DENTAL ERUPTION AND ORAL PATHOLOGY AMONG THE GALLONG

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Certified that the subject matter of this dissertation is the record of work done by **D.K. Limbu**, that the contents of this dissertation did not form a basis of any previous degree to him or to the best of my knowledge to anybody else, and the dissertation had not been submitted by him for research degree in any other University.

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CONTENTS

LIST OF TABLES

Chapter I

INTRODUCTION

Dental anthropology is a specialised field of Physical Anthropology under the broad discipline of anthropology which is concerned with the study of human teeth - one of the anatomical systems of man.

The primary aim of undertaking research works in physical anthropology and human population genetics has been to expound the nature of biological variations in different human populations and the meaning of these differences in the understanding of the ongoing evolutionary process. The systems used have been varying from time to time, and among the other systems regularly studied in this context, human dentition is of special interest and occupies important place. The special interest evinced on dentition may be due to its diachronic capability, to know about our species and racial origins, ease of direct comparison with living and also past populations facilitating of a much greater time depth in micro and macro evolutionary investigations and number of synchronic purposes. Teeth being the hardest and most durable materials of all parts of the body due to the presence of enamel and dentine in them preserve well and hence account for a large proportion of the human and pre-human fossil remains available for study. The environment has limited influence on the teeth which are highly genetic in nature as revealed by many a study postulating modes of inheritance for different dental traits (Kraus, 1951; Turner, 1967). They are the least biased to subjectivity unlike other anthroposcopic traits regularly studied and hence greatly help in the comparison and classification of populations as other biogenetic markers like blood groups, red cell enzymes,

dermatoglyphics, etc. do. The different dental aspects of study which attract the attention of human biologists are crown morphology, metrics, health, evolution, growth, genetics, usage, forensic and ethnographic treatment, all of which can be used as research tools and areas of academic studies.

It is well known that a series of variables such as sex, race, heredity,socio-economic level, and some aspects of the intrauterine and postnatal environment influence the sequence and timing of tooth emergence. The ever increasing volume of reports on the time of tooth emergence for human, primate, and mammalian groups is broadening our knowledge of the diversity in the timing of appearance of teeth in the oral cavity. The information is valuable in assessing the diversity seen between populations. The dental status of an individual at a particular age, especially in the younger age groups, provides an index of physiological maturity for the children. The chronology of tooth emergence has often been used in the medico-legal cases for the estimation of age.

Dentition is one of the most important anatomical systems of the human body. There are definite genetic factors that influence the entire dentition, those that affect only certain groups of teeth, and those that act on single tooth. The large genetic component and high heritability of dentition have been demonstrated by a number of genetic studies which facilitated the postulation of the modes of inheritance for various dental

traits.

Dental age like skeletal age and secondary sex character age is useful for the assessment of biological age, the significance of which has been greatly recognised in the diagnosis and treatment of children with growth disturbances. It can be estimated from data on tooth eruption in such a situations where it is highly difficult to estimate the chronological age on the basis of historical events. A proper estimation of dental age can be accomplished only by reference to standards established on the population, of which the subject is a member, living in same environmental conditions.

It has to be admitted that teeth are not only good indicators of age of the juvenile fossil ancestors of man but they also help in quick and easy identification of skeletal remains, cadavers, or amnesia victims. The standards obtained from the studies on tooth eruption pattern are quite useful to the orthodontist in proper and planned scheduling of maturation in comparison to other populations, and to forensic anthropologist as a criterion of age.

The age and order of eruption of deciduous and permanent teeth show as much marked variation between one individual and the other as among the different racial groups within same region. If a larger sample is studied possibly from a racial group, one can establish either a trend,

a constant, or a distribution within that sample of sufficient reliability just to justify the application to that group as a whole so that it could be distinguished from other populations.

History and Evolution of Subject

Study of dental anthropology began in the eighties of the 18th century when investigations on physical anthropology centered mainly round the analysis of the morphology of skeletons and teeth, though as a subject of academic research, its importance was not recognised until 1900. The root of the dental anthropology lay in the seventies of the 19th century as shown by a number of investigations, when the subject got its breakthrough for the first time.

The analysis of dentition has been long considered an important aspect of anthropological research on the biology of extinct and extant populations. In 1927, Krogman published the first comprehensive review of research on primate dentition. This 100 page treatise, comprising an entire issue of the Journal of Dental Research, should be considered a cornerstone in the field. It is obvious that to Krogman (1927), dental anthropology included the study of dental growth, theories on dental origin, primate dentition and population variation.

Following Krogman's work, research on detal anthropology proliferated in numerous anthropological and dental research journals. In addition,

there were a number of special journal issues, dissertations, monographs, and books developed to this subject (e.g., Moorrees, 1957; Brothwell, 1963; Wolpoff, 1971; Kurten, 1982; Reddy, 1985). In the American Journal of Physical Anthropology alone, annual report of the editorial notes that dental papers comprised about 11% of the total manuscripts submitted in 1985 and 1986. This is not a new trend, but rather a continuation of interest that has existed since the early days of the journal.

While dental anthropology was very much alive on the individual research level, there was no organized forum in which to communicate with others in the field to facilitate the exchange of ideas. The Dental Anthropological Association (DAA) was officially, created in 1986 during the American Association of Physical Anthropologists (AAPA) meeting in Albuquerque, New Mexico, and established the 'Dental Anthropology Newsletter' as its official publications. Since its inception, the DAA has sponsored symposia and scientific sessions where it exemplifies the diversity in dental anthropology, including interest in recent and archaeological populations as well as variation in methodological approaches and scientific results.

Dental Eruption

The process by which the crown of the developing tooth passes through its interrosseous surroundings and is maintained in normal occlusion

within the oral cavity is known as tooth eruption. Tooth eruption is generally defined as the time when any apart of the crown of the tooth has emerged through the gingival surface. In the words of Rainbow (1973), "... dental maturation is a continuum, comparable to skeletal maturation. One may calculate dental ages through the entire growth period, from foetal life to adolescence, by assessing stages of tooth formation, crown calcification, root development and eruption status from appropriate roetgenograms (oblique jaw views or pantomograms) and comparing the developmental status of each tooth with appropriate norms".

The age and order of eruption of deciduous and permanent teeth show as much marked variation between one individual and the other as among the different racial groups within the same region or outside. As such Hellman (1923), six decades ago, remarked: "The arrival of a comet which makes its appearance once in many years, can be accurately calculated to a small fraction in time, but notwithstanding the inestimably greater frequency with which the event of eruption occurs, the appearance of a tooth defines accurate forecast", which is perhaps valid even today. Therefore, one can establish a trend or a constant if a larger sample is studied possibly from a racial group.

Unlike in permanent teeth eruption times there is no significant difference in the eruption times of deciduous teeth in children of same physical health in many ethnic groups as well as between males and females,

though the role of genetic factors has been shown by twin studies.

After the crown and part of the root are formed, the tooth penetrates the mucous membrane and makes its entry into the mouth. Further formation of root is supposed to be an active factor in pushing the crown toward its final position in the mouth. Eruption of the tooth is said to be completed when most of the crown is in evidence and when it has made contact with its antagonists in the opposing jaw. Eruption may and usually does continue after this; i.e. more of the crown may become exposed and the tooth may move farther occlusally to accomodate itself to new conditions.

The Deciduous Dentition

Calcification of the deciduous teeth begins about the fourth month of the foetal life; near the end of the six month, all the deciduous teeth have begun to develop. Normally, at birth no teeth are visible in the mouth, occasionally, however, infants are born with erupted mandibular incisors. Such prematurely erupted teeth are usually lost soon after birth because of the incomplete development of the root attachment (Wheeler, 1988).

The deciduous mandibular central incisors appeared in the mouth at the age of approximately 6 months. They are followed a month or so later by the maxillary central incisors. About two months elapse before

the maxillary lateral incisors appear. The mandibular lateral incisors usually emerge a little earlier than maxillary laterals; in fact, to illustrate the variance in sequence in individuals, babies are often displaying four mandibular incisors and no maxillary teeth at all. However, the general rule to be kept in mind is that individual mandibular teeth usually precede the maxillary teeth in the process of eruption and the teeth in both jaws erupt in pairs, one right and one left.

Man has two sets of teeth; the first set of teeth is called primary set or milk teeth. These are 20 in number, i.e. 10 teeth in each jaw. The calcification of these teeth starts when the embryo is 16 weeks old. The development of the teeth continue during the period or pregnancy; hence it is important that the mother has proper nutrition in the form of adequate amount of calcium, vitamin D, phosphorus, etc. for the formation of healthy teeth and good jaws. The milk teeth start appearing in the mouth of the baby approximately by the age of six months and are complete by two and half to three years of age.

The usual order of appearance of the deciduous teeth in the mouth is as follows :

1. Central incisors
2. Lateral incisors
3. First molars
4. Canines
5. Second molars

A common impression, which is still widespread, is that the deciduous teeth are not to be taken seriously, since they will be lost at an early age in the process of making way for the permanent teeth. All the deciduous teeth may be in use from the age of 2 until the age of 5 years, or 7 years in some cases. Some of the deciduous teeth are in use from 6 months until 12 years of age, or $11\frac{1}{2}$ years in all. The actual situation is, that these teeth are in use, contributing to the health and well-being of the individual, during the first years of greatest development, physically and mentally.

The premature loss of primary teeth, retention of primary teeth, congenital absence of teeth, dental anomalies, and insufficient space are considered important factors in the initiation and development of an abnormal occlusion. The premature loss of primary teeth from dental neglect is likely to cause a loss of arch length with a consequent tendency for crowding of the permanent dentition.

The Permanent Dentition

The permanent set of teeth which are 32 in number are larger in size and continue to function throughout the life span of an individual if well cared. These teeth start eruption, generally, from the age of $5\frac{1}{2}$ to 6 years and have fully erupted and come into occlusion by the age of 21 years or so. All the deciduous teeth are replaced by the permanent

teeth during the age of 6 to 12 years. The care of deciduous teeth is equally important as care of the permanent teeth because they not only function in the early childhood but they also act as guides to permanent (development) successors as well as help in proper development of the jaws. The diseases which affect the deciduous teeth could also be passed on to the permanent teeth.

The transition to the permanent dentition begins with the emergence and eruption of the first permanent molars, shedding of the deciduous incisors, and emergence and eruption of the permanent incisors. After the shedding of the deciduous canines and molars, emergence and eruption of the permanent canines and premolars, and emergence and eruption of the second permanent dentition is completed except for the third molars. This process requires about 20 years to complete. The permanent or succedaneous teeth replace the exfoliated deciduous teeth in a sequence of eruption that exhibit great variety. The number of teeth in adults, including third molars when present, is 32.

The permanent dental formula in humans is :

$$I\ \frac{2}{2}\ \ C\ \frac{1}{1}\ \ P\ \frac{2}{2}\ \ M\ \frac{3}{3}\ =\ 16$$

Premolars have now been added to the formula, two maxillary and two mandibular.

In a clinical notation system for the permanent dentition, the maxillary teeth are numbered from 1 to 16, beginning with the right third molar. Beginning with the mandibular left third molar, the teeth are number 17 through 32. Thus, the right maxillary first molar is designated as 3, the Maxillary left central incisor as 9, and the mandibular right first molar as 30. The entire dentition is designated by the notation :

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

The usual order in which the permanent teeth appear is as follows:

1. First molars
2. Mandibular Central and Lateral Incisors
3. Maxillary Central Incisors
4. Maxillary Lateral Incisors
5. Mandibular Canines
6. First Premolars
7. Second Premolars
8. Maxillary Canines
9. Second Molars
10. Third Molars.

It has been suggested that a certain sequence or eruption of the teeth

is considered to be favourable to the development of a normal occlusion.

Oral Pathology

Dental caries or tooth decay and pyorrhea or periodontal diseases are the commonest diseases of the mouth. The former being the disease of the tooth proper and the latter that of the supporting structures of the tooth. Both these disease have afflicted not only the human races all the world over since pre-historic times up-to-date but also the non-human primates and lower animals.

Dental Caries

Dental caries is a pathological condition of the teeth resulting in the decalcification of the dentine or enamel and the disintegration of the remaining organic material often leading to the loss of the teeth and occurs in association with other conditions such as periodontal disease, which causes recession of the alveolar bone resulting in loosening of the teeth and their subsequent loss; dental abcess, which is a cavity of pus within the alveolus near the root apex; dental enamel hypoplasia, which is a developmental enamel defect in the deciduous and permanent teeth seen as transerverse lines, pits, and grooves on the enamel surface; ante-mortem or tooth loss; and attrition, which is the gradual wearing away of the hard parts of the teeth.

The IDF (International Dental Federation) Commission on Classification and Statistics for Oral Conditions (COSTOC) in its recommendation to the World Health Organisation, on the classification of epidemiologic studies of dental caries and definitions of related terms (1975), defined dental caries "as a localised, pathologic process of bacterial origin, that results in the demineralization of the hard tooth structures and progression to cavitation. Caries, being a disease process, starts with a microscopic lesion and eventually progresses into a macroscopic cavity. The term 'caries' designates 'decay of animal tissue'. Hence, it is necessary to specify tooth decay as dental caries ...". It is characterised by the molecular decay of bone softening the enamel and dentine in which it becomes thin and dark and usually breaks down with the formation of pus. It is generally held that there are micro-organisms of the type Lactobacillus Acidophilus odontolyticus in the mouth which are cariogenic in nature and produce acids by acting on food debris lodging around the teeth. These acids largely dissolve the hard tissues of the teeth leading to caries. There are different theories for explaining the etiology of dental caries. German scientists named Leber and Rottenstein in 1867, and Underwood and Mills in 1881, propounded the Acidogenic theory based on the experiments conducted on animals. Experiments confirmed this fact, because the existence of micro-organisms in man's mouth is necessary to ensure the physiological functions in the body, although it is still unknown which type of micro-

organism or virus is responsible for the disease as many kinds of them produce acids under varying circumstances ranging from neglect of oral hygiene to sugar containing food debris. Miller (1883) through his classic work made the explanation of the etiology of dental caries widely acceptable which according to him, was known as "Chemico-parasitic theory". There are other theories too such as the Proteolytic theory of Boedecker and Gottlieb, and also the Proteolysis-Chelation theory of Isenberg, Martin, Shatz and others put forth in 1950s on the etiology and pathogenesis of caries, which did not convince the scientific world.

James (1979) lists a number of contributory factors causing tooth decay which he divides into two broad categories namely intra-oral and extra-oral causes. Included in the intra-oral causes are the dental plaque consisting of food and bacteria in a creamish film sticking to the teeth; anatomy of the tooth - shape, form and structure; position of the teeth; dental appliances and restoration; and lack of salivary flow. The extra-oral causes are hereditary; high sugar intake, nutritonal deficiency in calcium, phosphorus, flurides, vitamins A, C and D and proteins, soft foods, and bottle feeding. Leus (1981), however, reduces them only to four to five well known factors which cause dental caries; low fluoride levels in drinking water, food products containing large quantitives of sugar, bad childhood health in general, inadequate quantitites of saliva and disturbance of its optimal composition. Hereditary predisposition of dental tissue to caries

appears to be another factor. The most important factors that contribute to the disease are consumption of food products with increased quantities of sugar and fluoride-lacking drinking water. When the disease acquires a high degree of severity, the affected individual finds it difficult to eat and swallow and at times resulting in speech problems and fever.

First of all, there is a loss of polish and translucency of the tooth surface, i.e. it changes the colour from white to brown or black. The area becomes soft and porous and the food starts getting lodged into it. The person becomes sensitive to cold and hot drinks and sweet and sour things. It gives mild to severe toothache depending upon the nearness and involvement of the pulp. The tooth becomes tender and is not able to chew food with it. In Sushruta Samhita the symptoms are described thus: "The tooth becomes loose and perforated by black holes accompanied by a copious flow of saliva. The appearances of an extremely diffused smell with a sudden aggration of the accompanying pain without any apparent cause is also one of its specific features". Once the pulp is involved, it becomes a passage for the oral micro-organisms to travel into the bone, smelling appears into that area and other complications of inflammation follow.

Caries of the teeth could be acute or rampant when the susceptibility is very high. Almost all surfaces are affected. Even the very immune areas, viz. the cervical and proximal surfaces of mandibular incisors are

involved. The other type is chronic or slow growing. It may involve one tooth or a group of teeth at the same time. There is another type called arrested, where further progress of caries does not take place because the area had become self-clean sample and secondary dentin has formed.

It has been labelled as a disease of the Western countries but this is not true. It is very much prevalent in our country. Different surveys conducted in this country reveal that the incidence is on the increase in the developing countries. More and more children are affected by it. It is second important disease next to pyorrhea for loss of teeth in Indians. Tylor and Marshal Day observed in 1939 a low incidence of caries in Kangra Valley. Marshal Day and Tandon (1940) from another group of children in Punjab recorded that caries was much less than in American children. Shourie (1941) made a comprehensive survey of children from various parts of India. He reported that 44.5% of children were free from caries which was considered to be much higher than that recorded in children in England and U.S.A. The incidence of caries in deciduous teeth was higher in girls than in boys. Urban children in all age groups showed more caries than the rural children. Thereafter, a number of surveys carried out by Vacher (1952), Mangi and Jalili (1961) showed the caries incidence to be on the increase.

Periodontal Diseases

Periodontal disease is the most common oral health problem of man

and also a major problem in modern dental practice. Paleopathological studies indicate that man has been subject to periodontal disease since prehistoric times, and our earliest historical records reveal an awareness of periodontal disease and the need for treating it.

Periodontal disease was the commonest of all diseases of which there was evidence in the embalmed bodies of the Egyptians of 4000 years ago. Oral hygiene was practised by the Sumerians of 3000 B.C., and elaborately decorated golden toothpicks found in the excavations at Ur in Mesopotamia suggest an interest in cleanliness of the mouth. In the oldest known Chinese medical work, written about 2500 B.C. by Hwang Fi, oral disease is divided into three types, as follows : 1) Fong Ya, or inflammatory conditions; 2) Ya Kon, or diseases of the soft investing tissues of the teeth; 3) Chong Ya, or dental caries. Gingival inflammations, periodontal abscesses, and gingival ulcerations are described in accurate detail. One gingival condition is described as follows: "The gingivae are pale or violet red, hard and lumpy, sometimes bleeding; the toothache is continuous". Herbal remedies, "Zn-hine-tong", are mentioned for the treatment for these conditions. The Chinese were among the earliest people to use the "chew stick" as a toothpick and toothbrush to clean to the teeth and massage the gingival tissues.

Among the ancient Greeks, Hippocrates of Cos (460-335 B.C.) was the father of modern medicine, the first to institute a systematic exami-

nation of the patients pulse, temperature, respiration, excreta, sputum, and pains. He discussed the function and eruption of the teeth and also the etiology of periodontal disease.

Among the Romans, Aulus Cornelius Celsus (first century A.D.) referred to diseases which affect the soft parts of the mouth and their treatment as follows : "If the gums separate from the teeth, it is beneficial to chew unripe pears and apples and keep their juices in the mouth". He described looseness of the teeth caused by the weakness of their roots or by flaccidity of the gums and noted that in these cases it is necessary to touch the gums lightly with a red hot iron and then smear them with honey. The Romans were very interested in oral hygiene.

Rhazes (850-923), an Arabian of the Middle Ages, recommended opium, oil of roses, and honey in the treatment of periodontal disease. To strengthen loosened teeth he recommended astringent mouth washes and dentifrice powders. He described a procedure of scarification of the gingiva, and strong counterirritants in the treatment of disease of the gums.

In the fifteenth century, Valescus of Montpellier (1382-1417) stated that in order to treat disease of the gums, tartar must be removed little by little either with iron instruments or with dentifrices. In the fourteenth century and fifteenth centuries references is also made to white wine, roasted salt, and aromatic substances as adjuncts in periodontal therapy.

With the beginning of the eighteenth century dentistry developed the early signs of scientific curiosity which were the precursors of present day research disciplines.

Pierre Fauchard (1678-1761), the father of modern dentistry, in the first and second editions of his epochal treatise "Le Chirurgien Dentiste" discussed many aspects of the subject of periodontology. He described chronic periodontal disease as a "kind of scurvy" which attacked the gums, the alveoli, and the teeth.

With the beginning of twentieth century there developed a prolific group of clinicians and scientists throughout the world with a major interest in the periodontal field.

The periodontium is the investing and supporting tissues of the tooth, and consists of the periodontal ligament, the gingiva, cementum, and alveolar bone. The cementum is considered a part of the periodontium because, with the bone, it serves as the support for the fibers of the periodontal ligament. The periodontium is subject to morphologic functional variations as well as changes with age.

Pyorrhea or periodontal disease unlike dental caries is the disease of the periodontium or the supporting structures of the teeth namely the gum, alveolar bone, periodical membrane and cementum. Inflammation and dystrophy are the two ways by which the disease of the periodontium

occurs. Inflammation of the gums or gingiva results in gingivitis manifested as change in colour, enlargement, bleeding, puffiness, friability, ulceration or sloughing. Gingivitis is the first stage of the periodontal disease when the gums are affected. Accumulation of tartar (calculus), the scaly yellowish or brownish hard chalk-like substance that forms at the gums around the teeth, is the most common cause of the gingivitis, others being the bacterial infection, acute necrotizing ulcerative gingivities, mouth-breathing habit, axis and contour of the teeth, faulty dental fillings, presence of food particles between the teeth, abrasions, cuts, fingernail and fishbone injuries, puberty and pregnancy periods, skin diseases, syphilis, tuberculosis, leukemia or blood cancer, vitamin C deficiency etc. Periodontal disease or periodontitis is the extension of gingivitis when inflammatory conditions spread to deeper structures leading to characterized by degenerative factors affect the gums and periodontium resulting in the fall of certain teeth. Thus periodontal disease, which is also widespread a disease as dental caries, leads to tooth loss, bad smell, tooth spacing, deterioration in the general bodily health, etc.

The term periodontal disease has received different meanings and is used rather ambiguously. It is used in a general sense to encompass all diseases of the periodontium in much the same way as are terms such as liver disease and kidney disease. It may be considered synonymous with periodontopathia, although this term is not in current use.

Periodontal diseases may be of different types. The most common by far is also called periodontal disease; in old text-books and papers it was called pyorrhea, periodontoclasia, periclasia, etc. This disease is initiated by plaque accumulation in the gingivo-dental area and is basically inflammatory in character. Initially it is confined to the gingiva and is termed gingival disease, later supporting structures become involved and the disease receives the name of periodontal disease. The term chronic destructive periodontal disease, which very accurately describes the condition, was used.

Periodontal disease	Periodontal disease	Chronic destructive periodontal disease	Periodontitis
(Synonym not currently used: periodontopathia)	Other disease of the periodontium	Gingival disease	Trauma from occlusion
			Periodontal atrophy

The above classification illustrates the different meanings currently assigned to the term periodontal disease.

The terminal effect of periodontal disease observed in adults have their inception earlier in life. Gingival disease in childhood may progress to jeopardize the periodontium of the adult. The increasing awareness of the prevalence of gingival and periodontal disease in children, coupled

with the need for more information regarding the early stages of periodontal disease, have focused attention upon the periodontium in childhood.

Gingivitis, inflammation of the gingiva, is the most common form of gingival disease. Inflammation is almost always present in all forms of gingival disease because of the bacterial plaque, which cause inflammation and irritational factors that favour its accumulation and are very often present in the gingival environment. The inflammation caused by dental plaque gives rise to associated degenerative, necrotic and proliferative changes in the gingival tissues.

The role of inflammation in individual cases of gingivitis varies as follows :

i) Inflammation may be the Primary and only pathologic change. This is by far the most prevalent type of gingival disease.

ii) Inflammation may be a Secondary feature, super-imposed upon systematically caused gingival disease.

iii) Inflammation may be the precipitating factor responsible for clinical changes in patients with systematic conditions that of themselves do not produce clinically detectable gingival disease. Gingivitis in pregnancy is an example.

The most common type of gingival disease is the simple inflammatory

involvement caused by bacterial plaque attached to the tooth surface. This type of gingivitis, sometimes called Chronic marginal gingivitis or simple gingivitis, may remain stationary for indefinite periods of time or may proceed to destruction of the supporting structures (Periodontitis).

Chapter II

REVIEW OF LITERATURE

The published literature shows that a majority of the investigations so far have been carried out only on the eruption of teeth in different populations. For example, Steggarda and Hill (1942) conducted study on the eruption times of teeth among the Whites, Negroes and Indians. The time of eruption of permanent teeth in British children was studied by Clements et al. (1953). Emergence of the permanent teeth in Pima Indian children was carried out by Dahlberg and Menegaz-Bock (1958). Eruption of permanent dentition of southern Chinese children in Hongkong was undertaken by Lee et al. (1965), Houpt et al. (1967) had investigated the eruption times of permanent teeth in region of Ghana. Helm et al. (1974) studied the timing of permanent tooth emergence in Danish children. Brown (1978) conducted study on tooth emergence in Australian Aboriginals. Hassanali and Okhiambo (1982) studied the ages of eruption of permanent teeth in Kenyan Africans and Asians.

In India also most investigations have been concerned with eruption of teeth. Shourie (1946) conducted pioneering work on the south Indian boys and girls. Nanda and Chawla (1966) studied middle socio-economic class and school children in Lucknow. Tooth eruption among school going Punjabi boys and girls in Chandigarh has been studied by Saini (1972), Saxena (1972) and Kaul et al. (1975), and, among Punjabis of Patiala by Sidhu and Gupta (1973). A study on eruption times of permanent teeth in the poorer socio-economic class school children of Kulu valley in Himachal Pradesh

was carried out by Bhasin et al. (1977). Rami Reddy (1981, 1982a, 1982b) undertook dental studies on children of different caste groups of Gulbarga, Karnataka. The time of tooth emergence has been reported by Kaul and Prakash (1982) on Jats of Haryana, on Bengalee boys and girls by Banerjee et al. (1984). Kaul and Pathak (1989) attempted the estimation of age from the total number of permanent teeth emerged in Punjabi children.

Though there are reports on permanent tooth eruption among tribal children in India such as Gaddi Rajput males of Dhaula Dhar Range of Himalaya by Singh (1980), age and sequence of permanent tooth emergence among Khasis by Jaswal (1983). We do not find tribal community in general, and that of North-East Region of India in particular.

A fair number of studies have been conducted on dental pathology on populations other than Indian. For example, Leigh (1925) undertook study on dental pathology of Eskimo. A study on the distribution of caries on different sites of the teeth in English children was conducted by Parfitt (1955). Takeuchi (1961) reported on epidemiological study on dental caries in Japanese children before, during and after World War II. Dental caries prevalence in school children of Baghdad province was studied by Baghdady et al. (1982). Diangelis and Rojas (1982) conducted study on the dental caries and periodontal disease in an Indo-Chinese refugee population where greater caries experience was noted in females and in the Vietnamee teen-agers. The prediction of mean caries experience of samples of the Australian

population was reported by Spencer and Eklaud (1982).

Among Indian populations very few studies on dental caries have been reported in literature. Day et al. (1950) studied the incidence of dental caries among the Punjabis. Rami Reddy et al. (1982) studied prevalence of dental caries among the Muslim of south-eastern Andhra Pradesh. Kunzru and Krishna Reddy (1984) undertook a study on dental caries among the two caste groups of Chittoor district, Andhra Pradesh.

Studies on periodontal diseases have conducted in a fair number on populations other than Indian. For example, Massler et al. (1950) reported the occurrence of gingivitis in sub-urban Chicago School Children. A study on the epidemiology of chronic periodontal disease in Western Nigerian children was undertaken by Sheihem (1968). An observation on dental health of young Vietnamee immigrants was made by Riordan et al. (1981).

Among Indian populations few studies on periodontal disease have been reported in literature. Ramfjord (1961) observed the periodontal status of 11 to 17 year old boys in Bombay. A study on prevalence of periodontal disease and dental caries among the school going children in Calcutta was undertaken by Dutta (1965).

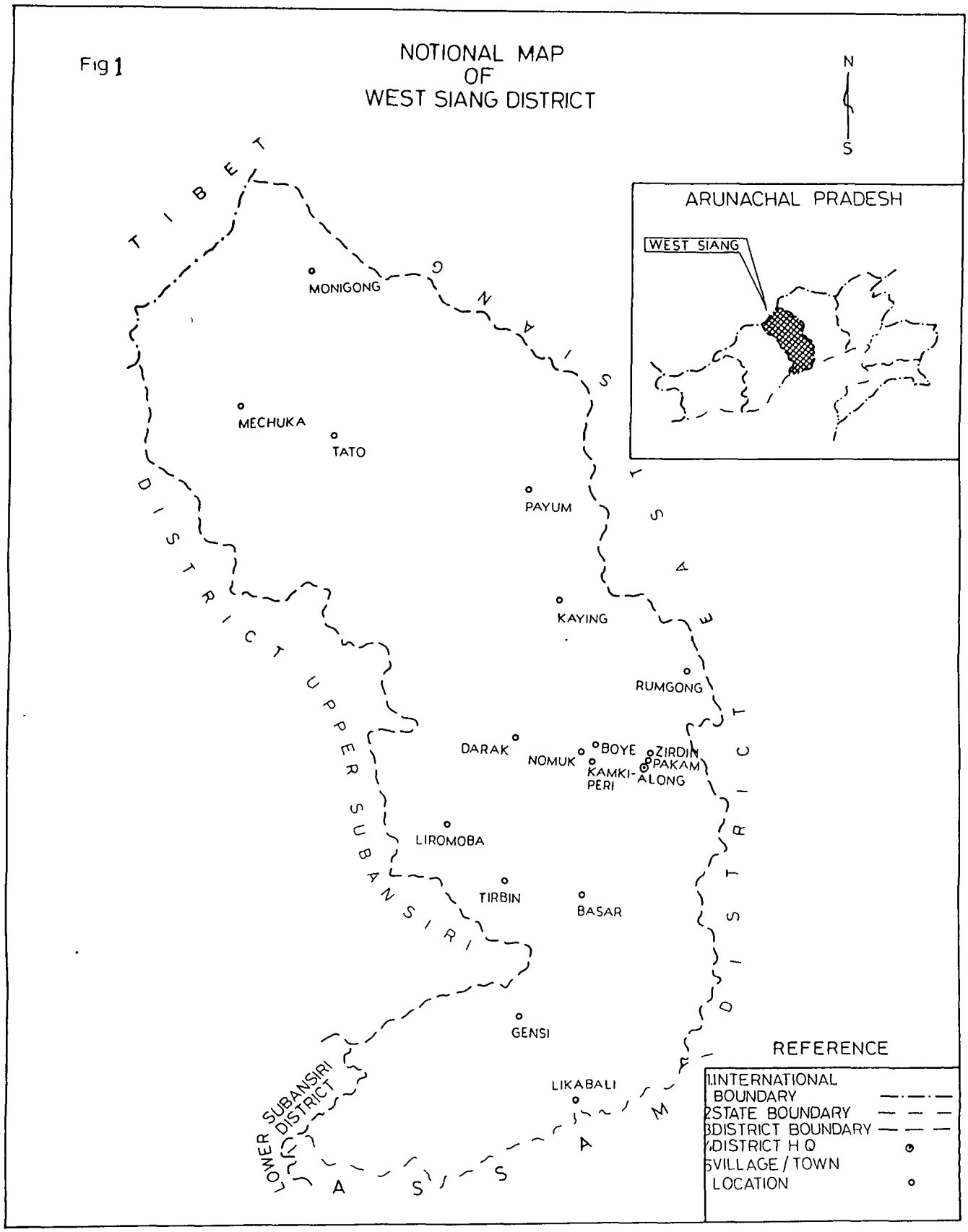
Chapter III

MATERIAL AND METHOD

West Siang is one of the districts of Arunachal Pradesh. It has a total area of 12,006 sq. km. and is located roughly between 93°09' to 95°35'E longitudes and 27°27' to 29°20'N latitude. The minimum altitude of the district is 100 m asl in Likabali and the maximum is 1,890 m asl in Mechuka, and Along is at 198 m asl. In the north the boundary touches China (Tibet), in the south it touches the boundary of Assam, in the east, East Siang district and in the west its boundary touches Upper Subansiri and Lower Subansiri districts as shown in Fig. 1.

The district forms part of eastern Himalaya hence it is highly mountainous. The district may be divided into two types of physiographic zones, viz., the Great Himalayan type in the north and lower Himalayan type in the south. The junction of the Siyum river with the Siang river forms a rough division between the above two zones. The country to the right of the West Siang district is less hilly. On the north there are high mountains and the whole area consists of a series of spurs of these mountains thrown out at right angles. On the east of the district there are subsidiary ranges running east and west throwing spures in a southernly direction. The 'outer ranges' south of the division gradually merge into ranges running from north-east to south-west and thus form a wall shutting off the valley of Assam from view. Except in the extreme north and east, the hills generally have moderate heights and gently falls lending themselves to rewarding hill cultivation. The flora and fauna are equally varied and rich in nature.

Fig 1


NOTIONAL MAP
OF
WEST SIANG DISTRICT
N
S
ARUNACHAL PRADESH
WEST SIANG
TIBET
GANGTSA
MONIGONG
MECHUKA
TATO
PAYUM
KAYING
RUMGONG
DARAK
NOMUK
BOYE
ZIRDIN
PAKAM
ALONG
KAMKI-
PERI
LIROMOBA
TIRBIN
BASAR
GENSI
LIKABALI
DISTRICT
UPPER SUBANSIRI
LOWER SUBANSIRI DISTRICT
ASSAM
REFERENCE
1.INTERNATIONAL BOUNDARY
2.STATE BOUNDARY
3.DISTRICT BOUNDARY
4.DISTRICT H Q
5.VILLAGE / TOWN
LOCATION

Owing to the rapid changes in topography the climatic conditions tend to change within short distances from south to north. There is a contrast in temperature and rainfall between sheltered valleys, foothills and mountain tops. The Siang Valley as it opens out towards the Assam plains, gets heavy rainfall. The South West Monsoon is the chief rainfall season. June and July are the wettest months.

Snowfall is experienced in the Upper Siang Valley at a height of 4,500 meters and above. Temperature varies considerably from place to place depending on elevation.

Vegetation throughout the West Siang district is complex with considerable variation in the composition of the different plant communities. In general, there is a close relationship between vegetation complexes and soil type although rainfall, drainage, slope, aspect and altitude all may be determining factors in certain cases.

As in other parts of Arunachal Pradesh, the vegetation in West Siang district ranges from tropical evergreen in the foothills, to temperate evergreen in the middle and coniferous and Alpine at higher altitude. The tropical rain forests are the typical three storied forest, containing either a few species or one of two peredominating species in the upper canopy. Examples of the former are the Hollong-Makai (Depterocarpus, Macrocarpus, Shorea assamica) forests, and of the latter, the Hollock (Terminalia myriocarpa) forests. The purer coniferous forests occur only at the higher

AN ADI VILLAGE

elevations.

The forests near the villages have suffered from felling and burning of trees for shifting cultivation, and the deforested areas are often covered with secondary growth.

Almost the whole of the Adi Hills is covered by dense forest. There is a great variation of flora in this area due to the difference in altitude and climate, starting from grass, reeds, swamps, to large trees. In the south of the Adi hills, the forest is full of evergreen sub-tropical vegetation with thick undergrowth and creepers. In the north the vegetation gradually changes. Here large trees are replaced by rhododendron and cypruses, while the central parts are clothed in bamboo, banana and cane. The common vegetation in the south are Simul (Salmalia malabarica, Schoot), Hollock (Terminalia myriocarp, Heurek and Mvecull), Pichola (Meliosma simplicifelia, Halp), Borpat (Ailanthus grandis, Prain), Walnut (Juglans regia, Linn) and the Oak, (quereus sp.), Chestnut (Castanopsis), Screw (Pandanus) pine and Orchids of different varieties in the north. The southern areas are rich in fruit bearing trees like Mango (Mangifera indica, Linn), Jack-fruit (Artocarpus integrifolia, Linn), Lichee (Nephelium chierensis, Sonorer), Yellow Rasberry (Rubus sp.), Orange (Citrus aurantium, Linn) and Pine apple (Ananas camosus, Linn Merr).

The wild life is rich and varied. Tigers, elephants, leopards, deer and wild pigs are found near the foothills. The higher ranges are the abode

GALLONG HOUSES

of Takin deer, musk deer, barking deer, clouded leopard and other cold climate animals. However, there is less wild life than can be expected with such large forested areas. The tribal people, being keen hunters and meat eaters, destroy wild life in and out of season. The mithun (a semi domesticated gaur or wild cattle) is highly valued as a source of wealth and mutton. It roams about free in the forest, finding its own food and is brought home only when it is to be slaughtered or exchanged in barter. The rivers abound in fishes of various types.

According to the 1981 census, West Siang district had a total population of 68,320. The scheduled tribe numbering 57,090 which has 28,266 males and 28,824 females.

The main tribes of West Siang district are Adi, Memba and Khamba. Adis are the major tribe of the district which is comprised of different sub-groups viz. Gallong, Minyong, Bori, Bokar, Pailibo and Ramo. The Gallong occupy a vast area in the lower sections of the Siyum valley and its tributaries. Their villages are situated on the river terraces of moderate elevation.

The people of the district were called 'Abors' by the plainsman, and the administration, had accepted it, which means 'unruly' or 'savage'. Now they aspire to call themselves 'Adi' meaning 'Hillman'. The Adi group is the largest section of the indigenous people. Racially they are classified as Mongoloid (Lal and Dasgupta, 1979). The villages are distri-

buted mainly along the courses of the river.

The tribes living in the Siyum valley are Gallongs. These tribal groups are conscious of their territory they inhabit, which is reflected in the saying that those who see Siyum river are Gallong and those who see Siang river are Minyong.

Dr. Varrier Elwin has described the Siang district as 'one of the most fascinating and exciting parts of NEFA; the scenery, when it is not hidden by cloud and rain, is superb; the people are charming, hospitable and filled with a zest for life: tribal institutions still retain their vitality. It is a country of song and dance, of hard eager work, of fine spinning and weaving, where, "rich and varied tapestry" of NEFA is displayed.'

The data for the present study was collected from the West Siang district of Arunachal Pradesh.

Adi is the major tribe of West Siang district which comprises of different sub-tribes of Adis, viz. Gallong, Minyong, Bokar, Bori, Ramo, Pailibo etc.

The present study is based on the fieldwork carried out in the West Siang district during the period January-Marhch 1990. Children attending eight different schools formed the subjects of the present study. Along, a small town, is the headquarter of West Siang district, from where three

schools were selected and one school each from the five villages, viz. Boye, Kamki-peri, Nomuk, Pakam and Zirdin. These five villages are situated within a radius of 30 km. from Along in different directions.

Data for the present study were obtained by oral examination of 496 boys and 514 girls ranging in age group from 5 to 16 years. These data are presented at page 35.

Dental status of the subject was examined with the help of a dental probe, spatula and a dental mirror in sufficient day-light. If any part of the crown had pierced the gum to become visible, the tooth was considered emerged. Some missing permanent teeth were counted as erupted when the subject could recall their emergence and/or extraction, and if the cavity were present. Date of birth of the subjects were recorded from the age records maintained in the school register. The other additional background information in each subject was gathered, which includes, their religion, parents' occupation and income, personal habits such as smoking, chewing, and diet. Eruption status of permanent dentition for each and every child was recorded.

The entire data on eruption, caries and periodontal disease was tabulated for statistical analysis, like percentage frequencies, median ages.

In order to find the prevalence of periodontal disease in the present study the method detailed by Russel have been used. Accordingly, the periodontal index score per person has been derived which describes the stages of disease and clinical condition as follows :

The Periodontal Index (Russell)

Score	Criteria and Scoring for Field Studies	Additional X-ray Criteria followed in the Clinical Test
0	**NEGATIVE.** There is neither overt inflammation in the investing tissues nor loss of function due to destruction of supporting tissues.	Radiographic appearance is essentially normal
1	**MILD GINGIVITIS.** There is an overt area of inflammation in the free gingivae, but this area does not circumscribe the tooth.	
2	**GINGIVITIS.** Inflammation completely circumscribes the tooth, but there is no apparent break in the epithelial attachment.	
4	(Used when radiographs are available)	There is early, notchlike resorption of the alveolar crest.
6	**GINGIVITIS WITH POCKET FORMATION.** The epithelial attachment has been broken and there is a pocket (not merely a deepened gingival crevice due to swelling of free gingivae). There is no interference with normal masticatory function, the tooth is firm and has not drifted.	There is horizontal bone loss involving the entire alveolar crest, up to half of the length of the tooth root.

8	**ADVANCED DESTRUCTION WITH LOSS OF MASTICATORY FUNCTION.** The tooth may be loose; may have drifted; may sound dull on percussion with a metallic instrument; may be depressible in its pocket.	There is advanced bone loss, involving more than one half of the length of the tooth root, or a definite infrabony pocket with widening of the periodontal ligament. There may be root resorption, or rarefaction at the apex.

$$\text{Periodontal Index Score per Person} = \frac{\text{Sum of individual scores}}{\text{Number of teeth present}}$$

"The significance of the periodontal index lies in the fact that more data have been assembled using this index than any other index of periodontal disease. As a result, much of what we know about the distribution of periodontal disease in United States and throughout the world resulted from this index. It is also used in the National Health Survey (Kelly and Van Kirk, 1966) in United States".

Clinical Condition	Group PI Scores	Stages of Disease
Clinically normal supportive tissues	0 to 0.2	Reversible
Simple gingivitis	0.3 to 0.9	
Beginning destructive periodontal disease	0.7 to 1.9	
Established destructive periodontal disease	1.6 to 5.0	Irreversible
Terminal disease	3.8 to 8.0	

DATA

Age in years	Decimal age	Boys	Girls	Total
5	4.500-5.499	1-39=39	40-72=33	72
6	5.500-6.499	73-107=35	108-139=32	67
7	6.500-7.499	140-181=42	182-224=43	85
8	7.500-8.499	225-267=43	268-313=46	84
9	8.500-9.499	314-351=38	352-392=41	78
10	9.500-10.499	393-443=51	444-493=50	101
11	10.500-11.499	494-532=39	533-583=51	90
12	11.500-12.499	584-631=48	632-666=35	83
13	12.500-13.499	667-709=43	710-762=53	96
14	13.500-14.499	763-808=46	809-852=44	90
15	14.500-15.499	853-893=41	894-935=42	83
16	15.500-16.499	936-966=31	967-1009=44	74
Total		496	514	1010

Chapter IV

RESULTS

Eruption

In the present chapter the results of the data analysed are presented under three broad headings, viz. dental eruption, dental caries and periodontal disease. While presenting the results for dental eruption, age group 15 and 16 have not been included, because by 14 year age group 100% teeth had erupted in all the children examined. Children belonging to the 5-year old age group were included for data collection in order to find if any tooth emerges during that age. Since no tooth was observed to have erupted in boys or girls belonging to age group 5 years, hence this age groups has all through been excluded while presenting the results.

Before going into detail of eruption tables the following facts of eruption can be brought into light :

a) No teeth is found to have emerged in the age group 5 years, i.e. before 5.499 decimal years.

b) In the 6 year age group first molars are erupted in both sides of maxilla as well as mandible, in both the sexes. During this age some central incisors are also observed to have erupted in boys and girls, but only in the mandible.

c) On the whole, there are not much differences in the total number of teeth erupted in the right or left sides of maxilla, and right or left sides mandible, in the two sexes, and at different age groups.

A HEALTHY GALLONG GIRL

d) The total number of teeth erupted in the mandible are found to be higher than those erupted in the maxilla at all ages in both the sexes.

e) Girls of the present study are observed to have a greater percentage of erupted teeth in maxilla as well as in mandible at almost all ages, as compared to boys.

Table 1 represents the number and percentage of erupted teeth in the right maxilla of the boys, where at the age group 6 years, only 5 (14.29%) first molars were found to be erupted. At 7-year age group, 1(2.38%) first incisor and 39(92.86%) first molars were seen. 41(95.35%) first incisors, 4(9.30%) second incisors and 41(95.35%) first molars were counted from the boys of 8-year old age group. By the age of 9, 37 (97.37%) first incisors, 32 (84.21%) second incisors, 2 (5.26%) canines and 37 (97.37%) first molars have erupted. Eruption of first and second incisors and first molars were completed by 10 year age group. Other teeth seen at this age group were 4(7.87%) canines and 6 (11.76%) first premolars. By 11 years of age, 7 (17.95%) canines, 35 (89.74%) first premolars and 7(17.95%) second premolars were observed to have erupted. There were 43 (89.58%) canines 40 (83.33%) second premolars and 6 (12.50%) second molars found to be present at age group 12 years. By the age of 13 years all teeth had completed eruption excepting the second molar, where only 22 (51.16%) of them had just erupted. The eruption in right maxilla of boys completed by 14 years of age.

Table 1

Number of erupted teeth in boys

RIGHT MAXILLARY

Age in years	I^1	I^2	C^0	P^1	P^2	M^1	M^2
6	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	5 (14.29)	0 (0.00)
7	1 (2.38)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	39 (92.86)	0 (0.00)
8	41 (95.35)	4 (9.30)	0 (0.00)	0 (0.00)	0 (0.00)	41 (95.35)	0 (0.00)
9	37 (97.37)	32 (84.21)	2 (5.26)	0 (0.00)	0 (0.00)	37 (97.37)	0 (0.00)
10	51 (100.00)	51 (100.00)	4 (7.84)	6 (11.76)	0 (0.00)	51 (100.00)	0 (0.00)
11	39 (100.00)	39 (100.00)	7 (17.95)	35 (89.74)	7 (17.95)	39 (100.00)	0 (0.00)
12	48 (100.00)	48 (100.00)	43 (89.58)	48 (100.00)	40 (83.33)	48 (100.00)	6 (12.50)
13	43 (100.00)	43 (100.00)	43 (100.00)	43 (100.00)	43 (100.00)	43 (100.00)	22 (51.16)
14	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)

Figures in parenthesis represent percentage

Table 2 reveals that the earliest tooth observed to have erupted in the left maxilla is - the first molar. At 6 year of age only 6 (17.14%) first maxillary molars were seen. At 7 year age group 3(7.14%) first incisors and 40 (95.24%) first molars have erupted. By 8-year age group, 40 (93.02%) first incisors and 10 (23.26%) second incisors were observed to have erupted. Eruption of first incisors and first molars were completed by 9-year age group and by 10 years first and second incisors and first molars in maxilla had completed the eruption. At this age group, 3 (5.88%) canines and 6 (11.76%) first premolars were found to be erupted. At 11-year age group some of the teeth had just completed eruption whereas not a single second molar had erupted so far. There were 42 (87.50%) canines, 36 (75%) second premolars and 9 (18.75%) second molars at 12 years of age which were under the process of eruption. By 13 years, all the teeth had completed eruption excepting the second molars, where only 19 (44.19%) of them had erupted. All the teeth in the left maxilla of boys had completed eruption by 14 years of age.

Table 3 shows that, 5 (14.29%) first incisors and 11 (31.43%) first molars which were erupted at 6 years of age and they are the earliest erupted teeth in the right mandible of boys. At the 7 year age group there were 36 (85.71%) first incisors, 5 (11.90%) second incisors and 38 (90.48%) first molars. By the age group 8 years, the eruption of first incisors and first molars completed and observed 36 (83.72%) second incisors have just

Table 2

Number of erupted teeth in boys

LEFT MAXILLARY

Age in years	I^1	I^2	C^o	P^1	P^2	M^1	M^2
6	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	6 (17.14)	0 (0.00)
7	3 (7.14)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	40 (95.24)	0 (0.00)
8	40 (93.02)	10 (23.26)	0 (0.00)	0 (0.00)	0 (0.00)	43 (100.00)	0 (0.00)
9	38 (100.00)	31 (81.58)	0 (0.00)	0 (0.00)	0 (0.00)	38 (100.00)	0 (0.00)
10	51 (100.00)	51 (100.00)	3 (5.88)	6 (11.76)	0 (0.00)	51 (100.00)	0 (0.00)
11	39 (100.00)	39 (100.00)	7 (17.95)	31 (79.49)	14 (35.90)	39 (100.00)	0 (0.00)
12	48 (100.00)	48 (100.00)	42 (87.50)	48 (100.00)	36 (75.00)	48 (100.00)	9 (18.75)
13	43 (100.00)	43 (100.00)	43 (100.00)	43 (100.00)	43 (100.00)	43 (100.00)	19 (44.19)
14	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)

Figures in parenthesis represent percentage

Table 3

Number of erupted teeth in boys

RIGHT MANDIBULAR

Age in years	I_1	I_2	C_o	P_1	P_2	M_1	M_2
6	5 (14.29)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	11 (31.43)	0 (0.00)
7	36 (85.71)	5 (11.90)	0 (0.00)	0 (0.00)	0 (0.00)	38 (90.48)	0 (0.00)
8	43 (100.00)	36 (83.72)	0 (0.00)	0 (0.00)	0 (0.00)	43 (100.00)	0 (0.00)
9	38 (100.00)	38 (100.00)	6 (15.79)	0 (0.00)	0 (0.00)	38 (100.00)	0 (0.00)
10	51 (100.00)	51 (100.00)	33 (64.70)	6 (11.76)	0 (0.00)	51 (100.00)	0 (0.00)
11	39 (100.00)	39 (100.00)	36 (92.31)	19 (48.72)	2 (5.13)	39 (100.00)	1 (2.56)
12	48 (100.00)	48 (100.00)	47 (97.92)	48 (100.00)	48 (100.00)	48 (100.00)	29 (60.42)
13	43 (100.00)	43 (100.00)	43 (100.00)	43 (100.00)	43 (100.00)	43 (100.00)	35 (81.40)
14	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)

Figures in parenthesis represent percentage

erupted. At age group of 9, second incisor also completed eruption but there seen 16 (15.79%) canines and the rest of the teeth had not erupted. 33(64.70%) canines and 6(11.76%) first premolars were found to be erupted by the age of 10 years. At the age group 11, there erupted 36(92.31%) canines, 19 (48.72%) first premolars, 2 (5.13%) second premolars and 1 (2.56) second molar. Excepting canines and second molar all teeth completed eruption by the age of 12. At 13 year age group there observed 35 (81.40%) second molars and finally the eruption of all the teeth completed in right mandibular jaws of the boys at the age of 14 years.

Table 4 reveals that 5 (14.29%) first incisors and 11 (31.43%) first molars have erupted at 6 year age group in left mandibular of boys. By age group 7 years there were 30 (71.43%) first incisors, 2 (4.76%) second incisors and 39 (92.86%) first molars have erupted and at the age group 8 years, the eruption of first incisor and first molars completed and 35 (81.40%) second incisors have erupted. At 9 year age group, the eruption completed in first and second incisors and in first molars, whereas 3 (7.89%) canines were observed to have erupted and rest teeth had not. By age group 10 years, 37 (72.55%) canines and 5 (9.80%) first premolars have erupted. The first and second incisors and first molars have completed eruption whereas the second premolars and second molars have not started yet. 37 (94.87%) canines, 17 (43.59%) first premolars and 2 (5.13%) second premolars were seen at 11 years of age. At the age group 12 all the teeth

Table 4

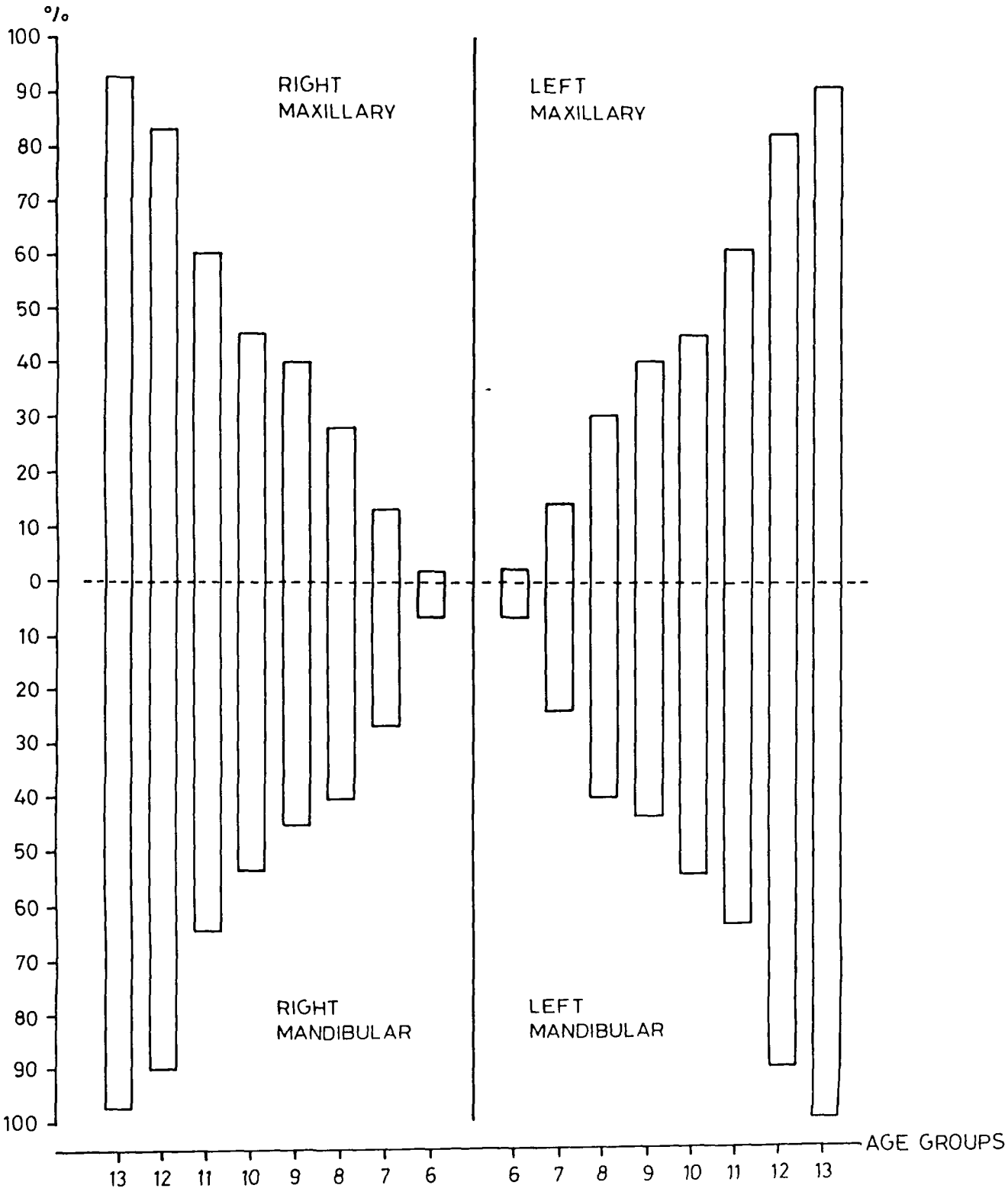
Number of erupted teeth in boys

LEFT MANDIBULAR

Age in years	I_1	I_2	C_o	P_1	P_2	M_1	M_2
6	5 (14.29)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	11 (31.43)	0 (0.00)
7	30 (71.43)	2 (4.76)	0 (0.00)	0 (0.00)	0 (0.00)	39 (92.86)	0 (0.00)
8	43 (100.00)	35 (81.40)	0 (0.00)	0 (0.00)	0 (0.00)	43 (100.00)	0 (0.00)
9	38 (100.00)	38 (100.00)	3 (7.89)	0 (0.00)	0 (0.00)	38 (100.00)	0 (0.00)
10	51 (100.00)	51 (100.00)	37 (72.55)	5 (9.80)	0 (0.00)	51 (100.00)	0 (0.00)
11	39 (100.00)	39 (100.00)	37 (94.87)	17 (43.59)	2 (5.13)	39 (100.00)	0 (0.00)
12	48 (100.00)	48 (100.00)	48 (100.00)	48 (100.00)	36 (75.00)	48 (100.00)	28 (58.33)
13	43 (100.00)	43 (100.00)	43 (100.00)	43 (100.00)	43 (100.00)	43 (100.00)	43 (100.00)
14	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)	46 (100.00)

Figures in parenthesis represent percentage

Fig.2 PERCENTAGE OF ERUPTED TEETH IN DIFFERENT AGE GROUPS OF BOYS



completed eruption except the second premolars 36 (75%) and second molars 28 (58.33%). Eruption in left mandible of boys have completed by 13 yea age group.

From table 5 it is observed that at age group 6 years no other teeth have erupted except 4 (12.50%) first molars. At the age 7 years, there noted 16 (37.21%) first incisors and 41 (95.35%) first molars in the right maxilla. At the age of 8 years, 45 (97.83%) first incisors, 8 (17.39%) second incisors have erupted and the eruption of first molars have completed. By the age group 9 years, in one hand eruption completed in first incisor and first molars and on the other hand canines, second premolar and second molar have not erupted. At the age 10 years, 8 (16%) canine, 28 (56%) first premolars and 10 (20%) second premolars observed to have erupted. By 11 year age group 29 (56.86%) canines, 45 (88.23%) first premolars, 24 (47.06%) second premolars, and 10 (19.61%) second molars were seen in the right maxilla of girls. At age group 12, the first and second incisors, first premolar and first molar completed their eruption. There were 33 (94.28%) canines, 34 (97.14%) second premolars and 21 (60%) second molars were found to be erupted at age group 12 years. Except the second molars which had 44 (83.02%) of them, all other teeth had completed eruption by 13 years of age and finally the eruption in right maxilla of girls completed by age group 14 years. The percentage of erupted teeth in different age groups of boys is shown in Fig. 2.

From table 6, it is observed that the first molar erupted earliest

Table 5

Number of erupted teeth in girls

RIGHT MAXILLARY

Age in years	I^1	I^2	C^0	P^1	P^2	M^1	M^2
6	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	4 (12.50)	0 (0.00)
7	16 (37.21)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	41 (95.35)	0 (0.00)
8	45 (97.83)	8 (17.39)	0 (0.00)	0 (0.00)	0 (0.00)	46 (100.00)	0 (0.00)
9	41 (100.00)	39 (95.12)	0 (0.00)	10 (24.39)	0 (0.00)	41 (100.00)	0 (0.00)
10	50 (100.00)	50 (100.00)	8 (16.00)	28 (56.00)	10 (20.00)	50 (100.00)	0 (0.00)
11	51 (100.00)	51 (100.00)	29 (56.86)	45 (88.23)	24 (47.06)	51 (100.00)	10 (19.61)
12	35 (100.00)	35 (100.00)	33 (94.28)	35 (100.00)	34 (97.14)	35 (100.00)	21 (60.00)
13	53 (100.00)	53 (100.00)	53 (100.00)	53 (100.00)	53 (100.00)	53 (100.00)	44 (83.02)
44	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)

Figures in parenthesis represent percentage

Table 6

Number of erupted teeth in girls

LEFT MAXILLARY

Age in years	I^1	I^2	C^o	P^1	P^2	M^1	M^2
6	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	6 (18.75)	0 (0.00)
7	21 (48.84)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	42 (97.67)	0 (0.00)
8	44 (95.65)	14 (30.43)	0 (0.00)	0 (0.00)	0 (0.00)	46 (100.00)	0 (0.00)
9	41 (100.00)	34 (82.93)	0 (0.00)	10 (24.39)	0 (0.00)	41 (100.00)	0 (0.00)
10	50 (100.00)	50 (100.00)	12 (24.00)	27 (54.00)	10 (20.00)	50 (100.00)	0 (0.00)
11	51 (100.00)	51 (100.00)	33 (64.71)	48 (94.12)	21 (41.18)	51 (100.00)	11 (21.57)
12	35 (100.00)	35 (100.00)	34 (97.14)	35 (100.00)	33 (94.29)	35 (100.00)	21 (60.00)
13	53 (100.00)	53 (100.00)	53 (100.00)	53 (100.00)	53 (100.00)	53 (100.00)	45 (84.91)
14	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)

Figures in parenthesis represent percentage

among all other teeth at the age group 6 year, and 6 (18.75%) of them have erupted at this age group. By 7 year age group, 21 (48.84%) first incisors and 42 (97.67%) first molars were observed to have erupted whereas rest teeth have not started to erupt at this age group. 44(95.65%) first incisors and 14 (30.43%) second incisors were observed to have erupted at the age of 8 year and here eruption of first molar has completed whereas the remaining teeth have not. At the age of 9 years, the canines, second premolars and second molars have yet to be erupted whereas the eruption have completed in first incisors, first molars, 10 (24.39%) first premolars and 34 (82.93%) second incisors have erupted. By the age group 10 years, 12 (24%) canines, 27 (54%) first premolars and 10 (20%) second premolars were observed to have erupted. Eruption have completed in the first and second incisors and also in first molar at age group 11. The observed teeth at this age group were canines 33 (64.71%), first premolars 48 (94.12%) and second premolars 21 (41.18%) and the second molars 11 (21.57%). By the age 12 years, the eruption completed in all the teeth excepting the canines 34 (97.14%) and second premolars 33 (94.29%) and also second molars 21 (60%). By age group 13 years, eruption completed excepting the second molars 45 (84.91%). All the teeth completed eruption in left maxilla of girls by the age 14 years.

Table 7 reveals that at 6 year age group, 7 (21.87%) first incisors and 12 (37.50%) first premolars were observed to have erupted. There were 42 (97.67%) first incisors, 10 (23.26%) second incisors and 43 (100%)

Table 7

Number of erupted teeth in girls

RIGHT MANDIBULAR

Age in years	I_1	I_2	C_o	P_1	P_2	M_1	M_2
6	7 (21.88)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	12 (37.50)	0 (0.00)
7	42 (97.67)	10 (23.26)	0 (0.00)	0 (0.00)	0 (0.00)	43 (100.00)	0 (0.00)
8	45 (97.83)	42 (91.30)	0 (0.00)	0 (0.00)	0 (0.00)	46 (100.00)	0 (0.00)
9	41 (100.00)	41 (100.00)	8 (19.51)	6 (14.63)	0 (0.00)	41 (100.00)	0 (0.00)
10	50 (100.00)	50 (100.00)	45 (90.00)	12 (24.00)	8 (16.00)	50 (100.00)	0 (0.00)
11	51 (100.00)	51 (100.00)	51 (100.00)	43 (84.31)	35 (68.63)	51 (100.00)	33 (64.71)
12	35 (100.00)	35 (100.00)	35 (100.00)	35 (100.00)	31 (88.57)	35 (100.00)	26 (74.29)
13	53 (100.00)	53 (100.00)	53 (100.00)	53 (100.00)	53 (100.00)	53 (100.00)	49 (92.45)
14	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)

Figures in parenthesis represent percentage

first premolars have been observed at 7 year age group, whereas remaining teeth were unerupted. At the age group of 8 years, 45 (97.83%) first incisors and 42 (91.30%) second incisors have erupted. By 9 year of age group, first and second incisors and first molars have completed eruption. By 10 years of age, 45 (90%) canines, 12 (24%) first premolars and 8 (16%) second premolars had erupted. Eruption of canines completed at 11 years of age, and at this age group, 43 (84.31%) first premolars, 35 (68.63%) second premolars and 33 (64.71%) second molars have erupted. At 12 years of age, 31 (88.57%) second premolars and 26 (74.29%) second molars have completed eruption and by 13 years of age eruption of all teeth completed excepting the second molars where 49 (92.45%) of them were present. Finally by 14 years of age the eruption of all the teeth completed in the right mandible of girls.

Table 8 shows that at 6-year age group only 4 (12.50%) first incisors and 8 (25%) first molars in left mandible observed to have erupted and by 7 years of age, 41 (95.35%) first incisors, 3 (6.98%) second incisors and 43 (100%) first molars have erupted whereas remaining teeth have not started to erupt. There were 45 (97.83%) first incisors, 34 (73.91%) second incisors and 46 (100%) first molars have erupted at the age of 8 years. By 9 years, first and second incisors and first molar completed eruption whereas 6 (14.63%) canines and 4 (9.76%) first premolars have just emerged. Excepting the second molar all the teeth have started emerging in the left mandible

Table 8

Number of erupted teeth in girls

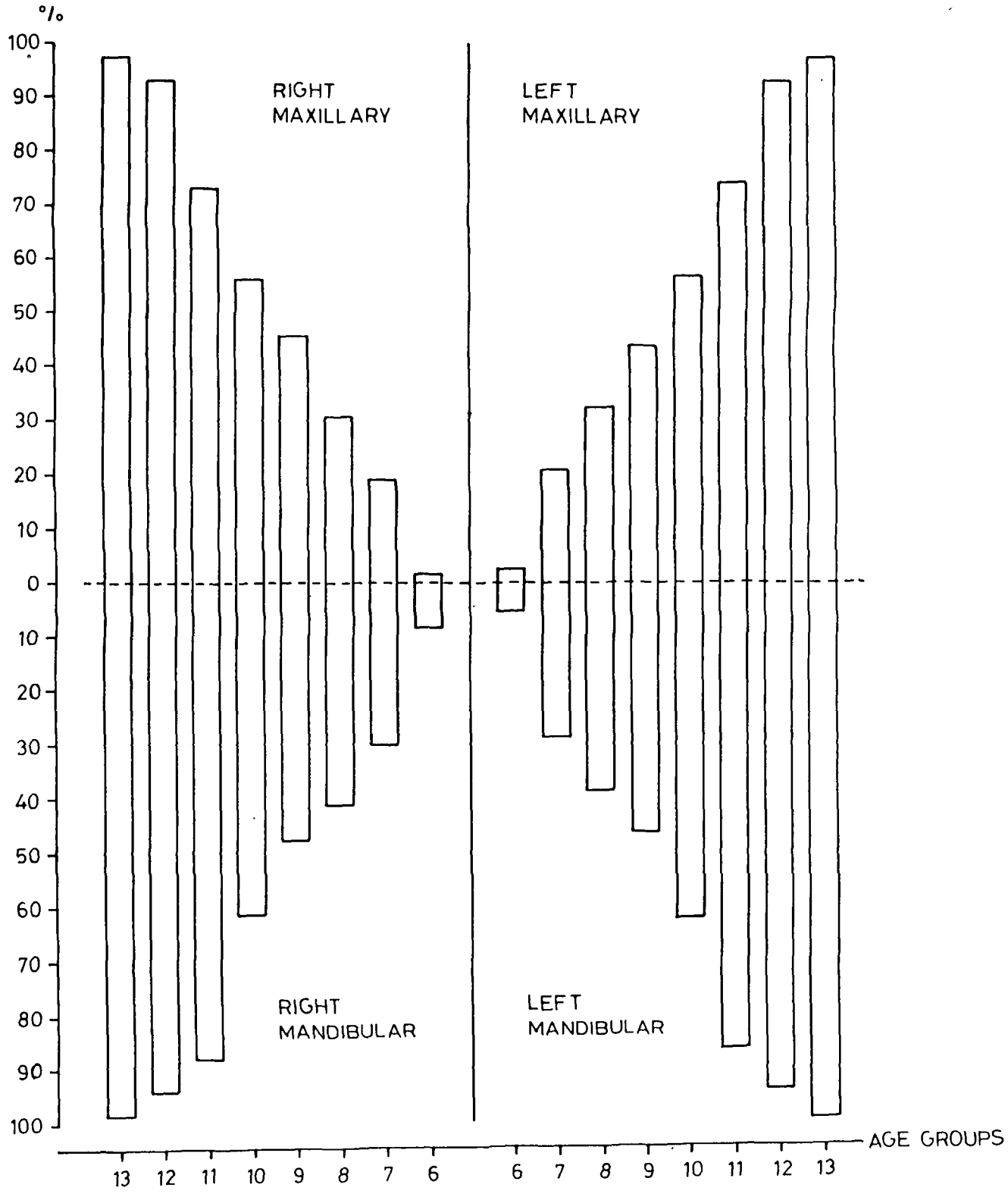
LEFT MANDIBULAR

Age in years	I_1	I_2	C_o	P_1	P_2	M_1	M_2
6	4 (12.50)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	8 (25.00)	0 (0.00)
7	41 (95.35)	3 (6.98)	0 (0.00)	0 (0.00)	0 (0.00)	43 (100.00)	0 (0.00)
8	45 (97.83)	34 (73.91)	0 (0.00)	0 (0.00)	0 (0.00)	46 (100.00)	0 (0.00)
9	41 (100.00)	41 (100.00)	6 (14.63)	4 (9.76)	0 (0.00)	41 (100.00)	0 (0.00)
10	50 (100.00)	50 (100.00)	43 (86.00)	16 (32.00)	9 (18.00)	50 (100.00)	0 (0.00)
11	51 (100.00)	51 (100.00)	51 (100.00)	39 (76.47)	42 (82.35)	51 (100.00)	25 (49.02)
12	35 (100.00)	35 (100.00)	35 (100.00)	35 (100.00)	33 (94.29)	35 (100.00)	23 (65.71)
13	53 (100.00)	53 (100.00)	53 (100.00)	53 (100.00)	53 (100.00)	53 (100.00)	53 (100.00)
14	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)	44 (100.00)

Figures in parenthesis represent percentage

Fig:3

PERCENTAGE OF ERUPTED TEETH IN DIFFERENT AGE GROUPS OF GIRLS



at 10 year age group and a few of them have just completed the eruption. All the teeth have completed eruption by 12 years of age excepting the second premolars and second molars which have 33 (94.29%) and 23(65.71%) respectively. By 13 year age group all the teeth in left mandible of girls have completed eruption.

Table 9 shows the sides-pooled number and percentage of erupted teeth, where only 11 (15.71%) first molars have just emerged at 6 year age group. At 7 years of age, 4 (4.76%) first incisors and 79 (94.05%) first molars have emerged and rest have not started to erupt. By 8 years of age 81 (94.19%) first incisors, 14 (16.28%) second incisors and 84 (97.67%) first molars have erupted. 75 (98.68%) first incisors, 63 (82.89%) second incisors, 2 (2.63%) canines and 75 (98.68%) first molars present at age group 9. By the age 10 years, first and second incisors and first molar have completed eruption and there were 7 (6.86%) canines and 12 (11.76%) first premolars have just emerged. At 11 years of age there present 14(17.95%) canines, 66 (84.61%) first premolars and 21 (26.92%) second premolars under process. By 12 year age group, 85 (88.54%) canines, 76 (79.17%) second premolars and 15 (15.63%) second molars were observed to have erupted. At 13 years of age all the teeth completed eruption excepting 41 (47.67%) and finally when the boys reached 14 years of age all the teeth in the maxilla completed eruption. The percentage of erupted teeth in different age groups of girls is shown in Fig. 3.

Table 10 represents the sides-pooled number of mandibular teeth

Table 9

Number of erupted teeth in boys - sides pooled

MAXILLARY

Age in years	I^1	I^2	C^o	P^1	P^2	M^1	M^2
6	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	11 (15.71)	0 (0.00)
7	4 (4.76)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	79 (94.05)	0 (0.00)
8	81 (94.19)	14 (16.28)	0 (0.00)	0 (0.00)	0 (0.00)	84 (97.67)	0 (0.00)
9	75 (98.68)	63 (82.89)	2 (2.63)	0 (0.00)	0 (0.00)	75 (98.68)	0 (0.00)
10	102 (100.00)	102 (100.00)	7 (6.86)	12 (11.76)	0 (0.00)	102 (100.00)	0 (0.00)
11	78 (100.00)	78 (100.00)	14 (17.95)	66 (84.61)	21 (26.92)	78 (100.00)	0 (0.00)
12	96 (100.00)	96 (100.00)	85 (88.54)	96 (100.00)	76 (79.17)	96 (100.00)	15 (15.63)
13	86 (100.00)	86 (100.00)	86 (100.00)	86 (100.00)	86 (100.00)	86 (100.00)	41 (47.67)
14	92 (100.00)	92 (100.00)	92 (100.00)	92 (100.00)	92 (100.00)	92 (100.00)	92 (100.00)

Figures in parenthesis represent percentage

Table 10

Number of erupted teeth in boys - sides pooled

MANDIBULAR

Age in years	I_1	I_2	C_o	P_1	P_2	M_1	M2
6	10 (14.29)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	22 (31.43)	0 (0.00)
7	66 (78.57)	7 (8.33)	0 (0.00)	0 (0.00)	0 (0.00)	77 (91.67)	0 (0.00)
8	86 (100.00)	71 (82.56)	0 (0.00)	0 (0.00)	0 (0.00)	86 (100.00)	0 (0.00)
9	76 (100.00)	76 (100.00)	9 (11.84)	0 (0.00)	0 (0.00)	76 (100.00)	0 (0.00)
10	102 (100.00)	102 (100.00)	70 (68.63)	11 (10.78)	0 (0.00)	102 (100.00)	0 (0.00)
11	78 (100.00)	78 (100.00)	73 (93.59)	36 (46.15)	4 (5.13)	78 (100.00)	1 (1.28)
12	96 (100.00)	96 (100.00)	95 (98.96)	96 (100.00)	84 (87.50)	96 (100.00)	57 (59.38)
13	86 (100.00)	86 (100.00)	86 (100.00)	86 (100.00)	86 (100.00)	86 (100.00)	78 (90.70)
14	92 (100.00)	92 (100.00)	92 (100.00)	92 (100.00)	92 (100.00)	92 (100.00)	92 (100.00)

Figures in parenthesis represent percentage

erupted in the boys which shows that at age group 6 years, only 10 (14.29%) first incisors and 22 (31.43%) first mandibles were found to be emerged and when they reached 7 years of age, 66 (78.57%) first incisors, 7 (8.33%) second incisors and 77 (91.67%) of first molars have emerged and remaining teeth have not pierced the gum to be emerged. By 8 years, first incisors and first molar have completed eruption, 71 (82.56%) second incisors present and rest of the teeth were not erupted. By the age 9, second incisors also have completed eruption and here 9 (11.84) canines were seen. At the age of 10 years first premolars also started emerging where 11 (10.78%) of them were erupted. In the boys of 11 years 73 (93.59%) canines, 36 (46.15%) first premolars and 4 (5.13%) second premolars and also 1 (1.28%) second molar found to be emerged. By 12 years of age 95 (98.96%) canines, 84 (87.50%) second premolars and 57 (59.38%) second molars have emerged. At the age group 13, all the teeth completed erupting excepting the second molar where 78 (90.70%) of them were observed and finally by 14 years of age the eruption of all the teeth completed.

Table 11 represents the number of erupted teeth-sides pooled in maxilla of girls; whereas at the age group 6 years only 10(15.63%) teeth were observed to have emerged and by age group 7, 37 (43.02) first incisors and 83 (96.51%) first molars have emerged. At age group 8, first molar completed eruption and 89 (96.74%) first incisors and 22 (23.91%) second incisors have emerged. First incisors and first molars have just completed eruption and second incisors 73 (89.02%) first premolars 20 (24.39%) were

Table 11

Number of erupted teeth in girls - sides pooled

MAXILLARY

Age in years	I^1	I^2	C^o	P^1	P^2	M^1	M^2
6	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	10 (15.63)	0 (0.00)
7	37 (43.02)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	83 (96.51)	0 (0.00)
8	89 (96.74)	22 (23.91)	0 (0.00)	0 (0.00)	0 (0.00)	92 (100.00)	0 (0.00)
9	82 (100.00)	73 (89.02)	0 (0.00)	20 (24.39)	0 (0.00)	82 (100.00)	0 (0.00)
10	100 (100.00)	100 (100.00)	20 (20.00)	55 (55.00)	20 (20.00)	100 (100.00)	0 (0.00)
11	102 (100.00)	102 (100.00)	62 (60.78)	93 (91.18)	45 (44.12)	102 (100.00)	21 (20.59)
12	70 (100.00)	70 (100.00)	67 (95.71)	70 (100.00)	67 (95.71)	70 (100.00)	42 (60.00)
13	106 (100.00)	106 (100.00)	106 (100.00)	106 (100.00)	106 (100.00)	106 (100.00)	89 (83.96)
14	88 (100.00)	88 (100.00)	88 (100.00)	88 (100.00)	88 (100.00)	88 (100.00)	88 (100.00)

Figures in parenthesis represent percentage

present at the age of 9 years. By 10 years of age 20 (20%) canines, 55 (55%) first premolars and 20 (20%) second premolars were shown to have emerged and second molar has not started to erupt. At 11 years of age 62 (60.78%) canines, 93 (91.18%) first premolars, 45 (44.12%) second premolars and 21 (20.59%) second molars have emerged. By age group 12 years, first premolar completed eruption and canines 67 (95.71%), second premolars 67 (95.71%) and 42 (60%) second molars were observed. Only the second molars left to be completed the eruption at 13 years of age, where 89 (83.96%) of them were present and finally eruption of all teeth completed by 14 years of age.

Number of erupted teeth sides pooled in mandible is shown in the table 12, where it is observed that at 6 year age group only 11 (17.19%) first incisors and 20 (31.25%) first molars were observed to have just emerged. By 7 years of age first molar completed eruption and 83 (96.51%) first incisors and 13 (15.12%) second incisors have erupted and remaining teeth have not emerged. There were 90 (97.83%) first incisors, 76 (82.61%) second incisors were present at the age of 8 years and by 9 years first and second incisors also have completed eruption. In this age group 14 (17.07%) canines, 10 (12.20%) first premolars also were seen and second premolar and second molars have not erupted. By age 10 years, 88 (88%) canines, 28 (28%) first premolars and 17 (17%) second premolars were present and at age group 11, canines also completed eruption and 82 (80.39%) first premolars,

Table 12

Number of erupted teeth in girls - sides pooled

MANDIBULAR

Age in years	I_1	I_2	Co	Pl	P_2	M_1	M_2
6	11 (17.19)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	20 (31.25)	0 (0.00)
7	83 (96.51)	13 (15.12)	0 (0.00)	0 (0.00)	0 (0.00)	86 (100.00)	0 (0.00)
8	90 (97.83)	76 (82.61)	0 (0.00)	0 (0.00)	0 (0.00)	92 (100.00)	0 (0.00)
9	82 (100.00)	82 (100.00)	14 (17.07)	10 (12.20)	0 (0.00)	82 (100.00)	0 (0.00)
10	100 (100.00)	100 (100.00)	88 (88.00)	28 (28.00)	17 (17.00)	100 (100.00)	0 (0.00)
11	102 (100.00)	102 (100.00)	102 (100.00)	82 (80.39)	77 (75.49)	102 (100.00)	58 (56.86)
12	70 (100.00)	70 (100.00)	70 (100.00)	70 (100.00)	64 (91.43)	70 (100.00)	49 (70.00)
13	106 (100.00)	106 (100.00)	106 (100.00)	106 (100.00)	106 (100.00)	106 (100.00)	102 (96.23)
88	88 (100.00)	88 (100.00)	88 (100.00)	88 (100.00)	88 (100.00)	88 (100.00)	88 (100.00)

Figures in parenthesis represent percentage

77 (75.49%) second premolars and 58 (56.86%) second molars were found to be erupted. By the age group 12, all the teeth completed eruption except the second premolars and the second molars and at the age of 13 years only second molar remains to be erupted. Finally all the mandibular teeth completed eruption by 14 years age.

The number and percentage of erupted maxillary teeth combined is presented in Table 13 which shows that the number of erupted teeth and their percentage increases with increasing age. There observe only 11 (2.24%) teeth to have erupted at 6 year age group and by 11 years more than 50 per cent have erupted and finally 644 (100%) teeth have erupted by 14 years of age.

Table 14 represents the mandibular teeth where a total of 32(6.53%) teeth have emerged at 6 year age group. In the lower jaw more than 50 percent teeth observed to have emerged by 10 years and finally the eruption completed at 14 years, where 644 teeth were noted.

The number and percentage of maxillary teeth in girls is given in Table 15 which shows that at 6 year age group 10 (2.33%) teeth have emerged and by 10 years 56.43 per cent of teeth have erupted and finally the eruption of all the maxillary teeth in girls completed when they became 14 years old. Number of mandibular teeth erupted by age group is represented in table 16 which shows that in general the mandibular teeth in girls found to have erupted earlier than all other teeth of present study. In the lower jaw, 31 (6.92%) teeth have erupted at 6 year age group and 61.86

Table 13

Number and percentage of erupted teeth in boys - all teeth combined

MAXILLARY

Age in years	Number of teeth	Percentage
6	11	2.24
7	83	14.11
8	179	29.73
9	215	40.41
10	325	45.22
11	335	61.35
12	560	83.33
13	557	92.52
14	644	100.00

Table 14

Number and percentage of erupted teeth in boys - all teeth combined
MANDIBULAR

Age in years	Number of teeth	Percentage
6	32	6.53
7	150	25.51
8	243	40.36
9	237	44.55
10	387	54.20
11	348	63.74
12	620	92.26
13	594	98.67
14	644	100.00
15	574	100.00
16	434	100.00

Table 15

Number and percentage of erupted teeth in girls - all teeth combined
MAXILLARY

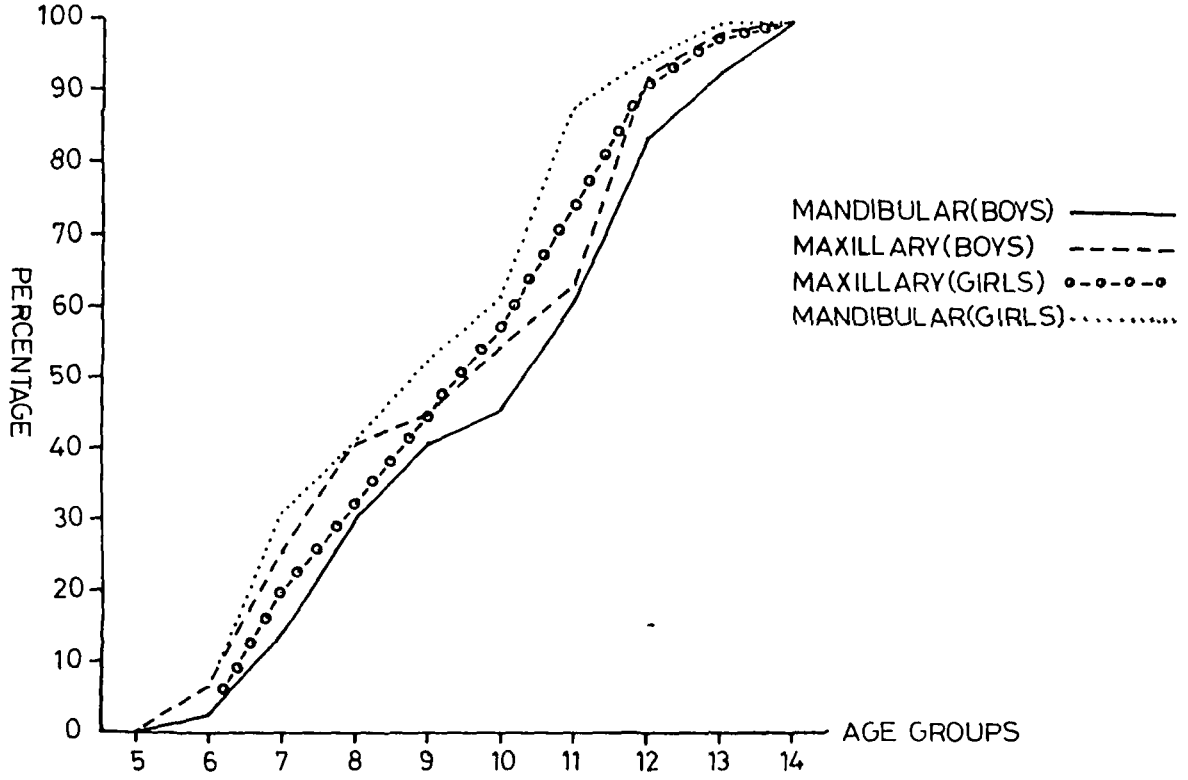
Age in years	Number of teeth	Percentage
6	10	2.23
7	120	19.93
8	203	31.52
9	257	4.77
10	395	56.43
11	527	73.81
12	456	90.06
13	725	97.71
14	616	100.00
15	588	100.00
16	616	100.00

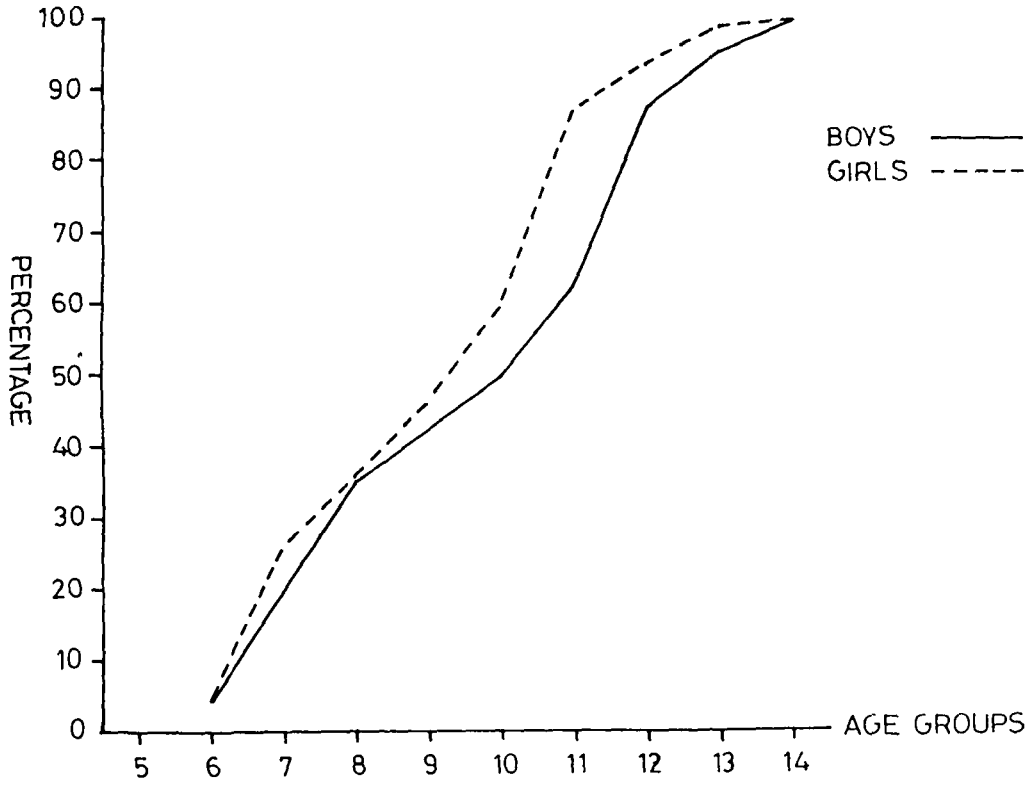
Table 16

Number and percentage of erupted teeth in girls - all teeth combined
MANDIBULAR

Age in years	Number of teeth	Percentage
6	31	6.92
7	182	30.23
8	258	40.06
9	270	47.04
10	433	61.86
11	625	87.53
12	463	94.49
13	738	99.46
14	616	100.00
15	588	100.00
16	616	100.00

Fig.4 PERCENTAGE OF ERUPTED TEETH(JAW & SEX WISE)





per cent have erupted at 10 years and finally by 14 years the eruption completed.

From the above tables it can be concluded that in all the jaws of both sexes, the teeth start emerging by 6 year age group and the eruption complete by 14 year. The number and percentage of erupted teeth increases with the increasing age. In general, the eruption timing is earlier in girls than the boys in both the jaws.

By observing all the teeth combined in boys as given in Table 17, we have seen that in 6 year age group 43 (4.39%) teeth have emerged and the number and percentage of teeth emerged increase with the increasing age and by 14 years eruption of all teeth complete in boys. In girls the total number of erupted teeth are 41 (4.57%) at 6 year age group and the eruption completed by 14 years of age. In girls also the total number of erupted teeth and their percentage increases with increasing age.(Table 18). The percentage of erupted teeth (Jaw and Sex-wise) is shown in Fig. 4.

Table 19 and 20 present the median age (± SD) of tooth emergene with their standard deviations by age, sex and jaw of left and right side, respectively. The sidewise comparison of tables 19 and 20 shows that all teeth in the left maxilla emerge earlier excepting canine and first premolar in boys, second incisor and second premolar in girls. However, it is noted that in girls the median age of emergence for second molar in both the sides of maxilla is same (11.9 years). All teeth in right mandible emerge earlier than the left mandible in boys as well as in girls, excepting first

Table 17

Number and percentage of erupted teeth in boys - all teeth combined

Age in years	Number of teeth	ercentage
6	43	4.39
7	233	19.81
8	422	35.05
9	452	42.48
10	712	49.86
11	683	62.54
12	1180	87.80
13	1151	95.60
14	1288	100.00
15	1148	100.00
16	868	100.00

Table 18

Number and percentage of erupted teeth in girls - all teeth combined

Age in years	Number of teeth	Percentage
6	41	4.57
7	302	25.08
8	461	35.79
9	527	45.90
10	828	59.14
11	1152	80.67
12	919	93.77
13	1463	98.58
14	1232	100.00
15	1176	100.00
16	1232	100.00

Table 19

Median age (± S.D.) of tooth emergence in Gallong - left quadrant

Jaw	Sex	I1	I2	CO	P1	P2	M1	M2
Maxilary	Boys	7.5 (0.20)	8.5 (0.22)	11.5 (0.25)	10.6 (0.20)	11.4 (0.30)	6.35 (0.30)	12.65 (0.25)
	Girls	7.1 (0.27)	8.4 (0.22)	10.6 (0.30)	9.75 (0.32)	10.85 (0.32)	6.3 (0.20)	11.9 (0.25)
Mandi-bular	Boys	6.6 (0.17)	7.65 (0.17)	9.9 (0.22)	10.75 (0.20)	11.35 (0.20)	6.25 (0.22)	11.95 (0.12)
	Girls	6.4 (0.20)	7.65 (0.17)	9.5 (0.20)	10.1 (0.25)	10.9 (0.35)	6.05 (0.15)	11.4 (0.35)

Table 20

Median age (± S.D.) of tooth emergence in Gallong - right quadrant

Jaw	Sex	I1	I2	C	P1	P2	M1	M2
Maxilary	Boys	7.6 (0.30)	8.55 (0.22)	11.4 (0.40)	10.5 (0.20)	11.45 (0.22)	6.7 (0.50)	12.7 (0.20)
	Girls	7.3 (0.20)	8.35 (0.22)	10.8 (0.40)	9.8 (0.55)	10.7 (0.30)	6.4 (0.20)	11.9 (0.22)
Mandi-bular	Boys	6.5 (0.20)	7.55 (0.20)	9.85 (0.40)	10.75 (0.20)	11.30 (0.10)	6.45 (0.30)	12.0 (0.25)
	Girls	6.4 (0.20)	7.25 (0.22)	9.4 (0.20)	10.00 (0.30)	10.8 (0.35)	6.1 (0.15)	11.3 (0.40)

Table 21

Median age (± S.D.) of tooth emergence in Gallong - both quadrants combined

Jaw	Sex	I1	I2	C0	P1	P2	M1	M2
Maxilary	Boys	7.55 (0.25)	8.52 (0.22)	11.45 (0.32)	10.55 (0.20)	11.42 (0.26)	6.52 (0.40)	12.67 (0.22)
	Girls	7.20 (0.23)	8.37 (0.22)	10.70 (0.35)	9.77 (0.43)	10.77 (0.31)	6.35 (0.20)	11.90 (0.23)
Mandi-bular	Boys	6.55 (0.18)	7.60 (0.18)	9.87 (0.31)	10.75 (0.20)	11.32 (0.15)	6.35 (0.20)	11.97 (0.18)
	Girls	6.40 (0.20)	7.45 (0.19)	9.45 (0.20)	10.05 (0.27)	10.85 (0.35)	6.07 (0.15)	11.35 (0.37)

and second molars in boys, and first molar in girls. The median age of emergence for both sides of mandibular first premolar in boys and first incisor in girls is same. Further the two tables reveal that the left teeth in general tend to emerge earlier than the right teeth in maxilla, while this order is reversed for the mandibular teeth in both sexes. Table 21 gives median age of emergence of various teeth in the two jaws of boys and girls, after pooling the left and right sides. It can be seen that all mandibular teeth with the exception of first and second premolar in both boys and girls tend to emerge earlier than their maxillary counterparts. A careful examination of the three tables would indicate that girls, in general, erupt their teeth earlier as compared to boys.

Table 21 gives the median ages of eruption of different maxillary and mandibular teeth in boys and girls. It can be seen that all mandibular teeth with the exception of first and second premolar in both boys and girls tend to emerge earlier than their maxillary counterparts. The median age of eruption of various teeth in girls is always lower than that observed for boys. The entire eruption of permanent teeth (except third molars) takes place between median age 6.07 to 11.90 year in girls, and, 6.35 to 12.67 years in boys.

Order of Eruption

The order of eruption by jaw and sex is as follows :

Maxilla : $M^1 > I^1 > I^2 > P^1 > P^2 > C^o > M^2$ in boys

" : $M^1 > I^1 > I^2 > P^1 > C^o > P^2 > M^2$ in girls

Mandible: $M_1 > I_1 > I_2 > C_o > P_1 > P_2 > M_2$ in boys

" : $M_1 > I_1 > I_2 > C_o > P_1 > P_2 > M_2$ in girls

In both the jaws and sexes, the earliest erupted tooth is the first molar, followed by the first incisor and then erupts the second incisor. But the canine changes its placing according to the jaw and sex. In the upper jaw of boys, canine emerges after the premolars, in the upper jaw of girls it emerges inbetween the first and second premolars and in the lower jaw of both the sexes it emerges before the premolars emerge.

Both the jaw combined

$M_1 > M^1 > I_1 > I^1 > I_2 > I^2 > C_o > P^1 > P_1 > P_2 > P^2 > C^o > M_2 > M^2$ in boys

$M_1 > M^1 > I_1 > I^1 > I_2 > I^2 > C_o > P^1 > P_1 > C^o > P^2 > P_2 > M_2 > M^2$ in girls

In both the jaw and sex combined, the first tooth to be emerged is the first mandibular molar. In all the teeth considered right from first molar upto second molar the mandibular teeth emerges before the maxillary teeth of same type do excepting the premolars which changes its placing depending upon the jaw and sex as explained earlier.

Pathology

Caries

Caries affected children for different age groups of boys and girls are presented in Table 22. An overall scrutiny of the table reveals that generally the percentage of occurrence of mild, moderate or severe caries increases in children of both the sexes as they grow up. In both boys and girls mild form of caries are recorded earliest in 6 year age group, whereas, moderate and severe forms of caries are recorded earliest in the 7 year age group for both the sexes. An interesting observation made here is that considering all the age groups together the frequency of occurrence of mild form of caries is almost similar in boys and girls; moderate form of caries occur with a greater percentage in boys, whereas, a higher percentage of severe form of caries are found in girls as compared to boys. Highest prevalence of mild, moderate and severe caries in both the sexes are found in 15 year age group.

The number and percentage occurrence of caries affected teeth is given in table 23 which shows that the percentage of caries affected teeth do not follow any pattern of their distribution.

In both the sexes the mild form of caries affected teeth have been recorded earliest in 6 years of age, whereas, moderate and severe forms are recorded earliest by 7 years of age for both the sexes. An observa-

Table 22

Caries affected children by age and sex

Age in years	Mild		Moderate		Severe	
	Boys	Girls	Boys	Girls	Boys	Girls
6	1 (2.86)	2 (6.25)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
7	2 (4.76)	1 (2.33)	1 (2.38)	1 (2.33)	1 (2.38)	1 (2.33)
8	1 (2.33)	1 (2.17)	1 (2.32)	1 (2.17)	1 (2.33)	2 (4.35)
9	3 (7.89)	2 (4.88)	1 (2.63)	1 (2.44)	1 (2.63)	1 (2.44)
10	4 (7.84)	2 (4.00)	3 (5.88)	1 (2.00)	2 (3.92)	1 (2.00)
11	3 (7.69)	2 (3.92)	2 (5.13)	2 (3.92)	1 (2.56)	2 (3.92)
12	4 (8.33)	2 (5.71)	3 (6.25)	2 (5.71)	2 (4.17)	1 (2.86)
13	3 (6.98)	3 (5.66)	3 (6.98)	3 (5.66)	1 (2.33)	2 (3.77)
14	3 (6.52)	3 (6.82)	4 (8.70)	2 (4.55)	1 (2.17)	2 (4.55)
15	3 (7.32)	3 (7.14)	4 (9.76)	2 (4.76)	2 (4.88)	4 (9.52)
16	2 (6.45)	4 (9.09)	2 (6.45)	3 (6.82)	2 (6.45)	3 (6.82)
Total	29 (2.87)	25 (2.48)	24 (2.38)	18 (1.78)	14 (1.39)	19 (1.88)

Table 23

Prevalence of caries in permanent teeth by age and sex

Age in years	Mild		Moderate		Severe	
	Boys	Girls	Boys	Girls	Boys	Girls
6	2 (4.65)	2 (4.88)	0 0.00)	0 (0.00)	0 (0.00)	0 (0.00)
7	4 (1.72)	2 (0.66)	1 (0.43)	1 (0.33)	1 (0.43)	3 (0.99)
8	2 (0.47)	4 (0.87)	1 (0.24)	3 (0.65)	1 (0.24)	3 (0.65)
9	7 (1.55)	5 (0.95)	3 (0.66)	3 (0.57)	1 (0.22)	2 (0.38)
10	10 (1.40)	8 (0.97)	7 (0.98)	4 (0.48)	2 (0.28)	3 (0.36)
11	8 (1.17)	8 (0.69)	7 (1.02)	8 (0.69)	2 (0.29)	4 (0.35)
12	11 (0.93)	6 (0.65)	8 (0.68)	6 (0.65)	2 (0.17)	4 (0.44)
13	9 (0.78)	10 (0.68)	7 (0.61)	9 (0.62)	3 (0.26)	6 (0.41)
14	11 (0.85)	12 (0.97)	9 (0.70)	7 (0.57)	4 (0.31)	5 (0.41)
15	10 (0.87)	11 (0.94)	11 (0.96)	7 (0.60)	5 (0.44)	7 (0.60)
16	7 (0.81)	11 (0.89)	8 (0.92)	8 (0.65)	5 (0.58)	6 (0.49)
Total	81 (0.99)	79 (0.85)	62 (0.76)	56 (0.60)	26 (0.32)	43 (0.46)
Total (both sexes combined)	160 (0.91)		118 (0.67)		69 (0.39)	
Total (both sexes and all age groups combined)			347 (1.98)			

A GALLONG BOY HAVING CARIES-AFFECTED TEETH

tion made here is that considering all the age groups together the frequency of mild and moderate form of caries occur with a greater percentage in boys, whereas, a higher percentage of severe form of caries are found in girls as compared to boys. In our sample 0.91 percent of teeth are affected by mild form of caries, 0.67 percent by moderate form and 0.39 percent of teeth are affected by severe form of caries and overall 1.98 percent of teeth are affected by various degree of caries in the Gallong children.

Periodontal Disease

In order to find the prevalence of periodontal disease in the present study the methods detailed by Russell (1956, 1957) have been used.

The number and percentage of periodontal index scores of children of present study are listed in tables 24(a).It is clear from the Table that the percentage of clinically normal supportive tissues in both boys and girls decreases gradually with increasing age. At the age of 6 years 65.71 percent of boys and 68.75 percent of girls have normal supportive tissues, the percentage reduces to about 41.94 and 31.82 in boys and girls, respectively, by the age of 16 years. The percentage of 'simple gingivitis' and 'the beginning of the destructive periodontal disease' (both being reversible forms of disease) ranges between 13.73 to 42.11 percent for different age groups in both the sexes. No clear pattern of occurrence of 'simple gingivitis' can be seen by age and sex, however, the average beginning of 'destructive

A GALLONG BOY HAVING PERIODONTAL DISEASE

periodontal disease' is found to occur with a greater percentage in boys as compared to girls.

The 'established destructive' periodontal disease' is found in boys and girls as young as 7 years old, and it is further observed that this prevalence is high in boys than the girls in most of the age groups. This disease ranges between 0 to 37.25 percent for different age groups in both the sexes. The last stage of periodontal disease, i.e. terminal disease, is found earliest in 13 year old boys and 14 years old girls, the percentage occurrence ranging between 2.17 to 6.82 percent from 13 to 16 years of age in both the sexes.

From the above observations it is clear that irreversible form of periodontal disease, sets in the children of the present study by the time they are 7 years old. Another fact which emerges from the table 25 is that at least 25.93 percent of children of the present sample are affected by the irreversible stages of periodontal disease before reaching adulthood.

Table 25

Periodontal Index score in permanent teeth by age and sex

Age in years	Score											
	0		0.0-0.2		0.3-0.9		0.7-1.9		1.6-5.0		3.8-8.0	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
6	15 (42.86)	16 (50.00)	8 (22.86)	6 (18.75)	6 (17.14)	6 (18.75)	10 (28.57)	9 (29.13)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
7	15 (35.71)	17 (39.53)	11 (26.19)	7 (16.28)	7 (16.67)	9 (20.93)	11 (26.19)	10 (23.26)	8 (19.05)	9 (20.93)	0 (0.00)	0 (0.00)
8	12 (27.91)	13 (28.26)	10 (23.26)	10 (21.74)	8 (18.60)	9 (19.57)	14 (32.56)	10 (21.74)	8 (18.60)	14 (30.43)	0 (0.00)	0 (0.00)
9	8 (21.05)	10 (24.39)	8 (21.05)	9 (21.95)	6 (15.79)	7 (17.07)	16 (42.11)	11 (26.83)	13 (34.21)	11 (26.83)	0 (0.00)	0 (0.00)
10	10 (19.61)	11 (22.00)	13 (25.49)	14 (28.00)	9 (17.65)	9 (18.00)	15 (29.41)	15 (30.00)	15 (29.41)	14 (28.00)	0 (0.00)	0 (0.00)
11	7 (17.95)	10 (19.61)	11 (28.21)	14 (27.45)	6 (15.38)	7 (13.73)	12 (30.77)	13 (25.49)	12 (30.77)	19 (37.25)	0 (0.00)	0 (0.00)
12	8 (16.67)	7 (20.00)	13 (27.08)	10 (28.57)	8 (16.67)	5 (14.29)	15 (31.25)	9 (25.71)	17 (34.42)	12 (34.29)	0 (0.00)	0 (0.00)
13	8 (18.60)	10 (18.87)	10 (23.26)	14 (26.42)	10 (23.26)	12 (22.64)	12 (27.91)	15 (28.30)	14 (32.56)	12 (22.64)	1 (2.33)	0 (0.00)
14	7 (15.22)	7 (15.91)	13 (28.26)	14 (13.82)	7 (15.22)	8 (18.18)	15 (32.61)	13 (29.55)	15 (32.61)	11 (25.00)	1 (2.17)	2 (4.55)
15	6 (14.63)	7 (16.67)	13 (31.71)	13 (30.95)	7 (17.07)	9 (21.43)	11 (26.83)	12 (28.57)	11 (26.83)	12 (28.57)	2 (4.88)	2 (4.76)
16	5 (16.13)	6 (13.64)	8 (25.81)	8 (18.18)	5 (16.13)	9 (20.45)	8 (25.81)	16 (36.36)	11 (35.48)	11 (25.00)	2 (6.45)	3 (6.82)
Total	101 (22.10)	114 (29.94)	118 (25.82)	119 (24.74)	79 (17.29)	90 (18.71)	139 (30.42)	133 (27.65)	124 (27.13)	125 (25.99)	6 (1.31)	7 (1.46)

Figures in parentheses represent percentage

Table 24

Periodontal Index score in permanent teeth by age and sex

Age in years	Score									
	0-0.2		0.3-0.9		0.7-1.9		1.6-5.0		3.8-8.0	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
6	23 (65.71)	22 (68.75)	6 (17.14)	6 (18.75)	10 (28.57)	9 (29.13)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
7	26 (61.90)	24 (55.81)	7 (16.67)	9 (20.93)	11 (26.19)	10 (23.26)	8 (19.05)	9 (20.93)	0 (0.00)	0 (0.00)
8	22 (51.16)	23 (50.00)	8 (18.60)	9 (19.57)	14 (32.56)	10 (21.74)	8 (18.60)	14 (30.43)	0 (0.00)	0 (0.00)
9	16 (42.11)	19 (46.34)	6 (15.79)	7 (17.07)	16 (42.11)	11 (26.83)	13 (34.21)	11 (26.83)	0 (0.00)	0 (0.00)
10	23 (45.10)	25 (50.00)	9 (17.65)	9 (18.00)	15 (29.41)	15 30.00)	15 (29.41)	14 (28.00)	0 (0.00)	0 (0.00)
11	18 (46.15)	24 (47.06)	6 (15.38)	7 (13.73)	12 (30.77)	13 (25.49)	12 (30.77)	19 (37.25)	0 (0.00)	0 (0.00)
12	21 (43.75)	17 (48.57)	8 (16.67)	5 (14.29)	15 (31.25)	9 (25.71)	17 (34.42)	12 (34.29)	0 (0.00)	0 (0.00)
13	18 (41.86)	24 (45.28)	10 (23.26)	12 22.64)	12 (27.91)	15 28.30)	14 (32.56)	12 (22.64)	1 (2.33)	0 (0.00)
14	20 (43.48)	21 (47.73)	7 (15.22)	8 (18.18)	15 (32.61)	13 (29.55)	15 (32.61)	11 (25.00)	1 (2.17)	2 (4.55)
15	19 (46.34)	20 (47.62)	7 (17.07)	9 (21.43)	11 (26.83)	12 (28.57)	11 (26.83)	12 (28.57)	2 (4.88)	2 (4.76)
16	13 (41.94)	14 (31.82)	5 (16.13)	9 (20.45)	8 (25.81)	16 (36.36)	11 (35.48)	11 (25.00)	2 (6.45)	3 (6.82)
Total	219 (47.92)	233 (48.44)	79 (17.29)	90 (18.71)	139 (30.42)	133 (27.65)	124 (27.13)	125 (25.99)	6 (1.31)	7 (1.46)

Figures in parentheses represent percentage

Chapter V

DISCUSSION

The comparative study of order of eruption of different populations by jaw and sex and both the jaw and sex combined. In all the populations, mostly first mandibular molars emerged earlier to all other teeth, followed by the central and lateral incisors. Canine and premolars do not occupy a specific position in the sequence of tooth emergence times.

The order of tooth emergence for jaw and sex combined reveals that mandibular canine emerge earlier to first premolars and maxillary canine emerges after the second premolars in our sample, whereas in Gulbarga children the emergence timing of second manibular premolar is same to maxillary second molar, and in general the order of eruption of tooth given by Wheeler 1988, there the mandibular first premolars and maxillary second premolar has same time of emergence.

The tooth emergence time of our population is compared with Khasi, a north-east Indian tribe and also with some other Indian populations. In general, among Gallong the permanent teeth emerge late compared to other Indian population.

The Patiala Punjabis studied by Sidhu and Gupta (1973), are close to our population in respect to the tooth emergence timing. The emergence time of the first maxillary premolar in male (10.55) is same in both the populations, and the other teeth which have closer eruption timing to our sample are the second maxillary incisor in girls, maxillary canine in both the sexes, first and second maxillary promolars in boys, the first mandibular premolar in girls, the second mandibular premolar and second molar in boys.

The Khasi children studied by Jaswal (1983) also shows that their tooth emergence timing is closer to our population. The maxillary premolar in girls, the first mandibular incisor in boys, the second mandibular incisor and first mandibular molar in girls are also close to our population in respect to their tooth emergence timings.

Some other populations like Bengalee studied by Banerjee et al. (1984) shows closer emergence timing of the second maxillary premolar in girls and first mandibular premolar in boys. Rest of the populations do not show much closer timing of tooth emergence, but one or two teeth show closeness with our population in respect to both emergence timing.

When our sample was compared with populations other than Indian for the tooth emergence timing, it is seen that the British populations studied by Clements et al. (1953a) and by Miller et al. (1965) are close to our population. The emergence time of second mandibular molar (11.35) in girls is same to our sample. The other teeth showing closer emergence timing with Gallong population are the second incisor in boys, canine in both the sexes, first premolar in girls, in the maxilla, and second incisor and first premolar in the mandible of boys.

The emergence time of the second premolar (10.85) and the second molar (11.35) in girls of Brazilian Japanese studied by Eveleth and Freitas (1969) is same to that of Gallong, Halikis (1961) studied the Australian population where the eruption time of maxillary second molar in girls and

Table 26

Permanent - tooth emergence times among some populations

Population	Sex	MAXILLA							MANDIBLE							Author (s)
		I1	I2	C0	P1	P2	M1	M2	I1	I2	C0	P1	P2	M1	M2	
Gallong (Present study)	Boys	7.55	8.52	11.45	10.55	11.42	6.52	12.67	6.55	7.60	9.87	10.75	11.32	6.35	11.97	Limbu (1990)
	Girls	7.20	8.37	10.70	9.77	10.77	6.35	11.90	6.40	7.45	9.45	10.05	10.85	6.07	11.35	
Khasi	Boys	7.50	8.75	11.00	10.10	10.70	6.25	12.30	6.50	7.65	10.55	10.60	11.20	5.70	11.70	Jaswal (1983)
	Girls	6.90	8.10	10.35	9.70	10.60	6.20	11.50	6.49	7.50	9.70	9.80	10.70	6.00	11.05	
South Indians	Boys	7.34	8.34	11.13	10.59	10.52	6.63	12.37	7.13	7.86	11.22	10.88	11.76	6.59	12.08	Shourie (1946)
	Girls	7.27	7.51	10.87	10.55	11.47	6.91	11.86	7.23	7.54	10.52	10.07	11.42	6.81	11.59	
Lahore Punjabis	Boys	6.87	8.56	11.02	10.44	11.11	6.06	11.91	6.79	8.11	10.45	10.48	13.18	5.92	11.34	Shourie (1946)
	Girls	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Patiala Punjabis	Boys	7.15	8.32	11.50	10.55	11.40	5.50	12.15	6.50	7.52	10.95	10.65	11.27	5.25	11.50	Sidhu and Gupta (1973)
	Girls	6.82	7.75	10.63	10.10	11.35	5.72	12.05	6.35	7.30	10.42	10.05	11.12	5.50	11.20	
Chandigarh Children	Boys	7.08	8.13	10.97	10.47	11.48	6.61	12.02	6.61	7.59	10.71	10.97	11.75	6.17	11.18	Kaul et al (1975)
	Girls	6.92	8.13	10.47	10.23	11.22	6.03	11.22	6.46	7.59	9.77	10.47	11.22	5.62	10.72	
Kuluis of H.P.	Boys	7.10	8.60	11.90	6.20	12.70	3.40	12.90	6.30	7.20	11.90	5.20	12.20	5.20	12.60	Bhasin et al (1977)
	Girls	6.70	7.20	11.40	5.90	10.80	5.30	11.80	6.40	7.80	10.20	5.40	10.90	5.10	11.90	

Permanent tooth emergence times among some populations

Population	Sex	MAXILLA							MANDIBLE							Author (s)
		I1	I2	C0	P1	P2	M1	M2	I1	I2	C0	P1	P2	M1	M2	
U.P. Magars	Boys	7.36	8.12	11.78	10.48	11.18	6.42	12.84	6.72	7.72	10.72	10.67	11.60	6.00	12.66	Awasthi and Khare (1978)
	Girls	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Gaddi Rajputs.	Boys	7.02	8.83	10.96	10.82	11.51	6.21	11.87	6.29	7.96	10.52	11.07	11.82	6.18	11.84	Singh (1980)
	Girls	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Haryana Jats	Boys	6.92	8.03	10.71	10.23	10.84	5.12	11.48	6.09	7.41	10.47	10.23	11.09	4.09	11.00	Prakash and Kaul (1982)
	Girls	6.46	7.67	10.35	10.59	10.71	5.37	11.35	5.96	7.16	9.88	10.23	11.09	4.77	10.85	
Bengalees	Boys	7.75	8.25	11.25	10.75	-	5.75	9.12	6.50	7.75	11.50	10.75	-	5.75	-	Banerjee et al. (1984)
	Girls	7.25	8.25	10.75	11.25	11.75	5.75	11.75	6.25	7.75	10.25	11.25	11.75	5.75	11.75	
People of Gulbarga (Karnataka)	Boys	6.38	8.13	11.25	10.00	11.00	5.75	12.13	7.00	7.13	10.38	10.63	11.75	5.50	12.00	Rami Reddy (1986)
	Girls	6.50	8.00	10.88	10.13	11.00	5.75	11.00	6.75	6.88	10.00	10.00	11.00	5.50	10.63	
American	Boys	7.33	8.42	11.50	10.33	11.08	6.33	12.16	6.25	7.58	11.66	10.58	11.33	6.16	11.66	Cattell (1928)
	Girls	7.08	8.00	10.08	9.92	10.92	6.16	12.08	6.08	7.25	9.66	10.08	11.08	6.00	11.42	
American	Boys	7.49	8.62	11.80	10.42	11.18	6.64	12.00	6.50	7.64	10.70	10.75	11.45	6.44	12.20	Klein et al (1938)
	Girls	7.20	8.15	11.05	10.00	10.82	6.54	12.40	6.19	7.31	9.85	10.20	11.00	6.12	11.90	
American-Whites	Boys	7.33	8.60	11.63	11.04	12.11	6.66	12.71	6.60	7.75	10.80	10.98	11.92	6.75	12.42	Nanda (1984)
	Girls	7.06	8.25	11.13	10.69	11.83	6.65	12.39	6.08	7.46	10.00	10.65	11.50	6.52	11.94	

Permanent - tooth emergence times among some populations

		MAXILLA							MANDIBLE						Author (s)
Population	Sex	I1	I2	C0	P1	P2	i1	i2	I1	I2	C0	P1	P2	i1	i2	
Canadians	Boys	7.20	8.30	11.40	10.50	11.30	6.10	12.30	6.10	7.30	10.70	10.80	12.70	6.20	12.00	Peel County Survey (1950)
	Girls	6.50	7.95	10.60	10.05	11.20	5.40	12.30	5.50	6.90	9.60	10.20	11.10	5.80	11.50	
British	Boys	7.01	8.18	11.46	10.41	11.52	6.11	11.97	6.08	7.30	10.51	11.35	12.32	6.14	11.41	Clements et al (1953 a)
	Girls	6.62	7.82	10.67	9.79	11.06	5.94	11.49	5.77	7.01	9.41	10.53	11.63	5.84	11.18	
British	Boys	7.27	8.39	11.33	10.34	11.02	6.22	11.90	6.50	7.66	10.42	10.80	11.88	6.12	11.64	Miller et al (1965)
	Girls	6.94	8.04	10.72	10.04	10.91	6.12	11.68	6.17	7.35	9.80	10.26	11.25	5.97	11.35	
Ghanaians	Boys	6.30	7.50	10.40	9.50	10.50	5.00	9.10	5.30	6.10	10.00	9.80	10.60	4.90	10.80	Houpt et al (1967)
	Girls	6.00	7.30	9.50	9.00	10.00	5.00	10.90	5.10	6.40	8.90	9.20	10.30	4.50	10.50	
Bantus	Boys	6.90	8.10	10.70	10.00	10.90	5.40	11.30	5.80	6.90	10.30	10.20	11.00	5.40	11.20	Mckay and Martin (1952)
	Girls	6.50	7.70	10.20	9.60	10.30	5.30	10.80	5.80	6.40	9.50	9.60	10.70	5.10	10.50	
Gambians	Boys	7.38	8.59	11.33	10.37	11.25	5.99	11.93	6.22	7.47	10.58	10.73	11.39	5.71	11.62	Billewicz and McGregor (1975)
	Girls	7.11	8.10	10.53	9.79	10.59	5.78	11.18	8.08	7.07	9.70	9.95	10.66	5.48	10.93	

Permanent - tooth emergence times among some populations

Population	Sex	MAXILLA							MANDIBLE						Author (s)
		I1	I2	C0	P1	P2	I1	I2	I1	I2	C0	P1	P2	I1	I2	
Australians	Boys	7.60	8.30	11.60	10.40	11.20	6.40	12.10	6.40	7.70	10.70	11.30	12.30	6.30	11.70	Halikis (1961)
	Girls	7.10	8.00	10.80	10.00	10.90	6.30	11.50	6.20	7.20	9.80	10.50	11.50	6.10	11.10	
New Zealanders	Boys	7.26	8.32	11.40	10.01	11.74	6.47	12.47	6.38	7.42	10.78	11.34	12.18	6.46	11.89	Leslie (1951)
	Girls	6.83	7.86	10.82	10.52	11.24	6.38	12.20	6.19	7.16	9.74	10.54	11.73	6.30	11.36	
Chinese	Boys	7.36	8.60	11.03	9.83	10.67	6.27	12.12	6.51	7.37	10.38	10.04	11.02	6.04	11.33	Lau (1971)
	Girls	7.23	8.19	10.26	9.47	10.48	6.29	11.80	6.28	7.13	9.51	9.55	10.44	5.85	10.95	
Brazilian Japanese	Boys	7.25	8.57	10.75	9.53	10.77	6.35	12.37	6.55	7.15	9.98	10.32	11.15	5.95	11.30	Eveleth and Freitas (1969)
	Girls	6.65	8.12	10.35	9.14	10.35	6.10	11.83	6.10	6.85	9.15	9.90	10.85	5.90	11.35	
Thais	Boys	8.10	9.10	11.50	10.50	11.90	7.00	12.20	7.00	8.20	11.30	11.10	11.80	7.00	11.70	Kamalanathan et al (1960)
	Girls	7.80	8.80	10.90	9.80	11.60	7.00	12.10	7.00	7.60	9.90	10.40	11.50	7.00	11.60	
Sri Lankan	Boys	7.24	8.69	11.55	10.52	11.21	5.51	11.89	5.18	7.72	11.04	10.78	11.28	5.02	11.73	Kamalanathan et al (1984)
	Girls	7.15	8.03	10.87	10.15	11.19	5.72	11.56	6.32	7.39	10.00	10.22	11.31	5.62	11.07	

maxillary first molar in both the sexes is close to our sample.

The emergence time of first maxillary premolar in boys and second mandibular molars in girls of Canadian population, studied by Peel Country (1950) is closer to our population. The first maxillary incisor and first maxillary molars in Chinese girls studied by Lau (1971) shows closer eruption timing with the present sample. Some of the maxillary teeth e.g. the canine and the first premolar in boys and the first premolar in girls of Thai population studied by Kamalanathan et al. (1960) shows nearer eruption time to the present sample.

The other population like Sri Lankan, Gambians and Newzealanders are presented in the table 26 shows few teeth, which has close emergence time with present sample.

Apart from the similarity in tooth emergence time, the remaining teeth have high and in some cases moderate variation with out population.

When our findings on number of tooth emerged at specific ages was compared to other populations viz. Newzealand, Sri Lanka and Gulbarga (Karnataka), it is observed that the eruption of the first tooth occurred as early as 4 years in Gulbarga children in both the sexes followed by the children of Newzealand at 5 years, while in the present sample and in Sri Lanka children the first tooth emerged at 6 years. The comparison does not give a specific pattern of mean number of erupted teeth in the four opulation samples considered. However, at 7 and 8 years of age the mean

Table 27

Mean Number of permanent teeth erupted at specified ages in children of New Zealand (Leslie, 1951); Sri Lanka (Pathmanathan et al., 1984); Gulbarga (Rami Reddy, 1986) and West Siang

Age in years	New Zealand		Sri Lanka		Gulbarga		West Siang	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
4	-	-	-	-	0.3	0.2	-	-
5	0.27	0.64	-	-	1.6	1.7	-	-
6	2.96	3.78	3.86	3.16	2.7	3.8	1.23	1.28
7	7.56	8.83	5.83	6.51	6.4	7.2	5.55	7.02
8	10.52	11.59	9.08	9.94	10.5	10.6	9.81	10.02
9	12.33	13.86	11.45	12.90	13.2	13.5	11.87	12.85
10	14.95	17.52	14.10	14.56	16.4	16.8	13.96	16.56
11	19.26	22.14	15.95	20.64	18.4	22.8	17.51	22.59
12	23.03	25.16	23.14	24.35	23.1	25.6	24.58	26.26
13	25.76	26.78	27.18	27.26	26.0	27.4	26.77	27.60
14	-	-	-	-	-	-	28.00	28.00

Table 28

Position, Age and Sex-wise distribution of caries-affected teeth

Age in years	Sex	Anterior	Percentage	Posterior	Percentage
6	Boys	1	0.01	1	0.01
	Girls	0	0.00	2	0.02
7	Boys	2	0.02	4	0.05
	Girls	2	0.02	4	0.04
8	Boys	2	0.02	2	0.02
	Girls	4	0.04	6	0.06
9	Boys	6	0.07	5	0.06
	Girls	4	0.04	6	0.06
10	Boys	9	0.11	10	0.12
	Girls	9	0.10	6	0.06
11	Boys	8	0.10	9	0.11
	Girls	10	0.11	10	0.11
12	Boys	9	0.11	12	0.15
	Girls	7	0.08	9	0.10
13	Boys	6	0.07	13	0.16
	Girls	9	0.10	16	0.17
14	Boys	7	0.09	17	0.21
	Girls	9	0.10	15	0.16
15	Boys	9	0.11	17	0.21
	Girls	8	0.09	17	0.18
16	Boys	7	0.09	13	0.16
	Girls	7	0.08	18	0.19

Table 29

Percentage frequency distribution of Caries-affected children by age and sex

Age in years	Gallong (Present Study) Boys	Girls		Gulbarga (Karnataka) Boys	Girls	
6	2.86	6.25		-	-	-
7	9.52	6.98		8.00	1.90	
8	6.98	8.70		4.80	16.20	
9	13.16	9.76		10.90	19.20	
10	17.65	8.00		9.00	19.50	
11	15.38	11.76		13.30	18.50	
12	18.75	14.29		5.30	20.60	
13	16.28	15.09		17.20	33.30	
14	17.39	15.91		20.80	22.70	

number of emerged teeth in both sexes are more in the Newzealand sample. By the age of 13 years the mean number of teeth erupted is greater in Sri Lankan boys, followed by boys of Arunachal, Gulbarga, and Newzealand). By the age of 13 years, the greatest mean number of erupted teeth in girls is found in present sample followed by Gulbarga, Sri Lanka and Newzealand samples; whereas, in boys it is Sri Lanka followed by present sample, Gulbarga and Newzealand.

The number of caries-affected teeth is recorded high in the posterior teeth (premolars and molars) than the anterior (incisors and canines) in all the age groups and both the sexes. The percentage of caries-affected teeth is little high in boys than the girls. On an average, 1.65 per cent of caries-affected teeth were found in the girls and 2.27 per cent in the boys.

The finding of the present study in Gallong is discussed in the light of Rami Reddy's (1986) work on the people of Gulbarga (Karnataka) on permanent teeth, carried out more or less on similar lines.

The highest percentage of caries-affected persons found in the age group of 12 years in boys and 14 years in girls of our sample, whereas, the highest percentage of persons having caries-affected teeth are 14 years in boys and 13 years in girls of Gulbarga (Karnataka). In our sample the percentage of caries-affected boys are more than the girls, whereas, this percentage is found to be reversed in the Gulbarga children. In general,

Table 30

Prevalence of gingivitis in children and young adults

Investigators	Year	Group studied	No. of children in Group	Age Group (years)	% of persons affected with Gingivitis
Limbu, D.K. (Present study)	1990	Gallong children, Arunachal	1010	6-16	73.98
King	1940	Isle of Lewis	2280	6-15	90.00
Marshal-Day	1944	Boys in Kangra district in India (poor nutrition)	200	Appx. 13	81.00
Marshall-Day and Shourie	1944	Low-middle class school children	613	5-15	80.00
King	1944	Gibraltar evacueesin England	135	10-14	85.20
	1945	Primary school children in Dunbee, Scotland	103	12-14	90.00
	1945	Harpenden Institute, England	170	11-14	Groups vary 56.40-97.50
Marshall-Day and Shourie	1947	Low to middle class male school children in Lahore, India	1054	9-17	99.40
	1947	Girls of high socio-economic level at Lahore, India	179	9-17	73.30
Massler, Schour and Chopra	1950	Sub-urban Chicago school children	804	5-14	64.30
Marshall-Day and Shourie	1950	Virgin Island (91% Negro population)	823	6-18	57.00
			860	5-13	26.90

Investigators	Year	Group studied	No. of children in Group	Age Group (years)	% of persons affected with Gingivitis
Greene	1960	School boys in low socio-economic area in India	1613	11-17	96.90
		School boys in low socio-economic area in Atlanta, Georgia	577	11-17	92.00
Zimmerman and Baker	1960	White children from Maryland	529	6-12	35.00
		Negro children from Texas	442	6-12	67.00
		White children from Texas	435	6-12	79.00
McHugh et al.	1964	Dunbee, Scotland, boys and girls	2905	13	99.40
Dutta	1965	Calcutta, India, boys and girls	1424	6-12	89.80
Downer	1970	Secondary school children in London, England	373	11-14	79.00
Jorkjend and Birkeland	1973	Primary school children in Porsgrunn, Norway	154	11-13	99.00
Bowden et al.	1973	Cheshire, England	622	15	81.20

Table 31

Average periodontal index in different populations

Population Group	Average Periodontal Index	Age Group (years)
Gallong, Arunachal Pradesh	0.96	
Baltimore, Maryland (White)	1.03	40-49
Alaska; primitive Eskimos	1.17	"
Ecuador	1.85	"
Ethiopia	1.86	"
Baltimore, Maryland (Negro)	1.99	"
Uganda	2.50	"
Vietnam; Vietnamese	2.18	"
Colombia	2.21	"
Alaska; urban Eskimos	2.31	"
Chile	2.74	"
Lenanon; Lebanese	2.98	"
Thailand	3.30	"
Lanonon; Palestinian refugees	3.52	"
Burma	3.58	"
Jordan; Jordanian civilians	3.96	"
Vietnam; Hill Tribesmen	3.97	"
Trinidad	4.21	"
Jordan; Palestinian refugees	4.41	"

the percentage of caries-affected children increase with increasing age, in both the populations.

On a world-wide basis the Gallong (73.98%) ranks relatively low in the magnitude and prevalence of periodontal disease. The prevalence of gingivitis is found to be comparatively very low in the Virgin Island (Negro population) (26.9%) and also in White children from Marryland (35%). High prevalence of gingivitis is found in low to middle class male school children in Lahore (99.4%), and the primary school children in Norway, (99.0%). The percentage of prevalence of gingivitis in the present sample (75.26%) is close to that of the Lahore girls of high socio-economic level, and White children from Texas (79.0%) and secondary school children in London (79.0%).

Gallong children ranks relatively low in magnitude and prevalence of periodontal disease in world-wide basis. Table 31 shows shows mean Periodontal Index scores by various population groups throughout the world. Compared with South America, United States and other Asian countries, the severity of periodontal disease in Gallong children is relatively low.

CONCLUSION

From the findings of the present study following conclusions can be drawn :

1. First mandibular molars are the earliest to emerge in the entire dentition, in six year age group of both the sexes.

2. The emergence of permanent tooth except the third molar was completed by the age group of 12 years in girls and 13 years in boys.

3. In general the emergence timing of permanent teeth in girls is slightly earlier than in boys.

4. Median age of tooth eruption, in general is relatively high in children of present study in comparison to other populations.

5. Present sample follows the common order of tooth emergence excepting the maxillary canine and second premolars.

6. The prevalence of caries-affected teeth are earliest observed in age group 6 years in both sexes, and the percentage of affected-children is found to be highest in age group 12 and 14 years for boys and girls, respectively.

7. Present sample has higher percentage of boys with caries-affected teeth as compared to girls.

8. In the Gallong children, 77.90 percent of boys and 70.06 percent of girls are affected by different stages of gingivitis.

9. Gallong rank relatively low in magnitude and prevalence of periodontal disease as compared to other populations considered in the present study.

Comparative studies show that people of Gulbarga (Karnataka) studied by Rami Reddy have higher percentage of persons with caries-affected

teeth than our sample. In worldwide basis Gallong children rank relatively low in the magnitude and prevalence of periodontal disease and also in Average Periodontal Index. There may be several reasons for it, some of which may be because of their less interaction with the outside people, and their food habit. In the villages people occasionally have the previlege of taking pork and mutton, specially during ceremonial rituals or during construction of houses in the village. The major food of Gallong consists of boiled rice, boiled green vegetables, dried and fermented bamboo shoots, roots, raw fruits and enough quantity rice beer. The green leafy vegetable is fibrous in nature that cleans the teeth and the alcohol content in rice-beer also work as a tooth cleaning agent. Moreover their food is less sugary.

Higher prevalence of caries-affected teeth and periodontal disease are found in boys than the girls in our population. Relatively greater number of boys have found to smoke or chew tobacco and also to chew betelnut, which have highly associated with the increase of periodontal disease, although this association is not unequivocal, it seems reasonable that any habit that increases irritation to the gingivitis tissues or lowers the resistance of the tissues would be a predisposing of secondary factors in initiating periodontal disease. People in the villages do not go for individual pot for drinking. By nature boys often visit their relatives and friends where they may share drink with the caries-affected persons. In general children in the villages clean their teeth with finger and water, charcoal and also with tooth paste and brush whereas in town most of the children use tooth paste and brush to clean and keep their teeth healthy.

After carying out this research work among the Gallong, it is fruitful to make some suggestions on preventive and remedial measures for dental care.

1. In the villages people should be encouraged to use tooth brush and fluorided tooth paste instead of charcoal or water and finger.

2. Modern medical facilities should be made available in the remote villages.

3. Food item should contain adquate amount of vitamin, minerals, calcium that required to keep the teeth and gums healthy.

4. Caries-affected parents should be encouraged not to eat or drink together with their children in same pot.

5. Caries patients should brush their teeth just after meal so that no soft food debris remain attached in between the teeth.

6. The persons having caries-affected teeth should not be encouraged to eat sweets or any food item containing large amount of sugar.

7. Persons suffering from caries or periodontal disease should be encouraged to visit the dentist.

8. The people should be given the basic knowledge of tooth care and its importance.

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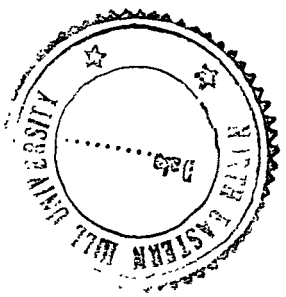
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