Chapter II
DENTAL ERUPTION

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 recognized in the diagnosis and treatment of children with growth disturbances (Tanner, 1962). It can be estimated from data on tooth eruption in such situation where it is highly difficult to estimate chronological age on the basis of historical events (Rami Reddy, 1986). A proper estimation of the dental age can be accomplished only by reference to standards established on the population of which the subject is a member living in the same environmental conditions. If a large 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 to justify its application to that group as a whole so that it could be distinguished from other populations (Rami Reddy, 1986).

Though teeth eruption has been the subject of interest since centuries to scholars from various disciplines, it was not until recently that systematic and extensive studies have been made on it by several workers providing as much dependable results as possible.

Jelliffe and Jelliffe (1973), presented cross-sectional, longitudinal and hospital data on different ethnic groups from different part of the world aimed at evaluating the feasibility of age grouping by dental assessment, and association between nutritional
status and timing of deciduous dental eruption and suggested that severe PCM (Protein Calorie Malnutrition), may lead to delay in teeth eruption.

Data pertaining to tooth eruption in population of India is scanty. The pioneer work in this regard was carried out by Powell (1902) in Bombay. This study was an attempt to define the range of variation rather than to estimate the mean age of eruption of teeth.

Rami Reddy et al., (1985), studied the eruption of deciduous dentition among the Velama of South-eastern Andhra Pradesh and found that the onset of tooth eruption occurred at the same age in both sexes, their completion was found to occur earlier in males than the females, and also found that children belonging to upper and middle income groups were found to have full complement of teeth at the lower ages compared to the lower income group. Singh and Singh (1995) explored the patterns and ages of primary dental eruption of Khatri children of Punjab. They observed that the Khatri boys and girls follow a pattern of eruption which is of universal in character. Their study further shows that the teeth in the upper and lower jaws do not differ in respect of the ages of eruption. The eruption of mandibular incisors is earlier in girls than in boys.

Saran (1985), reported that the first molars erupted in the age group of 4 to 5 years and the time of eruption of the third molar teeth is uncertain among the Christian Oraons of Ranchi district, Bihar. Chhabra et al., (1993), examined the sequence and eruption time of permanent teeth among the Punjabi boys and girls in a comparative perspective. The sequence of eruption is M1, I1, I2, P1, C, P2 and M2 in upper jaw and in lower jaw C (canine) erupted earlier than P1.
Jaswal (1983) carried a study on the age and sequence of permanent tooth emergence among the Khasi children of Shillong, Meghalaya. She observed that, tooth emergence in females was markedly earlier than in males. Limbu (1996) reported a similar trend among the Gallong children of Arunachal Pradesh as reported among the Khasi children by Jaswal.

DENTAL AND ORAL PATHOLOGY

A. Dental Caries: The FDI (International Dental Federation) Commission on Classification and Statistics for Oral Conditions (COSTOC) in its recommendation of the World Health Organization, on the classification of epidemiologic studies of dental caries and definitions of related terms (1975), defined dental caries “as a localized, pathologic process of bacterial origin, that results in the demineralization of the hard tooth structures and progression to cavitations”.

Though there is variation in the prevalence patterns of dental caries from time to time, from country to country and from region to region within a country, the fact is that the disease has afflicted all the nations of the world.

Barmes (1981) on the basis of epidemiological studies distinguishes five levels of dental caries prevalence: very low, when the decayed or missing teeth are a few, low, moderate, high; and very high, when the number of carious or missing teeth is quite high. He reports from a recent study made on children age 13-14 years that the levels of dental caries ranges from moderate to very high in a number of developed countries. In certain
highly industrialized countries like Japan, prevalence of dental caries has shown an increasing trend whereas; in the developing countries it is very low level.

In 1932, Goldstein reported presence of very low proportion of caries among the Eskimos. The same author in 1948 reported a fairly higher incidence of caries among the Texas Indians. Godivari et al., (1960) studied the incidence of dental caries among school children in Bang Chan, Thailand and observed that the low incidence. One of the reasons for this low incidence of caries was low intake of sugar. Kalvani et al., (1960) studied a group of provincial Thai children and they found that the prevalence of dental caries was less in the rural areas where less refined carbohydrates and more fruits and vegetables and glutinous rice were eaten.

Alvarez et al., (1988) carried out a cross-sectional study on evaluation of dental caries in primary teeth and nutritional status of Peruvian children from low socio-economic conditions and found 49% were found to be chronically malnourished, and nutritional deficits that lead to not only tooth exfoliation but also susceptible to caries attack later in life.

The prevalence of this disease was studied by few people in India. Shourie (1946) has shown a marked rise among the Punjabis of Lahore. Pal (1983) examined the incidence of dental diseases like caries, tooth loss, alveolar abscess, etc. among the Negritos of the Andaman Islands and found that extremely low rate of dental abscess reflects that the Negritos were devoid of any form of periodontal diseases. Very low incidence of caries suggests that the traditional diet of the people was mostly free from
carbohydrate items. Complete absence of the exposure of pulp cavity through dental attrition points towards a softer food habit.

Rami Reddy et al., (1985) studied the prevalence of dental caries among the Balijas of Tirupati town of Andhra Pradesh, aged between 20-40 years and found that 44% of the individuals were found with caries, females (49%) were found to be more prone to this than males (38.5%). Basha et al., (1998) study dental caries and fluorosis among Muslims of low, middle and upper income groups of Kurnool district, Andhra Pradesh. The study reports prevalence of caries is about 38.6% of the overall sample with considerable variation between age, sex, income and habit. The study further reports how caries correlates with fluorosis in rural and urban situation.

Venugopal et al., (1998) examined prevalence of caries among the children of Mumbai between age group 1 year and 14 years and found 35.6% had dental caries. Parental income was not to have any bearing on caries prevalence, but parental literacy, particularly maternal literacy was shown to influence caries prevalence in children. The study also shows that prevalence was low in well-nourished and in those taking vegetarian type of diet.

Ghoshmaulik and Devi (1999) studied the relations between dental caries and a few genetic markers and salivary factors, among the Oriya speaking Hindu population living in Bhubaneswar. The study reports nearly 43% of the sibs were affected with caries and concluded that dental caries seem to have biological predisposition. Chronic illness of digestive tract, parasitic infection of intestine, persistent throat infection etc. are likely to produce acidic oral fluid, which may be accentuated by antigenic affinity present in the
saliva. Cultural habits like chewing betel nut or unhygienic method of tooth care; sweet and tobacco consumption etc. are added factors.

Saravanan et al., (2005) conducted studied on children of 5 years of both sexes of school children of Pondicherry urban area randomly selected and found prevalence was 44.4% among the population, being higher in boys and also found higher prevalence of caries in maxillary anterior teeth and mandibular posterior teeth.

B. Periodontal Diseases: Studies on periodontal diseases have conducted in a fair number of populations outside India. King (1940), studied children of Isle of Lewis, age group between 6 and 15 years and observed that 90% of them were affected by periodontal diseases. Greene (1960) found 92% of the school boys in low socio-economic area in Atlanta, Georgia are suffering from periodontal disease. Zimmerman and Baker (1960) studied the prevalence of periodontal disease among the White children from Maryland, Negro children from Texas and White children from Texas and found 35%, 67% and 79% respectively.

Among Indian populations few studies on periodontal diseases have been reported in literature. Marshal-Day (1944), studied among the low economic class boys of the Kangra district in India and observed that the prevalence of periodontal diseases in 81%. Dutta (1965) reported that the prevalence of periodontal diseases among the school going children of Calcutta are found to be 89.80%. Varidana and Reddy, (2007) carried a study on Denagere district of Karnataka and found that gingivitis and periodontal disease are more common in females than in males and as the age advanced gingivitis reduces,
periodontal disease increases steadily and periodontal disease is high in subjects with poor oral hygiene.

Limbu (1990), observed the incidence of periodontal disease among the Gallong of Arunachal Pradesh to be 73.98%.

**DENTAL MORPHOLOGY**

The dental traits purely based on phenotypic morphologic classification consist of supernumerary teeth or hyperdontia and hypodontia, carabelli’s anomaly, shovel-shaped incisors, diastema, crowding, cingulum and occlusion.

The study of the distribution and inheritance of the morphological characteristics of the teeth and jaws in the living as well as extinct man and non-human primates renders it possible to delineate the nature and extent of interrelationship between them, their origin and evolutionary part from variation. Some of the pioneering studies on these traits particularly among the Mongoloid populations have been made by Hrdlicka (1911), Dahlberg (1963), Pederson (1949), Hellman (1943), Moorrees (1957) and others.

A. **Supernumerary teeth or Hyperdontia and Hypodontia**: Supernumerary or Hyperdontia are extra teeth beyond the normal number unlike hypodontia or decrease in number of teeth both representing numerical variations in teeth. Published literature shows a very few works on the numerical variations of most of which are limited to tribal population alone. One of the earliest studies made by Campbell (1925) among the Australian Aboriginals and on the skull shows 1.8% of supernumerary teeth. Sinclair et al., (1947) examined the dental conditions among the Papuans of New Guinea and found
2% of them were with supernumerary teeth. Pederson (1949) reported slightly less than 2% of supernumerary teeth in the East Greenland Eskimos, while Pederson (1949) found 2.7% of the South African Bantus possessing these teeth.

In India too studies have been conducted on this anomaly but a few populations only such as on the crania from East India by Pal (1964); among the Vaisyas of Southern Andhra Pradesh by Rami Reddy and Vijay Kumar (1978) and among Muslims of the same region by Rami Reddy et al., (1982b) in whom the proportions of supernumerary teeth noticed are 2%, 0.25% and 2.35% respectively. The work done in India in respect of this trait is limited.

**B. Carabelli’s Trait:** Carabelli’s trait gained much importance as a ‘marker’ for differentiation between populations of different ethnic origins. Several studies conducted on this dental polymorphism in a number of populations outside India revealed that it occurs in a much higher incidence in the Caucasians, Dietz (1944) and Negroes than in Mongoloid and related groups. The highest frequency of the trait ranging from 51% to 90% has been reported in European populations, slightly lower percentage in African populations and in American Indians, and the lowest among the Arctic population (Alvesalo et al., 1975). The different populations of the Mongoloid stock studied are Pecos Indians by Nelson (1983); East Greenland Eskimos by Pederson (1949); Northwest and Labrador Eskimos and Pima and Blackfoot Indians by Dahlberg (1949). In Australian aboriginals Campbell (1925) found 33% of the molar teeth with carabelli’s cusp. Pederson (1949) reported 29% of this trait in East Greenland Eskimos of White
admixture, while in isolated areas where the admixture has been the least, the trait was nearly absent.

In India, this trait has been studied by Joshi et al., (1972) among the Hindus of Gujarat (64.6%), by Pal (1978) on the human crania from East India (26.4%), Bhasin et al., (1979) among the Jats of Haryana (61.2%) and by Rami Reddy et al., (1982a and 1982b) among the Pattusalis (26%) and Muslims (15%) of South-eastern Andhra Pradesh.

C. Shovel-shaped Incisors: Hrdlicka (1911) who has done pioneering work in the area of dental anthropology reported pronounced shovelling in the incisor teeth of the American Indians. In the years 1920-21, he found the highest incidence of this trait in the different Mongoloid groups – Chinese, Japanese, Eskimo and American Indians where as in Negroes the proportion was lower and among Caucasians the lowest. These findings of Hrdlicka were later confirmed by the works of a number of scholars, Nelson (1938); Goldstein (1948); Pederson (1949); Dahlberg (1945, 1949) showing that the shovel-shaped teeth are characteristics of the Mongoloid stock. Lasker (1950) found shovel-shaped teeth in 14% among the White Americans. He pointed out that there is no difference in the incidence of the trait between central and lateral incisors but in the latter teeth, the character has been observed to be predominantly more pronounced.

In India, the only studies on this dental trait are those of Ganguly (1960) among the Nicobar Islanders, whose frequency with shovel-shaped incisors comes very close to the proportions found in the people of Indonesia, Micronesia and Polynesia. Pal (1964) studied on the crania from Eastern India and found 48% of this dental trait, Bhasin et al.,
(1979) studied among the Jats of Haryana and found 72.2% and Rami Reddy et al., (1982a & 1982b) among the Pattusalis (50%) and Muslims (5.74%) of Southern Andhra Pradesh. Rami Reddy (1985) found shovel-shaped incisors slightly over 30% of males and 25% of females among the people of Gulbarga, Karnataka.

D. Diastema: The diastema though a questionable character; is of intrinsic value in the study of human phylogeny. Boyd (1972) reports the trait of diastema in 62 cases (28.4%) in a sample of dental casts of 218 natives of Eastern Highlands of New Guinea from which he concluded that the absolute tooth size in cases with spacing is relatively smaller than for those individuals with crowding, although their general body size and arch size were also smaller.

In India, Rami Reddy et al., (1982a & 1982b) carried out a study on the prevalence of diastema among the Pattusalis and Muslims of South-eastern Andhra Pradesh and found out 3.25% and 5% of this dental trait respectively. The results of this study further shows that in both the populations the incidence of the trait is slightly higher in males than in females.

E. Crowding: Crowding is another non-metric trait which is complex in nature. According to Lasker (1950), the crowding of teeth results due to the inheritance of large teeth from one parent and small jaw from the other, which are determined before birth. According to Cadien (1972), extreme crowding of teeth probably is not an advantageous condition, so selection may be operating to reduce it. Therefore, crowding one of the
many causes for it malocclusion may be considerably influenced by genetic as well as environmental factors.

This dental anomaly which is known for its significance in understanding human evolution is most neglected in population studies in India or outside. The study is that of Boyd (1972) among the natives of Eastern Highlands of New Guinea who have shown crowding to the extent of 34.4% cases in mandible and 26.1% cases in maxilla in a sample of 218 dental casts of natives. There were only nine cases with mark crowding in which the arch length was found to be greater than 5cm. Mandibular crowding has been found to be significantly greater in these natives. Boyd in an attempt to relate crowding to tooth size computed the mesio-distal tooth measure from second molar to second molar in each arch for the natives and found a progressive increase in tooth size as crowding becomes more severe.

**F. Cingulum:** According to Segal (1963) the ridge found on the lingual lobes of the incisor and the canine teeth is termed the ‘cervical ridge’ or the ‘cingulum’. This is a primitive characteristic which helps in highlighting the racial difference between populations of different biological origins.

The only work available in literature is that of Pederson (1949) among the East Greenland Eskimos for whom no percentage of the incidence of the cusp is given. Barksdale (1972) reported the occurrence of lateral incisors with lingual cusps or cingulum in 18% of the casts of the Eastern Highland natives of New Guinea.
In India, the only study conducted in this trait is that of Rami Reddy et al., (1982a & 1982b) among the Pattusalis and Muslims of South-eastern Andhra Pradesh in whom the proportion of the trait has been found to be around 4%, and more frequent in maxillary incisors than the mandibular ones and central than lateral incisors.

G. Occlusion: Dental occlusion is the relationship between the masticatory surface of the maxillary and mandibular teeth, when the mouth is closed. The irregular occlusal variation or the so called malocclusion is caused by hereditary or environmental factors. Persons living in rural areas of developed countries, the prevalence rate of malocclusion have been found to be much lower than that in those in urban areas as revealed by the studies of Goose et al., (1957) in the West Midland country Youths; Lavelle (1973) among Youths and their parents in Central England; Barnard (1956) in the country dweller of Australia; and of Corruccini and Whitley (1981) in the rural Kentucky American community. Corruccini and Whitley (1981) on the basis of a number of works stated that “an important consideration in understanding occlusion variation is the tendency among non-technologic human societies for virtually all individuals to show nearly ideal occlusion. Malocclusion is malady of civilized man”. From this statement it is clear that malocclusion results due to one of chewing stress on the modern process foods and the lacks of direction provided to the growing jaws and erupting teeth. A number of studies made on tribal populations have shown a high proportion of normal occlusion than in a situation when these communities came in contact with industrial societies with a high rate of malocclusion. The examples given in this respect are the Australian Aborigines studied by Barrett (1969), C.H.M. Williams (1943) etc.
In India very less studies have been conducted on occlusal variation. Sidhu et al., (1970) based on the cephalometry, experimented on the school going Parsi children and Maharastrians of Bombay and concluded that the different eating habits were the cause of malocclusion. The works on dental occlusion contributed by some physical anthropologist are by Rami Reddy and Vijay Kumar (1978) among the Vaisayas of South Eastern Andhra Pradesh and by Rami Reddy (1985) among the people of Gulbarga, Karnataka. These studies have revealed a very low proportion of malocclusion cases as a result exposure to processed foodstuffs in spite of the existence of contact with the urban and rural areas.

The other studies carried out by Corruccini et al., (1982) was among the 265 Jat youths of Chandigarh (Punjab), both sexes (Males 145, Females 120) aged 12 – 16 years from seven schools representing the high, middle and lower socio-economic groups. It is revealed that the children of the lower socio-economic group mainly rural in origin showed significantly better dental occlusion with broader maxillary arches as their counterparts in developed countries and suggested a number of environmental factors as responsible for malocclusion such as deciduous tooth loss, nutritional heterosis and masticatory function. Sengupta and Das (2002) carried out a study on the tooth occlusion pattern among the Sonowal Kacharis of Dibrugarh district, Assam and found the frequency of overbite highest in males. The Sonowal female characteristically show a prevalence of edge to edge bite.

Though a number of studies have been conducted on many populations outside India, a survey of literature reveals that only a few of these are on Indian population.
Practically no serious attempt has been made so far to study on dentition in the populations of Northeast India. Keeping this in view that people belonging to Mizo of Aizawl town, Mizoram have been chosen for the present study due to the following reasons: 1. The fluorine content is only traced i.e., inadequate in the drinking water of Aizawl Town (PHE Aizawl, 2006), 2. The National Family Health Survey (1998-1999) report shows that among the Mizo, 59.4% males and 22.1% females has the habit of smoking; 60% of males and 60.7% of females are reported to be chewing tobacco and 3. They are also regular chewer of *kuhva* (areca nut and betel leaf with lime).

Therefore, we have undertaken a study on dental anthropology among the Mizo of Aizawl town, Mizoram with the following objectives:

**OBJECTIVES OF THE STUDY**

1. To assess the eruption pattern of different types of teeth, both deciduous and permanent, their eruption age and order, in both boys and girls.

2. To record the various morphological patterns of teeth.

3. To assess the prevalence of dental pathology and impact of food habits, including chewing of betel nut, tobacco and smoking on dental health.

4. To find out the relationships of eruption pattern, dental pathology and frequency occurrence of various morphological traits with certain demographic and socio-economic variables such as age, sex, income and education.