**
3.4 Primary spaces maxillary and mandibular arches in relation to gender	**18**

Chapter Four : Discussion	
4.1 the sample	**19**
4.2 Distribution of the primate space in primary dentition	**19**
Chapter Five: Conclusion and Suggestions	
Conclusion	**20**
Reference	**21**
Appendix	**29**

List of Tables	Page No.
Table (3-1) Distribution of sample according to gender	**16**
Table (3-2) Distribution of sample according to age	**16**
Table (3-3) Distribution of primary spaces in dental arch	**17**
Table (3-4) Differences of primary spaces between maxillary and mandibular in relation to gender	**18**

List of figures	Page No.
Figure 1.1 Upper and lower occlusal views of primary dentition	**15**

List of abbreviations	
%	percentage
No.	number
y	Year

Introduction

Introduction

Childhood is the mirror in which the characteristics of adulthood are reflected, It has been seen that very little importance has been given to the primary dentition when compared to permanent dentition because deciduous teeth get exfoliated eventually, so the characteristics of primary dentition to a large extent lays the foundation for proper eruption and alignment of succeeding dentition, the observation of the features of occlusion in the child's dentoalveolar system during the formative years can predicted the characteristics of the permanent dentition occlusion (Hegde et al, 2012).

It is very important for the children to have well-aligned teeth for proper occlusion, which in turn contributes to better chewing and facial appearance, occlusion constitutes one of the important objectives of pedodontic treatment whether it is preventive, interceptive or corrective (Zakirulla, 2012).

Aims of the study

The study was carried out to determine the distribution of primate space in the primary dentition in preschool children in order to expect the occlusion in the permanent teeth.

Chapter One
Literature Review

1.1 Occlusion in primary dentition

The occlusal relationship in deciduous dentition is known to have an important bearing on the establishment of the normal occlusal relationship in the permanent dentition, studies on the occlusion of primary dentition had been carried out widely among children with different age groups in various regions of the world (Yilmaz et al, 2006).

The development of occlusion depends on the harmonic growth of the maxilla and mandible, and the role of the functional matrix (temporomandibular joint destruction and mandibular function in children, and the relation between factors such as bite force and chewing characteristics), which correlates form and function (Randall et al, 2012).

Primary dentition to a large extent lays the foundation for proper eruption and alignment of the succeeding dentition, based on the observation of these key features of occlusion in the child's dentoalveolar system during the formative years, the characteristics of the permanent dentition occlusion can be predicted very well, although the occlusion of the permanent dentition is largely influenced by the framework provided by the preceding primary dentition, its features vary among different populations and ethnic (Abu Alhaija et al, 2003).

1.2 Characteristics of ideal occlusion in primary dentition

Normal occlusion in primary teeth has the following characteristics: spacing between anterior teeth, primate spaces, flush terminal plane molar relation overjet and overbite, (Joshi MR and Makhija PG, 1984, Motayam KME and Elbardissy A ,2007).

1.2.1Developmental spaces between primary teeth.

Certain characteristics of primary dentition and occlusion, which are required for a smooth transition from primary to permanent dentition which are (Bhayya DP, Shyagali TR ,2011):

Spacing is a common condition in the primary dentition and constitutes a very important feature of the dentition as it is an indicator of favorable development of permanent occlusion. Spacing often presents between all anterior primary teeth with the most marked spaces present being mesial to canines in the maxilla and distal to canines in the mandible These are called primate spaces or anthropoid spaces The secondary or developmental spaces which are commonly found between the incisors are termed physiological spaces (Abu Alhaija and Qudeimat ,2003 ; Gkantidis et al , 2007).

A balanced occlusion in primary dentition favors the proper development of chewing, speech, and breathing functions in a critical period of both physical and emotional growth and development (Kramer et al, 2013).

1.2.2- Occlusal characteristics in primary dentition

Occlusal characteristics was assessed according to :-

1-Molar Relationship:

Baume (1950) categorized the primary molar relationship using the distal surface of primary second molars into:-

(A)Flush Terminal plane: The distal surface of maxillary and mandibular primary second molars lie in the similar vertical plane.

(B) Mesial step: The distal surface of mandibular primary second molar is mesial to the distal surface of maxillary primary second molar.

(C) Distal step: The distal surface of the mandibular primary second molar is distal to the distal surface of maxillary primary second molar.

Analysis of the occlusion in the primary dentition should consider the arrangement of deciduous teeth and the occlusal relationship of the anterior and posterior segments of both arches. The recognition of normal occlusion patterns in primary dentition as well as the identification of morphologic changes during permanent teeth eruption is essential for treatment planning in pediatric dentistry, At the time of eruption of the first permanent molar, their initial occlusion is dependent on the terminal plane relationship of the deciduous second molars (Bishara et al, 1988).

2-Canine Relationship:

Primary canine relationship was determined using the following classification (Foster & Hamilton 1969).

(A) Class I: The tip of the maxillary primary canine is in the same vertical plane as the distal surface of the mandibular primary canine.

(B) Class II: The tip of the maxillary primary canine is mesial to the distal surface of the mandibular primary canine.

(C) Class III: The tip of the maxillary primary canine is distal to the distal surface of the mandibular primary canine.

Assessments regarding molar relationships and canine relationship were made by assessing both sides of the dental arches. The decision was made in favor of flush terminal plane, in the case of a distal step or mesial step molar relationship on one side and flush terminal plane on the other. In case of Class II or III canine relationship on one side and Class I on other, the decision was made in favour of Class I canine relationship (Hegde et al , 2012; Khan et al , 2014).

3-Overjet: Overjet is defined as horizontal overlap of the incisors, normally the incisors are in contact with the upper incisors ahead of the lower by only the thickness of their incisal edges (i.e, 2-3 mm overjet is the normal relationship), if the lower incisors are in front of the upper incisors, the condition is called reverse overjet or anterior crossbite (profit, 2007).

Types of overjet

There are three types of overjet according to Graber (2017):

1-Normal overjet (positive) 1-4 mm

2-Increased overjet (positive)5 mm

3-Decreased overjet (negative)

A-Zero (edge to edge)

B-Negative (reversed overjet)

4-Overbite: The extent of overbite was graded according to coverage of mandibular incisor by the fully erupted maxillary incisor. Overbite was considered to be increased when the degree of overlap of the maxillary central incisors was greater than one half of the clinical crown of the mandibular central incisors, i.e., more than 3 mm and reduced if the degree of overlap was less than one-third (Reddy et al, 2010) .

5-Open bite: The degree of open bite was recorded when incisal edges of the maxillary incisors did not vertically overlap the incisal edges of the mandibular incisors (Reddy et al, 2010) .

6-Anterior crossbite: It was noted when one or more maxillary incisors and canines occluded lingual to the mandibular incisors(Reddy et al, 2010) .

Posterior crossbite: It was noted when one or more maxillary primary canines or molars occluded lingual to the buccal cusps of the opposing mandibular teeth(Reddy et al, 2010) .

1.3 Factors affect on primary spaces

1.3.1 Tooth size - jaw size discrepancy

In spacing cases caused by tooth size - jaw size discrepancy , the problem lies with jaw size. It has been found that individuals with bigger faces and jaws usually have spacing and not crowding (Leighton and Hunter, 1982).

1.3.2 Congenitally missing teeth

Spacing in cases of congenitally missing teeth is not located only at the edentulous area, but it is more generalized as neigh boring teeth often migrate into the existing space (Moyers, 1988).

Existing teeth are often smaller, with an atypical conical shape and create esthetic and functional problems worsening the spacing problem (McKeown et al, 2002).

Congenitally missing teeth play an important role in the etiopathogenicity of spacing, Concerning the etiology of congenitally missing teeth ,there are several genetic, and environmental factors (Brook, 1984; Shapira et al, 2000; Dhanrajani, 2002; Fekonja, 2005;Klein et al, 2005).

1.3.3Macroglossia

True macroglossia is a condition where the tongue is bigger than normal. Macroglossia constitutes an etiological factor for spacing, open bite and protrusion of both jaws. A large tongue may also compromise the stability of or cause masticatory, swallowing, respiratory and speech problems (Kawakami et al., 2005). The causes of true

Macroglossia may be hereditary or acquired (Klaiman et al., 1988; Weiss and White, 1990). Macroglossia diagnosis may be performed empirically when the tongue occupies the entire oral cavity, when impressions of the lingual surfaces of mandibular teeth are present at the lateral tongue margins or when the patient is capable of touching the chin or the nose tip with her/his tongue. Tongue size can be estimated with direct measurement, indirect measurement through an impression and, finally, with magnetic tomography(Deguchi, 1993; Rakosi et al., 1993). Certain cephalometric measurements may also aid in diagnosing macroglossia (Rakosi, 1982; Rakosi et al., 1993; Wolford and Cottrell, 1996). However, due to lack of practical methods for measuring tongue size, it is sometimes difficult to assess to what extent macroglossia is responsible for malocclusion (Schwenzer et al, 1977). Pseudomacroglossia is also an etiologic factor for spacing. Tongue size is normal, but it appears larger than other anatomical features because certain causes forcethodontic treatment outcome and the tongue to an anterior position. This condition results in spacing, which is more pronounced in the anterior dental arch (Wolford and Cottrell, 1996).

1.3.4 Supernumerary teeth

Supernumerary teeth constitute one of the causes for local interdental spaces, as they interfere with the eruption of neighboring teeth or displace them out of the arch. Incidence in the permanent dentition ranges between 0.5% and 3.8%, whereas in the deciduous dentition the condition is rarer with an incidence of 0.35-0.6% (Fernandez Montenegro et al., 2006). Approximately 75% of supernumerary teeth are located in the maxilla (Fernandez Montenegro et al, 2006; Gabris et al., 2006).

It was also found that patients with supernumerary teeth have larger teeth in general. This leads to lack of space for the eruption of the remaining teeth even after the supernumerary one is removed (Khalaf, 2005).

1.3.5 Microdontia and teeth with crown anomalies

Small teeth usually result in generalized spacing (Moyers, 1988). Small teeth and teeth with smaller and anomalous crowns may also be The cause of localized spacing (Bishara, 1972; Becker, 1978; Oesterle and Shellhart, 1999) . Approximately 5% of the population presents some degree of discrepancy concerning tooth sizes (Proffit, 2000). It has also been found that oligodontia and microdontia occur more often in female, whereas megalodontia and supernumerary teeth are more common in male (Brook, 1984). The cause of dental shape or size anomaly may be congenital or acquired (Marec-Berard et al, 2005; Stahl et al, 2006).

1.3.6 Hypertrophic upper lip frenum

Hypertrophic upper lip frenum had responsible for median diastema Gardiner, 1967). However, diastemata, which sometimes create severe esthetic problems due to their location, may also be dueto other causes. The latter include incomplete fusion of the two osseous parts of the premaxilla at the suture (Stubley, 1976) , congenitally missing lateral incisors (Oesterle and Shellhart, 1999), supernumerary teeth at the midline (Mason and Rule, 1995), small teeth (Bishara, 1972; Becker, 1978; Oesterle and Shellhart, 1999) or even the combination of suture deficiency at the midincisor area and congenitally missing lateral incisors(Moyers, 1988).

1.3.7 Habits:-

A- Sucking habits

This factor had important effect in primary space and dentofacial development of both thumb- and finger sucking habits.(Jagman et al, 1989) he present about 60% Of all children had a nonnutrive sucking habit during their youth, sucking habits can have an influence on both

The dental arches separately as well as on the intermaxillary relationship, prolonged finger and thumb sucking results in a disturbance of the dentofacial development in the anteroposterior, vertical and transverse directions. Dummy sucking had consequences for the development especially in vertical and transverse directions. With regard to dental complications it is advised to stop finger- and thumbsucking prior to the eruption of the permanent incisors and to stop dummy sucking before three years of age (Jagtman et al , 1989).

B- Mouth breathing

The mouth breathing affect in primary space and the position of primary dentition, resulting in mouth breathing change the pattern of craniofacial growth causing malocclusion found significant association of mouth breathing with malocclusion represented by increasing overjet & openbite, while no association was found with crossbite therefore it is necessary to intervene early on these a etiological factors of malocclusion to prevent its development or worsening and, if already developed, correct it by early orthodontic treatment to promote skeletal growth (Grippaudo et al, 2016).

C-Feeding pattern

Adamiak (1981) found a clear negative association between the duration of breast-feeding and the incidence of occlusal anomalies. Meyers and Hertzberg (1988) found an increasing prevalence of need for orthodontic treatment with increasing degree of exposure to the bottle. Additionally, Davis & Bell (1991) demonstrated an association between exclusive bottle-feeding and malocclusion in the anteroposterior plane. Breast and bottle feeding enhance oral development and the formation of proper swallowing technique, sucking and swallowing are reflex mechanisms that represent the first coordinated muscular activity of the infant (Turgeon et al, 1996). This muscular activity is different for various methods of sucking, milk sucking aided by the negative pressure created intraorally by muscular sucking motions (Westover et al, 1989).

While abreast nipple lactates in non-continuous fine streams from its pores, the active sucking requires substantial energy expenditure and strenuous muscle activity, this allows for proper development of the muscles involved the orbicularis oris, masseter, buccinator, pharyngeal constrictors, and posterior digastrics (Westover et al, 1989 Auerbach 1990).

D-Tongue Thrust

Tongue Thrust In a small proportion of subjects the swallowing activity is accompanied by an anterior thrust of the tongue which appears to be a basic neuromuscular mechanism, this so-called 'endogenous' tongue thrustis sometimes associated with an anterior lisp during speech. It usually affects the developing teeth to the extent of preventing the full vertical development of the anterior dento-alveolar segments, so that an incomplete overbite or more usually an anterior open bite developed, the upper and lower incisors may be proclined by the action of the tongue, if it is a normal neuromuscular mechanism rather than an adaptive or habit activity, it would not be modified by orthodontic treatment, re-positioning the teeth would not be likely to alter the tongue activity, and any open bite caused by the tongue thrust would be likely to recur, the 'adaptive tongue activity will change if the teeth are moved so that the adaptation becomes unnecessary, but the 'endogenous' tongue thrust will not change, the muscle forces acting against the teeth during speech and swallowing are too short acting to influence arch form in most cases. The adaptive tongue thrust in swallowing often seen with an increased overjet is also associated with a forward resting posture of the tongue and that it is the latter which has the most important influence on arch form vertical mal relationship of the skeletal bases would also modify the effect of a tongue thrust, an increased vertical distance between the upper and lower jaws (large infra-nasal height) would discourage the occlusion between the upper and lower incisors, It also places the tongue and lower lip at a lower level relative to the upper incisors (Foster,1985).

1.4 Distribution of primate spaces :-

Spacing in the primary dentition can be subdivided into two types: primate space and developmental space (Janiszewska_olszwska , 2009).

Primate spaces are located between the lateral incisors and canines in the upper arch, and between the first molars and canines in the lower arch, whereas developmental spacing also called interdental spacing is found between the incisors in both the upper and lower arches (Baume, 1950).

In addition to these two spaces type , there is other space type which is **leeway space**

The leeway space is arch circumference difference between the primary canine, first primary and second primary molars, and the permanent canine and the first and second premolars, according to Black's (2008) the maxillary arch leeway space is 1.9 mm, and the mandibular arch leeway space is 3.4 mm.

Leeway space in lower jaw was more than upper jaw, One of the most important reasons for this is more mesial migration of permanent mandibular first molar for reaching to class I normal occlusion (Mahmoodian J et al ,2000).

Additionally, a lack of these spaces in deciduous dentition may result in disproportionate jaw and tooth sizes (Vinay et al ,2012).

Spaced primary dentition is an indicator of the favorable development of permanent dentition (Vinay et al ,2012). While, closed dentition without primate or interdental spaces can increase the risk of proximal dental caries (warren et al , 2003 ;Subamaniam et al , 2012).

Wide variation in mesiodistal crown width of primary teeth has been reported among populations. this is due to complex interactions between genetic and environmental factors (Townsend et al ,2005).

The dental arch is divided into various segments including incisor, canine and molar segments which are important in determining the space and occlusion in the permanent dentition. A balanced occlusion can be considered normal, even if it contains teeth that are slightly rotated or incisors that show slight buccal or lingual inclination (Freire et al ,2007).

After the complete eruption of primary dentition by the age of three, the entire arch and occlusion is relatively stable for the next years. During this static period, if proper prediction of arch changes and occlusion are done by the pediatric dentist, it helps in establishing an acceptable esthetic and functional occlusion at a later age (Prabhakarah et al , 2006).

Occlusion constitutes one of the important objectives of pedodontic treatment whether it is preventive, interceptive or corrective. The understanding of the anteroposterior changes that occur in the occlusion between the deciduous and permanent dentition is crucial for the clinician involved in early orthodontic treatment (Zakirulla, 2012).

Occlusion is influenced by changes in timing of tooth eruption and loss, and dental caries (aranza et al ,2011).

Abu Alhaija and Qudeimat(2003) showed that generalized spacing was more in upper arch than lower arch and anthropoid spaces were found also more in upper arch than lower arch.

Gkantidis et al (2007) demonstrated that spacing is more common in the maxilla than in the mandible and spaces are observed more among boys rather than girls Perhaps lack of spacing suggests severe risk for crowding in the permanent dentition.

Suma and Das (2010)observed that statistically significant difference was found for canine relationship among genders, crowding was seen more in boys than girls and spacing was seen more in girls.

Vegesna et al (2014) observed among the majority of the children the Spaced type of arches occurred more frequently than closed arches and the incidence of primate spaces was more in males than in females.

Chapter Two
Materials and Methods

Sample

The sample of this study consisted of 70 child aged (4and5) years old (33 girls and 37 boys) who were collected from the clinic of teaching hospital of Dentistry College of Baghdad University . Examination done from 24/ 12/2017 to 8/3/2018 as appendix 1 .

2.1 Materials

1-Gloves

2-Mirror

3-Mask

4 –Disinfection

2.2 Methods:-

Children who had selected in this study had fulfilled the following criteria:

No missing teeth, no grossly decayed teeth, no permanent teeth , no developmental anomalies and no tooth with proximal restorations.

Examination was done by seated the child in up right position, and the child was asked to bite in centric occlusion, the present or absent of primate space was examined between primary lateral incisor and canine in the upper arch and primary canine and deciduous first molar in the lower on right and left sides on both arches (Farsi and Salama , 1996) such as showing in (figure1).

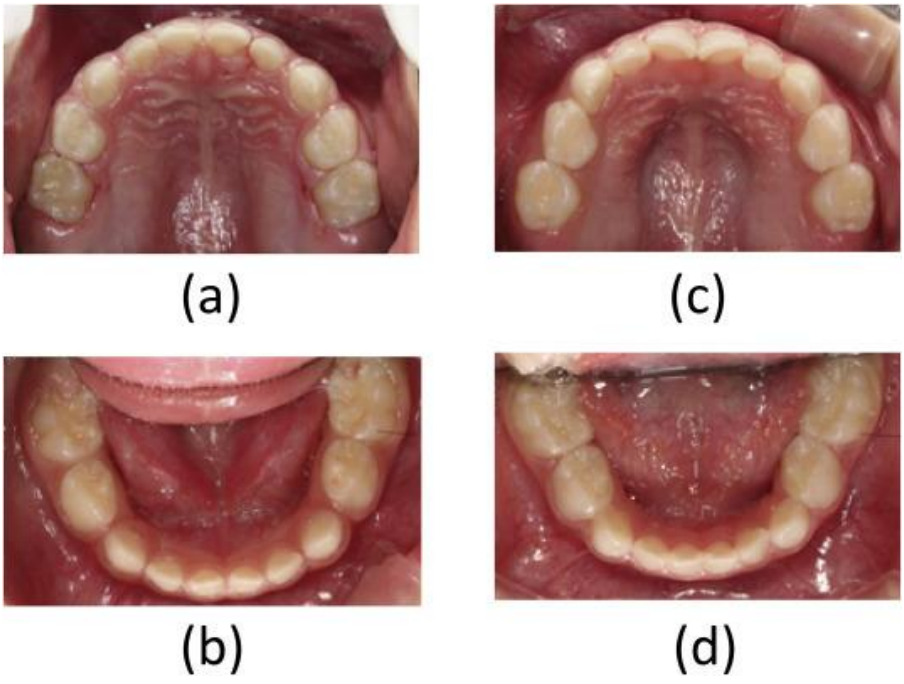

Figure (1) Upper and lower occlusal views of primary dentition. (a) The upper dentition with space. (b) The lower dentition with space. (c) The upper dentition without space. (d) The lower dentition without space. (Sun K-T, et al.2017).

Chapter Three

Results

3.1 The sample

Table (3-1) shows the distribution of samples according to gender.

The results showed that the percentage of boys were higher than girls group and total sample.

The finding showed that the percentage of children with 4years old was higher than the percentage of children with 5 years old in total sample.

Table (3-1) Distribution of sample according to gender and age

Gender	No.	Percentage %
Girls	33	47.14
Boys	37	52.85
Total	70	99.99
Age	No.	Percentage %
4years	37	52.85
5years	33	47.14
Total	70	99.99

3.2 Primary spaces distribution with dental arch

Table (3-2) illustrates the distribution of primary spaces in dental arches .

The results showed that the percentage of primary spaces in maxillary arch was equal in right quadrant with left quadrant while the percentage of primary spaces in mandibular arch was higher in left quadrant than right quadrant and the percentage of the primary space in left quadrant was higher than right quadrant .

Table (3-3) Distribution of primary spaces in dental arch.

Primary space	Right quadrant		Left quadrant		Total	
	No.	%	No.	**%**	No.	**%**
Maxillary arch	66	94.29	66	94.29	132	94.29
Mandibular arch	52	74.29	54	77.14	106	75.71
Total	118	84.28	120	85.71	238	85.00

3.4 Primary spaces maxillary and mandibular arches in relation to gender

Table (3-4) demonstrates the differences of primary spaces between maxillary and mandibular arches in relation to gender.

The results revealed that the percentage of primary space in maxillary arch was higher than mandibular arch in total sample .

Concerning gender differences, the percentage of primary spaces was higher in boys than girls.

Table (3-4) Differences of primary spaces between maxillary arch and mandibular arch in relation to gender

Gander	No.	Primary space			
		Maxilla		Mandibular	
		No.	%	No.	%
Girls	33	33	100	22	66.33
Boys	37	34	91.89	32	86.49
Total	70	67	95.71	54	77.14

Chapter Four

Discussion

4.1 The sample

This study was carried out among 4 and 5 years old preschool children in order to exclude the mixed period dentition.

4.2 Distribution of the primate space in primary dentition

The result of this study showed that the spaced arch was occur more frequency than closed arch and the percentage of spaced arch was 85% from the total sample ,This reveled that sample of this study showed normal occlusal characteristic in primary dentition which give an expection for normal occlusal characteristic in permanent dentition.

These primary spaces are a prerequisite to compensate for the discrepancy between the tooth sizes of primary and permanent dentitions, and play a critical role in the later eruption of permanent teeth and the establishment of occlusion (Janiszewska_olszwska , 2009).

The results of this investigation revealed that the primate space percentage in maxillary arch was higher than in mandibular arch, in both genders and in total sample, this result agree with Mahmoodian et al (2000) who showed a larger primate space in maxilla and generally anterior positioning of this space in maxilla to mandible which is the result of larger size of maxillary anterior teeth rather than mandibular anterior teeth and these , primate space in upper jaw has been used for alignment of permanent anterior teeth.

While the percentage of primate space were higher among boys than girls in both age group, this result agree with Abu Alhaija et al (2003) because males might had larger tooth/arch dimension than that of females in the primary dentition stage due to different ethnic groups present with unique dental arch characteristics (Kaye EK et al,1976) .

Chapter five

Conclusions

5.1 Conclusions

1- The percentage of boys was higher than girls in both age groups.

2- The percentage of primary space showed that in maxillary arch was equal in right quadrant with left quadrant while the percentage of primary space in mandibular arch was higher in left quadrant than right quadrant and the percentage in left quadrant was higher than right quadrant and in total sample.

3- The results revealed that the percentage of primary space in both genders and in total sample was higher in maxillary arch than mandibular arch , concerning gender differences the percentage primary spaces was higher in boys than girls.

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Appendix

Case no. :

Children name:

Age :

Gender:

Primate spaces:

EDCBA	**ABCDE**
EDCBA	**ABCDE**