CHAPTER I

INTRODUCTION

1.1. STATEMENT OF THE PROBLEM

One of the central themes of physical anthropology is to find out and understand the biological variations in human populations and the causes of such variations. It is true that at the initial stages, the physical anthropologists were largely involved in researches on taxonomic classifications of mankind. But since the middle of the present century, they have shifted from the so-called taxonomic research to population genetical research with a view to understanding the various processes of human evolution and variation. Subsequently, the various aspects of human variation like physical growth, environmental adaptation, etc. have also become the subject matters of interest among the physical anthropologists. Recently, efforts are being directed to understand the relationship between human biological traits and various physical as well as socio-environmental factors (Basu et al., 1980b). It is now believed that biological processes and health are largely influenced by various socio-environmental proximates (Newman, 1975). So, though population genetics is still considered as the theoretical backbone of physical anthropology (Kirk, 1978), it is quite imperative on the part of physical anthropologists to understand the effect of various socio-environmental factors on well-being of human population(s).

Nutrition, along with other socio-environmental factors, is generally known to be associated with many biological and health oriented traits such as physical growth, adult body dimensions, haematological traits, infant mortality, etc. Thus, it cannot be denied that a study of the inter relationship between/among nutritional status, socio-economic factors and biological characteristics of human population is a very important aspect of research in the field of physical anthropology (Basu, 1987: Bharati,1989). Such studies are very few in India,especially in the north-eastern region of of the country.

Nutrition, which reflects the socio-economic condition of a community, is one of the vital environmental factors for the study of human evolution and variation (Newman, 1975) and/or the health status of a community. In this regard, it may be mentioned that the World Health Organisation(WHO, 1971) has defined health as a "...complete physical, mental and social well-being and not merely the absence of disease and infirmity". However, for the purpose of the present study, health is narrowly defined as a physical well-being of an individual or a population in terms of certain biological traits that are easily examined such as physical growth, adult body dimensions, infant mortality, haematological traits, etc.

The effect of nutrition on health and other biological characteristics has been revealed in many studies (Ghosh and Dhatt, 1961; Morley, 1969: Gopalan et al., 1971; Chandra, 1981; McMurray et al., 1981; Martorrel and Ho, 1984; Eveleth and Tanner, 1990; and others). Dumont and Rosier (1969) have estimated that out 60 million deaths in the world every year, 10 to 20 millions are due to dietary causes. In developing countries, at least one third of the people is reported to have a diet with protien deficiency (FAO/WHO Expert Committee, 1965). In India, about 80 % of the population is confined to rural areas, where there are widely prevalent-nutritional defi-

ciencies(Vijayaraghavan et al.(1985). But studies on nutritional status of population are still limited, especially with reference to regional, ethnic , socio-economic and cultural variations, and so far no such study, to the best of our knowledge, has been carried out in the north-eastern region of the country.

1.2. OBJECTIVES OF THE PRESENT STUDY

In view of the fact that no study has so far been undertaken in the north-eastern region in general and among the War Khasi in particular on the effect of bio-social factors(including nutrition) on health status, we propose to undertake a study on nutrition and health status in relation to some bio-social factors among the War Khasi of Meghalaya. Accordingly , the main objectives of the present study are as follows:-

1. To describe the dietary/nutritional status of the War Khasi,following as far as possible the recommended dietary intakes, given by the Indian Council of Medical Research (ICMR, 1977, 1989).
2. To assess the nutritional status in the present population, using anthropometric variables.
3. To find out the relationship between various socio-economic conditions and dietary/nutritional status.
4. To find out the effects of other bio-social factors like age, sex, birth order, anthropometric variables, age at marriage, economic condition, religion, education, etc. on some demographic parameters like fertility, mortality, etc.
5. To understand the effects of diet/nutrition and other bio-social factors on child growth, adult body dimensions and haemoglobin content, etc.

6. To find out the frequency of nutritional deficiencies, if any, in this population.

1.3. AREA OF STUDY

Location and Topography

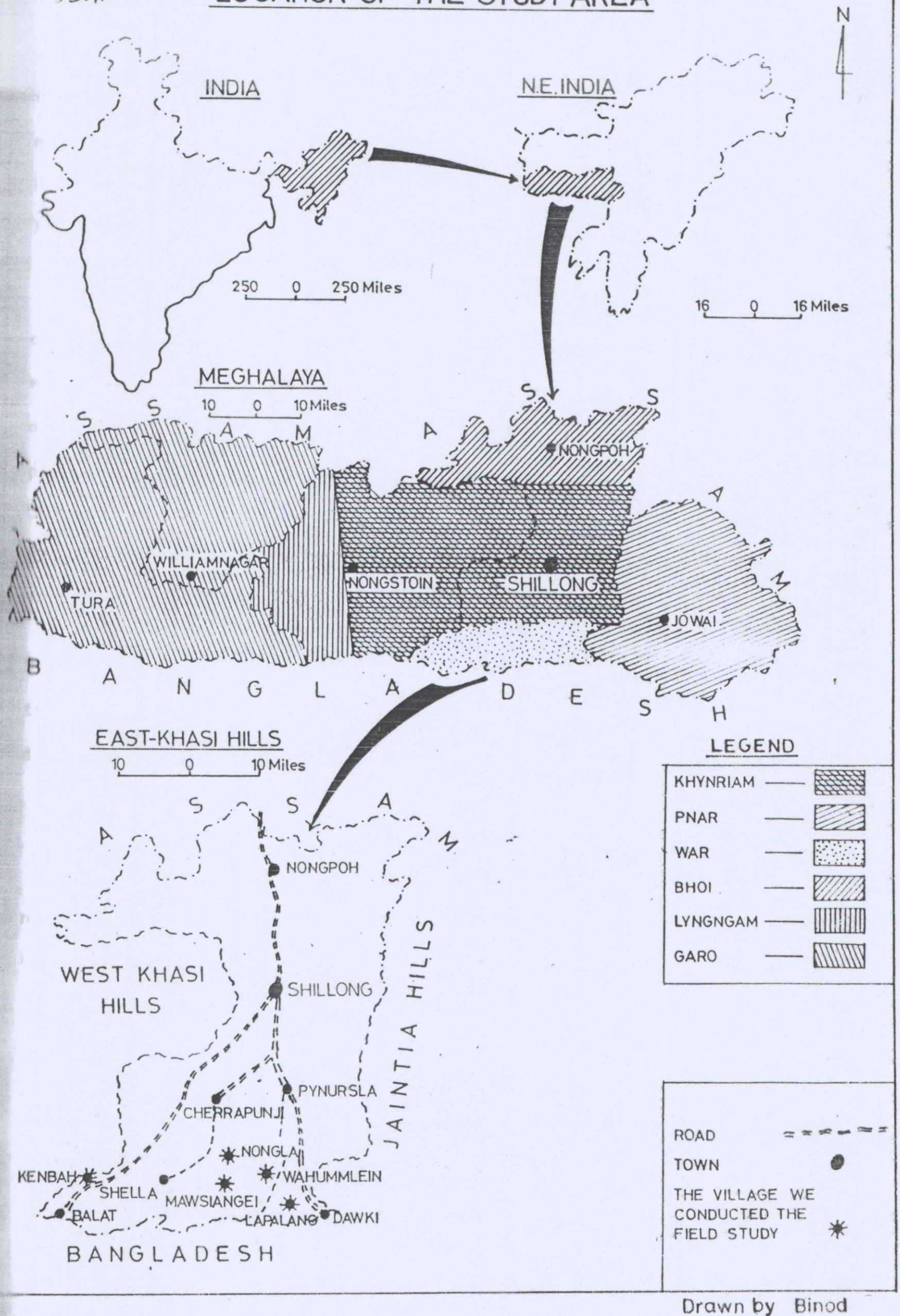
Meghalaya is essentially a small tribal state in the north-eastern region of India. It lies between 25°47′ and 26°10′ N latitude and 89°45′ and 92°47′ E longitude. The state covers an area of about 22429 Km^2. It is bounded by Assam on the north, east and north-west, and by Bangladesh on the south and south-west (Fig. 3.1).

Initially, Meghalaya was a part of Assam, which was composed of only two districts, namely, the United Khasi and Jaintia Hills district and the Garo Hills district. It was bifurcated from Assam as an autonomous state on April 2, 1970, and subsequently a full-fledged statehood was achieved on January 21, 1972. Prior to 1992, there were five districts in the state, namely, the Jaintia Hills, East Khasi Hills, West Khasi Hills, East Garo Hills and West Garo Hills districts. At present, there are altogether seven districts with the creation of two more districts in 1992, viz, the Ribhoi and South Garo Hills districts. Till now, no official map has been published by the State Government, which indicates the boundaries of the newly created districts.

The War Khasi mostly live in the southern slope of the East Khasi Hills district of Meghalaya. They are also found in the east-southern slope of the West Khasi Hills district as well as in the southern slope of the Jaintia Hills district. The East Khasi Hills district covers an

Fig.3.1.

LOCATION OF THE STUDY AREA



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area of 5196 Km^2. It is bounded by the Ri Bhoi district on the north. Bangladesh on the south, Jaintia Hills district on the east and West Khasi Hills district on the west. The headquarters of the East Khasi Hills district is Shillong, which is situated about 1510 metres above sea level, and it is also the capital of the state.

The southern slope of Khasi hills is also known as 'Ka Ri War'(War country). It extends roughly from Dawki on the east to Balat on the west. It is situated between the central upland region and the plains of Bangladesh. The area is characterised by the hill slopes and precipices, beautiful platforms and waterfalls. The famous platforms are Cherrapunji platform (1337 metres), Mawsynram (1305 metres) and Pynursla (Zimba, 1983).

The important rivers in the War area are Umngot, Khasmar, Umiam, Umrew, Umngi, Khuba, etc. These rivers have created the deep valleys through cretaceous sandstones and hard rocks while flowing towards Bangladesh.

Geological Composition

Meghalaya may be broadly divided into five geological formations, namely, Archean Gneissis Complex, Shillong Group of Rocks, Lower Gonduana Rocks, Cretaceous Tertiary Sediments and Sylhet Traps (Bhaktia, 1992). The central and northern parts of the state are covered by the Archean Gneissis Complex. The important rocks of this geological formation are quarizite, gneissis, schist, etc. The Shillong Group of Rocks occupies the central and eastern parts of the state. The major rocks found in

this formation are quartzite, granite, schist, etc. The Lower Gonduana rocks lying in the western parts of the Garo hills are composed of pebble-beds, sandstones, shales, etc. The southern part of the state is formed by the Cretaceous Tertiary Sediments. It is said that these sediments are a continuation of the Cretaceous Tertiary Sediments of the Bengal plains.

The Sylhet Traps, comprising basalt, rhyolites, etc., occur in narrow belt and extend in the east-west direction along the southern slope of the West Khasi Hills district. These traps are closed to the Dawki-Shella fault. Zimba (1983) describes that the cretaceous or shalky rocks of this area, containing coal fields and limestones in the alternating strata of the compact rocks, are the result of transitional nummulities.

The War area is very rich in limestone and coal deposits. Limestones are found to exist in the whole area of southern slope from the Lubha river on the west to the Umngot river and southern parts of the Jaintia Hills district on the west. The Commorrah Quarry near Bholaganj is very famous for its supply of limestone to Assam Bengal Factory at Chattak, now in Bangladesh. Coal deposits of the War area are found in Mawlong, Mustoh, Mawsynram, Mawdon, Langrin, Langkyrdem, Pynursla, etc. Petroleum is also reported to have existed in the valley of the Khasimara river on the west of Shella village (Das Gupta, 1984).

Climate

The climate is wet and warm during summer and dry and cold during winter. The average temperature ranges from 30° to 34° C during summer,

but it drops to as low as 12° C during winter. The average annual rainfall in the East Khasi Hills district is about 7090 mm (Simba, 1985). According to annual record of rainfall in 1974, Sohra (Cherrapunji) experienced about 976 inches or 24, 554 mm, thereby having the heaviest rainfall in the world. But according to the Indian Meteorological Department (Sachdeva, 1993), Mawsynram, which is located about 16 Km. west of Cherrapunji, is now having the highest rainfall in the world. The average annual rainfall in Mawsynram exceeds that in both Cherrapunji in Meghalaya and Waileale in Hawaii.

Flora and Fauna

The important flora of the War Khasi area include teak(tectona grandis), pooma (cedrela toona), rubber plant (figus religiosa), palm tree (fenic dactilifera), bay leaf (belula acuminata), upas (rhus succedanea), arecanut (areca catchu), simul tree (bombax malabarica), orrange (citrus aurantium), mango (mangifera indica), jackfruit (artocarpus integrifolia), chestnut (castonopsia indica), pan leaf (buclandia populnea), pine apple (bromelia ananas), quava (psidium quajiva), Indian plum (flacourtia jangomas), broom-stick (thysamolanena maxinus),Sohphie' (myrca esculenta), 'diengngan' (Khăsiana dyer),'dieng pyrsit'(eurya japonica), 'dieng Sohum' (eugenia tetragona), etc. Other species like cinanamomium zeilandium, quercus spicata, citriodora, bacaria, sapeda, sapindus mukorosi, species of orchids, ferns, mosses, fungi, lichens, etc. are also found in the War area.

The area was once a sanctuary of various types of wild animals.

But owing to the practice of shifting or jhum cultivation and merciless killings of animals, most of the fauna have now become extinct. The fauna, which are found at present, include leopard, bear, deer, mongoose, small rodent, wild pig, fox, otter, monkey, squirrel, wild fowl, crow, myna, pheasant, owl, etc.

1.4. THE PEOPLE

Distribution

According to 1991 Census, the total population of Meghalaya is 17,60,626, of which males are 904,308 and females 856,318. The overall sex ratio is 94.7 females per 100 males. The density of population is approximately 78 persons per square kilometre.

The people of Meghalaya are mostly tribals, among which the Khasi and the Garo are the most dominant tribal groups. The other tribal populations like the Hajong, Naga, Mizo, etc. along with some Hindu caste populations, Nepali, etc. have also settled in the state.

The Khasi tribe consists of five major sub-groups, namely, the War, Khynriam (upland Khasi), Jaintia (Pnar or Synteng), Bhoi and Lyngngam. The Khynriam are mostly found in the upland regions of the East and West Khasi Hills districts of the state. The Jaintia Hills district is dominated by the Jaintia. The Bhoi predominantly live in the Ri Bhoi district or northern parts of the Khasi hills. The Lyngngam are mainly confined to the southern and western parts of the West Khasi Hills district. The entire southern slope of Khasi hills is dominated by the War Khasi. They are also found in the southern part of Jaintia Hills district.

Physical Characteristics and Affinity

From the anthropological point of view, the Khasi (or Khynriam, Pnar, Bhoi, War and Lyngngam) belong to the Indo-Mongoloid group of the Mongoloid racial stock (Das, 1981). Das (1987) has described that the "Khasi have brown skin colour. Their head hair is dark brown with a reddish tinge in colour, straight or flat, wavy in form and coarse in texture. They have scanty beard and moustache. The colour of eye is brown to dark brown. The eye slit is mostly oblique and palpebral fissure is medium. Eye fold is present in most of the cases. They are short in stature. Their head is mesocephalic and nose is mesorrhine". Regarding the four sub-groups of the Khasi, Das (1978) says that these four divisions (i.e. Khynriam, Pnar, Bhoi and War) do not deviate much from the average Khasi in relation to stature and trunk height. He, however, points out that the "Pnar and the Bhoi show most often deviation in higher magnitude and that these two populations are standing opposite to one another in relation to average Khasi". It may be mentioned that the people have so far treated the Khynriam, Pnar, Bhoi, War and Lyngngam as one and the same ethnic group. Marwein (1987) says that the Khasi are"known sometimes by different names at different places. The names are either confined to a particular Syiemship or state or a particular geographical region". All these sub-groups claim to have deseended from the same origin, i.e. **U Hynniew Trep Hynniew Skum** (Seven Huts). Recently, the Government of Meghalaya has published one volume on Meghalaya(DIPR, 1991). In this volume, it is clearly stated that these Khasi groups are of the same ethnic origin. They share common traditions and customs, though there may be some variations, owing to different geographical conditions and admixture with other communities.

All the sub-groups of the Khasi follow the matrilineal system of society and linguistically, they speak a different dialect of the Monkhmer language, which belongs to the Austric (Austro-Asiatic) group. So far as the Austric language is concerned, it is believed to be spoken by the earliest inhabitants of the country, particularly the Australoids and their descendants. At present, besides the Khasi, other peoples like the Kol, Munda, Nicobarese of Nicobar islands, etc. are the Austric speakers in India. Das (1987) has reported that the Wanchoo of Arunachal Pradesh also use some Austric words in their language.

With regard to the position of the Khasi, Dixon (1922) says "... the Khasi in spite of their linguistic isolation among the peoples of Assam, are racially closely related to the majority of the Tibeto-Burman tribes. With them they represent a very old western drift of south-western Asia peoples. Unlike their neighbours, however, they have succeeded in retaining their old speech". Haddon (1924) has also tentatively suggested the presence of ancient dolichocephalic platyrrhine (Pre-Dravidian) type among the Khasi . Linguistically, Chatterjee (1951) says "... in Burma and Indo-China lived speakers of Austric language, who are largely of Proto-Australoid race from India". Accordingly, Das (1978) has proposed that one of the possibilities is that the " Khasi are an Australoid population speaking Austric language. Their physical features were modified by a strong intrusive Mongoloid strain. They have retained their language but have undergone remarkable changes in physique". In view of these circumstances, we may also say that although the present day Khasi are not Australoid, they might be the autouchthonous population of this part of the country, or they might have been the small divergent group of the Proto-Australoids, who migrated

to Burma and Indo-China from India.

The other possibility is that the Khasi are a Mongoloid people, who came from south-east Asia as suggested by many scholars like Gurdon (1907), Chatterjee (1951), Bareh (1967), Das (1978), and others. According to Gurdon (1907), " ... the Khasi are an offshoot of the Mon people of Further India in the light of historical fact ...." Chatterjee (1951) says, "They would appear to be a Mongoloid people who have adopted the language of the earlier race, the Austrics (or Proto-Australoids), after they have come down south from the Tibeto-Burman area of dispersion. They may have changed their speech to the Austric (Mon Khmer) Khasi even while they were in Burma ...." He has also pointed out that the admixture of proto-Australoids and Mongoloids "... in very early times in Burma and Indo-China is very likely, this mixture producing the ancient Rmen (Rman) or Mon people of central and southern Burma, the Palaungs and Was of Upper Burma, as well as the Khmers, the Chams, the Stiengs, the Bahnars and other Austric or Austro-Asiatic speakers of Siam and Indo-China". It may be mentioned here that the Proto-Australoids are known by different names like Pre-Dravidian, Australoid, Veddid and Nishada. The Proto-Australoids are similar to Caucasoids in respect of many characteristics. Sometimes, they are also considered a sub-division of the Caucasoid known as Archaic Caucasoid (Das, 1970). In view of the above suggestions, it appears that the Khasi are a Mongoloid people, who might have learned their language from the Australoids (or Proto-Australoids) on their way to India or they might be one of those peoples resulting from the admixture between the Mongoloids and Proto-Australoids (Australoids), somewhere in Burma or Indo-China. Some scholars (like Gurdon, 1907; Bareh, 1967; Das, 1970; and others) have also

supported this view on the basis of cultural evidence. It may, however, be noted that there are also some cultural similarities between the Khasi and the Kolarian tribes of Central India.

Occupation

The main occupation of the War Khasi is agriculture and horticulture. They mainly produce paddy, arecanut, bay leaf, betel leaf, pepper, lemon, orange, broom-stick (thysamolanena), banana, pine-apple, guava, ginger, tumeric, etc. It may be mentioned that the people, who cultivate paddy are those who live mostly in the plain regions, bordering Bangladesh. A large number of people, possessing no land property, are working as day labourers. Some people are also engaged in business and services. Some others have trade and commerce relation with the Khynriam and others mainly at the centres like Ranikor, Balat, Shella, Sohra(Cherrapunji), Langkyrdem, Pynursla, Dawki, Shillong, etc.

Rule of Inheritance

Among the War Khasi, the rule of inheritance is not exactly identical, though similar to that in other Khasi sub-populations. It is gerally believed that both son(s) and daughter(s) inherit the parental property (Gurdon, 1907; Bareh, 1967; Das Gupta, 1984; and others). It may, however, be mentioned that this practice is mainly prevalent among the War Shella and some parts of the War Cherrapunji. The other War Khasi, living in Balat, Pynursla and Dawki areas, except one or two villages, do not follow this pattern of inheritance; but they have adopted the customs, followed by the Khynriam, which mean that the daughters, but not the sons, in-

herit the parental property (the youngest daughter gets the lion's share). So, among the War Khasi, there are two types of the rule of inheritance : (i) The War Shella customs and (ii) the general customs followed by the other Khasi groups, viz., the Khynriam, Pnar, Bhoi and Lyngngam, though there slight variations in certain respects.

Religion

The War Khasi have been in contact with a different people of different religious faiths from time to time (Das Gupta, 1984). The arrival of the Christian and Hindu missionaries, particularly in Shella and some parts of Cherra areas, has brought about a tremendous change in religion and belief of the people. At present, there three main religious sections in the War Khasi. These are : (i) **Ka Niam Khasi** - believer of Khasi traditional religion, (2) the Christian War Khasi - believer of Christianity, and (3) the Hindu War Khasi - believer of Hinduism. Of these religious groups, **Ka Niam Khasi** (Khasi religion) and the Christian War Khasi are the most predominant sections in the War Khasi. The spread of Hinduism among the War Khasi is mainly restricted in Shella and some parts of Cherra area. The Christian War Khasi are divided into different sects like the Presbyterian, Roman Catholic, Church of God and Fellowship.

The people, who are still following their traditional religion, are monotheistic, though the others are of the opinion that the Khasi religion may be described as animism (Gurdon, 1907; Bareh, 1967; Bhowmick, 1971) and demon worship (Nataranjan, 1977) and so on. This is due to the fact that the others have a vague understanding of the Khasi religion as said by Gur-

den (1907), "The Khasi have a vague belief in God, the Creator". Nevertheless, the War Khasi, like the other Khasi sub-groups, believe in one God, the Supreme Planner and Creator (**U Blei Nongbuh Nongthaw**). It may not simply be assumed that the Khasi are polytheistic since they used to speak of many gods. Mawrie (1981) says, "Khasis are not polytheists. Occasionally, talk of many gods is rather to be understood as talk about multiciplicity of the manifestations of one and the same God. To a Khasi, God is one and many because of attribute of being present in all the world above and the earth below" . The breaking of eggs and sacrifice of birds and animals like fowl, pig, cow, goat, etc. are their important riligious rites and ceremonies. The priest locally known as **U Nongknia** or **Nongshat Nongkhein** performs these religious rites either for the individual cause or for that of the community as a whole. They do not have any religious scripture, or any common place of worship. "To a Khasi, religion is a personal contract between man and God" (Hipshon Roy, 1990). It may also be mentioned here that the movement for revivalism of the traditional religion (**Ka Niam Khasi**), under the leadership of the Seng Khasi Organisation, established first on August 23, 1899, has already started among the War Khasi.

Marriage and Clan Exogamy

Monogamy is the general practice of the War Khasi. According to Gurdon (1907), this pattern of marriage is prevalent among the Khasi owing matriarchal system of the society. Though the War Khasi do not strictly prohibit intermarriages with other Khasi sub-groups, like the Khynriam, Pnar, Bhoi and Lyngngam, yet village endogamy is very much prevalent. A recent

study has revealed that the frequency of inter-village marriages is only about 6.51 %. Besides, there is also a strong tendency towards religious endogamy even within a single village (Khongadier, 1994a). Nevertheless, marriages with other communities like the Garo, Mizo, Naga, Assamese, Bengali, Nepali, etc. also take place at times. Cousin marriage like mother's brother's daughter (MBD) or father's sister's daughter (FSD) is generally prohibited (Gurdon, 1907). However, marriage with mother's brother's daughter is not theoretically prohibited, especially after the death of the maternal uncle (Das Gupta, 1984). In a recent study, a few cousin marriages among the War Khasi have been noticed(Khongadier, 1991).

Relation with other Neighbours

The War Khasi are surrounded by the Khasi proper (Khynriam), peoples of Bangladesh, Pnar and Lyngngam on the north, south, east and west, respectively. Social contacts with these neighbours are always through trade and business transactions mainly at the centres like Balat, Shella, Cherrapunji, Pynursla, Majai, Nongjri, Hatthymmai, Lyngkhat, Dawki, Shillong, etc. It may be noted that the War Khasi, who are always in contact with the Pnar or Jaintia, are those who live in Pynursla and Dawki areas. Similarly, the people, who are in constant contact with the Lyngngam, are those, who live in the western part of the War country or Balat area. The War Khasi are dependent on the Muslim and Hindu of Bangladesh for the supply of fish, egg, fowl, utensils, etc. In turn, they sell to the neighbours some agricultural produce like arecanut, bay leaf, betel leaf, orange, lemon, guava, ginger, tumeric, etc. These local

produce are also sold at Cherrapunji, Shillong, Pynursla, Langkyrdem, Laitlyngkot, Dawki,etc., where they frequently meet with the Khynriam, and otthers. It is also from these centres that they purchase rice, cloth, and other essential commodities.

Food Habits

Rice is the staple food of the War Khasi. It is taken by the people for all seasons in a year. Actually, rice is locally produced by a few sections of the people living on the border of Bangladesh or plain area. Since the War Khasi mainly depend on rice, a large quantity of it is procured from other state to meet the requirement. The principal pulse taken by the people is lenttil, which is available in local market. They also consume different types of bean especially during winter season. Common vegetables include onion, potato, brinjal, pumpkin, gourd, plantain flowers, yam, arum, green banana, cucumber, papaya, etc. Tomatoes are also taken frequently during the months between December and April. Different types of leafy vegetables, mushroom and bamboo shoots are collected from the jungles and consumed during the rainy season (April to September). There are also different types of fruits, especially during the rainy season. The most common fruits include orange, jackfruit, banana, pine - apple, papaya and different types of lemon.

The War Khasi are fond of meat and fish. They usually take fishes which may be either fresh or dry ones. Pork is taken frequently, particularly during the market days. Except the Hinduised War Khasi, beef is also consumed by a large number of people. They also use to take

the flesh of other animals like mangose, seal, roddent, otter, monkey, wild pig, bear, deer, etc. Besides, the people are fond of chicken and different types of birds. Egg is also taken frequently. In general, besides vegetables, the people always take their rice along with either meat, or fish, or egg. It may be noted that nowadays, tea is another important ingredient of the breakfast and tiffin (Das Gupta, 1984). Along with tea, they take cold rice (Ja Jah), or boiled arum or yam, bread and biscuits. The War Khasi are not fond of milk, though they do consume little milk with tea.

CHAPTER VII

SUMMARY

A study of human variation is one of the important themes of physical anthropology. The main objective of such a study is to understand the processes of human evolution. Accordingly, since the middle of the present study, the physical anthropologists have firstly shifted their basic interest from the so-called taxonomic to population genetical researches with a view to understanding the various processes of human evolution and, later the other aspects of human variation like physical growth, environmental adaptation, etc. Recently, attempts have also been made to study the relationship between human biological traits and a large number of physical and environmental factors. In fact, it is now believed that human health and/or biological traits are highly associated with socio-environmental factors. So, though population genetics is still considered the theoretical backbone of physical

anthropology (Kirk, 1978), it is quite imperative on the part of physical anthropologists to understand the relationship between socio-environmental factors and well-being of human population(s). Such studies are very few in India, especially in the north-eastern region of the country.

In view of the fact that no study has so far been undertaken in the north-eastern region in general and among the War Khasi in particular, the present study is being carried out on nutrition and health status in relation to some bio-social factors among the War Khasi of Meghalaya.

The Khasi are the matrilineal tribe inhabiting the state of Meghalaya (25°47′ - 26°10′ N and 89°45′ - 92°47′ E). The tribe consists of five major sub-groups, namely, the War, Khynriam(upland Khasi), Pnar(Jaintia or Synteng), Bhoi and Lyngngam. The War Khasi are mostly confined to the southern slopes of the Khasi and Jaintia hills of Meghalaya, bordering Bangladesh. The people who live in the upland region of Khasi hills are known as the Khynriam and those living in Jaintia hills are called the Pnar. The Bhoi and Lyngngam are found in the northern and south-western parts of the Khasi hills, respectively. All these sub-groups of the Khasi have been following the matrilineal system of society. They speak the Monkhmer language which belongs to the Austro-Asiatic group. They also share a common pattern of social structure, though "each group tends to be endogamous and there are shades of differences in respect of dialect, political organisation, economy and in some of the customs and manners between groups"(Das Gupta, 1984).

Objectives of the Present Study

Following are the objectives of the present study:-

1. To describe the dietary/nutritional status of the War Khasi, following as far as possible the recommended dietary intakes, which are given by the Indian Council of Medical Research (ICMR, 1977, 1989).

2. To assess the nutritional status in this population, using anthropometric variables, etc.

3. To find out the relationship between socio-economic condition and dietary/nutritional status.

4. To find out the effect of bio-social factors like age, sex, anthropometric variables, religion, economic condition, education, etc. on demographic parameters like fertility, mortality, etc.

5. To understand the effects of diet/nutrition and other bio-social factors on child growth, adult body dimensions, haemoglobin content, etc.

Materials and Methods

The field work of the present study was conducted in five villages, falling under under the War area in the East Khasi Hills district of

Meghalaya, during the period between 1990 and 1994.

For the purpose of the present study, a 2 % systematic-random sampling of the War Khasi villages was drawn, since it was very difficult to collect data from all the villages (i.e. more than 250 villages). As a result, five villages, viz., Nongkenbah, Mawsiangei, Nongla and Lapalang, were eventually selected for the present study. There are altogether 366 households, of which 58 in Nongkenbah, 41 in Mawsiangei, 24 in Nongla, 33 in Wahumlein and 210 in Lapalang.

Demographic Data: The entire demographic data like name, age, sex, marital status, number of conceptions, number of live-births, number of dead children, age at death, etc. were collected through pedigrees and schedules from all the 366 households in the five selected villages. The nature of demographic data collected, was based on the demographic parameters suggested by the WHO Scientific Group (1964, 1968a).

Dietary Data: One day dietary survey was conducted in each of 184 households, following weightment method. No correction was made for the wastage or loss of the values of foods or nutrients on account of cooking, etc. So, there is a possibility of slight overestimate of the nutritional status of the population.

The nutrient values as well as the edible portion of foods were computed from the Food Composition Tables, prepared by the Indian Council of Medical Research (ICMR, 1977, 1989), considering the War Khasi as moderate by nature of their work. The consumption unit (C.U.) per household

was calculated, following the method suggested by Bhattacharya at al. (1981).

Anthropometry (children and adults): Selected anthropometric measurements like weight, height, sitting height, biacromial diameter, biiliac diameter, mid upper arm circumference, biceps and triceps skinfold thicknesses, etc. were taken on 434 adult males and females (aged 20 - 50 years), following standard techniques (Weiner and Lourie, 1981, Sen, 1994). For growth data, a cross-sectional sample of 514 children (aged 3 - 15 years) was taken, following standard techniques (Weiner and Lourie, 1981; Sen, 1994). Ponderax skinfold caliper was used for taking the measurement of skinfold thickness as suggested by Sloan and Koeslag (1973). Anthropometric ratios/indices and/or estimates like weight/height, body mass index, ponderal index, cormic index surface area, body fat, weight for height, weight for age, height for age, etc. were also computed.

Haemoglobin Estimation: Standard techniques (WHO, 1980) were followed, using Sahli's Haemometer.

Results

The findings of the present study may be briefly summarised as follows:-

Socio-economic Condition:

1. Distribution of CH and NCH households: Out of 366 households covered under the present study, 152 (i.e. 41.53 %) and 214 (i.e. 58.47 %) belong to the CH and NCH, respectively. So,

it shows that the number of households is higher in the NCH than in the CH.

2. Family Size: (i) The mean family size among the War Khasi is 6.67 ± 2.89, which is relatively large in comparison with other tribal populations.

(ii) It is found that the mean family size is higher among the CH (6.97 ± 2.77) than among the NCH(6.45 ± 2.95), though the difference between them is not statistically significant ($z = 1.72$, $P > 0.05$).

3. Occupation: (i) It is found that agriculture is the primary occupation of the people in both the religious groups, whereas agricultural labour is their secondary occupation. Some of them are also engaged in business and services.

(ii) The percentage of the heads of households, depending on agricultural activity, is higher in the NCH (34.58 %) than in the CH (26.97 %), despite the absence of significant difference between them ($d = 1.55$, $P > 0.05$).

(iii) The frequencies of families, possessing no land property, are 28.95 % and 33.64 % in the CH and NCH, respectively ($d = 0.95$, $P > 0.05$)

4. Frequency of Income Groups: The frequencies of LIG, MIG and HIG among the CH are 34.24 %, 45.39 % and 30.39 % ;respectively; whereas among the NCH, these frequencies are 42.06 %, 41.12 % and 16.82 %, respectively ($X^2 = 2.41$, $P > 0.05$).

5. Literacy: (i) The total literacy rate among the War Khasi of the present study is 53.27 %, which is lower in comparison with other populations in the north-easter region.

(ii) The total literacy rate is higher among the CH (54.17 %) than that among the NCH (52.59 %), though the difference between them is not statistically significant (d = 0.77, P > 0.05).

(iii) It is also found that the total literacy rate is higher in males than that in females for both the religious groups, despite the absence of significant difference between two sexes.

Nutritional Status and Socio-economic Condition

1. Consumption of Foods: (i) It is found that the CH have higher intakes of different types of food than the NCH, though the differences between them are significant only in respect of meat, fish and egg; and milk. On the other hand, the mean intakes of cereals and fats are higher among the NCH, and it is significant in respect of cereals.

(ii) It is found that the consumption of different food groups, except other vegetables, is higher in the MIG and HIG, when compared with that in the LIG. The analysis of variance also shows that the differences among the income groups are significant in respect of the intakes of many food groups, except in the case of other vegetables and fruits in both the religious groups.

(iii) In both the religious groups, the intakes of pulses, green leafy vegetables, milk, fats and fruits are found to be less

than the recommended allowances. It is almost true for all the income groups in both the CH and NCH.

2. Consumption of Nutrients: (i) It is found that the CH have higher consumption of many nutrients than the NCH, except in the case of calories, calcium and vitamin B_{12}, which are higher among the NCH. The differences between the CH and NCH are statistically significant only in respect of calcium, iron and vitamin B_2.

(ii) It is also found that the consumption of many nutrients tends to increase significantly with the increasing income level in both the religious groups, except in the case of vitamin B_2 and folic acid among the CH, and vitamin A and vitamin B_{12} among the NCH.

(iii) The consumption of vitamin B_2 and vitamin A is below the recommended allowances in all the income groups for both the CH NCH. With respect to calories, vitamin B_1, vitamin C and folic acid, the consumption is less than the requirement levels in the LIG for both the religious groups.

(iv) The nutrient intakes among the CH and NCH are higher than those reported for many tribal populations in India.

Nutritional Anthropometry

Anthropometry is widely recognised as one of the most useful techniques to assess the nutritional status of an individual, or a population. It is generally agreed that the mild and moderate forms of

undernutrition manifest themselves in varying degrees of growth retardation and adult body dimensions. Since these forms of undernutrition are not easy to diagnose, the use of anthropometry is very much essential. Therefore, certain anthropometric standards with reference to well nourished populations like Harvard standard, or American standard known as NCHS standard (Jelliffe, 1966; Frisancho, 1990) have been established to assess the growth and nutritional status of a population. Nutritionists and others have supported the use of international standards for measuring the magnitude of undernutrition in a population in view of the emperical evidence that the growth performance of children below six years of age is more influenced by environment (mainly nutrition), but not by the genetical factors. However, as far as the present study is concerned, it is found that most of the children in the present population are undernourished according to the NCHS standard, but quite normal as per the ICMR standard. But the calorie and protien intakes in the present population are much better than those reported for other Indian tribal populations. Moreover, no cases of severe forms of malnutrition like marasmus and kwashiorkor had been observed in the present study.

In view of the above circumstances, it is considered essential to pay more attention to the methods of estimating the cut-off point (critical limit) and trigger level (distance or interval between two groups or grades of malnutrition and/or growth status) for assessing the growth and nutritional status of the children in the present study. The WHO Working Group (1986) has recommended to maintain the conventional

cut-off point - 2SD, for "Comparison of prevalences and for screening of populations". Accordingly, a similar method was used for the assessment of growth and nutritional status in the present population, for which the cut-off point was estimated using 95 % confidence interval based on the t-distribution, i.e. $- t_{0.05}SD$ (for large sample it is equivalent to - 2SD). Since anthropological researches are mostly concerned with micro-studies it is felt necessary to used $- t_{0.05}SD$ as the cut-off point for screening the sample size of children into two groups, i.e. $\geqslant - t_{0.05}SD$ and $< - t_{0.05}SD$. Regarding the method of determining the trigger levels, the cut-off point $+ t_{0.05}SD$ derived from the group $\geqslant - t_{0.05}SD$ (i.e. normal sample size) is taken as another critical limit. As a result, the distance or interval between $- t_{0.05}SD$ of the total sample size and $+ t_{0.05}SD$ of the normal sample size is taken as the trigger level for subsequent groupings.

The same method was followed with respect to the assessment of the nutritional status of adults. The only difference is that, we have taken - 4SD of the total sample size and + 4SD of the normal sample size (i.e. - 4SD of the total sample size) for determining the cut-off points and trigger levels, respectively. We have taken - 4SD as the cut-off point for screening the adult sample size, taking into consideration the fact that the variation in adult body dimensions, owing to various factors, is greater than that among the children.

Applying the above method, it is found that there is no difference between the international and national/local standards in the assessment of growth and nutritional status of children (i.e. provided all standards are having the same device of grouping and data analyses). There-

fore, the present method seems to take into account the approximate feature of the population concerned and thereby it is, to some extent, independent of the ethnic differences in physical growth and adult body dimensions, owing to various factors. However, for the purpose of comparative studies of growth, but not for the assessment of growth and nutritional status, the use of NCHS/Harvard population reference standard and that of Z-scores may be essential as recommended by the WHO Working Group (1986).

Nutritional status of children (3 - 5 years): (i) With respect to weight for height, the frequency of undernourished children is lower among the CH (32.73 %) than among the NCH (36.49 %), though the difference between them is not statistically significant (d =0.44, $P > 0.05$)

(ii) In the CH, the frequency of undernourished children is found to be 36.36 %, 38.89 % and 20.00 % in the LIG, MIG and HIG, respectively ($\chi^2_2 = 1.62$, $P > 0.05$); whereas among the NCH, it is found to be 42.86 %, 38.46 % and 25.00 % in the LIG, MIG and HIG, respectively ($\chi^2_2 = 1.68$, $P > 0.05$).

(iii) Similar results are found with regard to other indices like weight/height^2, etc.

Nutritional status of adult males: (i) Among the CH, the frequencies of undernutrition, according to weight for height, are 36.36 %, 41.30 % and 11.54 % in the LIG, MIG and HIG, respectively($\chi^2_2=6.55$,

$P < 0.05$); whereas among the NCH, these frequencies are found to be 46.67 %, 23.81 % and 30.00 %, respectively ($\chi^2_2 = 5.36$, $P > 0.05$).

(ii) With respect to weight/height^2, the frequencies of malnutrition among the CH are 42.42 %, 39.12 % and 11.54 % in the LIG, MIG and HIG, respectively ($\chi^2_2 = 7.47$, $P < 0.05$). Among the NCH, these frequencies are 46.67 %, 21.43 % and 30.00 % in the LIG, MIG and HIG, respectively ($\chi^2_2 = 6.44$, $P < 0.05$).

(iii) The difference between the CH and NCH with regard to frequencies of undernutrition, according to weight for height and and weight/height^2, are not significant, though the CH have lower frequencies.

Nutritional status of adult females: (i) In both the religious groups, the frequencies of undernutrition with respect to weight for height and weight/height^2 decreases significantly with the increasing economic level.

(ii) No statistical differences were found between the CH and NCH with regard to the frequencies of undernutrition, according to weight for height and weight/height^2, So, it shows that it is not religion, but economic condition which really plays a significant role in regulating the nutritional status in the present population.

Effects of Bio-Social Factors on Health Traits

Fertility: (i) The mean number of live-births per ever-married woman is more or less same in both the CH (4.87 ± 0.27) and NCH (4.90 ± 0.19); whereas the mean number of surviving children is slightly higher among the CH (4.39 ± 0.21) than among the NCH (4.29 ± 0.18).

(ii) It is found that the mean number of live-births as well as the mean number of surviving children tends to increase as maternal age advances. The coefficient of regression on the effect of maternal age (independent variable) on the number of live-births and surviving children (dependent variables) also shows that there is a significant positive relationship between them for both the religious groups.

(iii) It is found that the mean number of live-births among the CH are 5.65, 4.64 and 3.89 in the LIG, MIG and HIG, respectively ($F = 5.23$, D.F. = 2,178, $P < 0.05$); whereas among the NCH, these mean numbers are 5.56, 4.66 and 3.82, respectively ($F = 6.03$, D.F. = 2.235, $P < 0.005$).

(iv) As regards the age at marriage, it is found that the mean number of live-births per ever-married woman decreases with the rise in age at marriage, and it is true in both the religious groups.

(v) With respect to educational levels, the mean number of live-births among the CH are found to be 5.28, 4.71, 4.71 and 3.81 in the illiterate, primary and secondary groups, respectively ($F = 4.56$, D.F. = 2,178, $P < 0.05$). Among the NCH, these mean numbers are 5.35, 4.60 and 3.75, respectively ($F = 4.01$, D.F.= 2,235, $P < 0.05$).

(vi) It is found that the differences in live-births among the educational and income groups are not statistically significant, after removing the effect of maternal age. So, it shows that the maternal age, but not the socio-economic condition, which plays a significant role in regulating the fertility rate in the present population.

Infant and juvenile mortality: (i) It is found that the infant as well as the juvenile mortality rate is higher in males than in females for both the religious groups, though the difference between sexes is not statistically significant.

(ii) It is found that the infant mortality rate is higher among the NCH (8.67 %) than among the CH (7.03 %), despite the absence of statistical difference between them ($d = 1.36$, $P > 0.05$). Similarly, the frequencies of juvenile mortality are 3.17 % and 3.78 % in the CH and NCH, respectively ($d = 0.44$, $P > 0.05$).

(iii) The coefficient of regression shows that there is a significant positive relationship between birth order and infant mor-

tality for both the CH ($b = 1.63 \pm 0.39$, $P < 0.001$) and NCH($b = 1.53 \pm 0.53$, $P < 0.05$), which can be expressed as per the following equations:

CH : Infant mortality = 1.73 + 1.63 x Birth order rate

NCH : Infant mortality = 3.87 + 1.53 x Birth order rate

(iv) The relationship between juvenile mortality and birth order is also found to be positive, but it is not significant among the CH.

(v) The regression coefficient also shows that there is a significant positive relationship between maternal age and infant mortality rate among the CH ($b = 0.14 \pm 0.03$, $P < 0.01$), which is expressed by the equation : Infant mortality rate = 1.28 + 0.14 x Maternal age. Among the NCH, this pattern of relationship is not significant ($b = 0.21 \pm 0.08$, $P > 0.05$).

(vi) The relationship between juvenile mortality and maternal age is not clearly perceptible in the present study.

(vii) The relationship between per capita monthly income and infant as well as juvenile mortality is not significant for both the religious groups.

(viii) The effect of maternal education on infant mortality, unadjusted for age, is found to be negatively significant for both the religious groups. However, this negative relationship disappears

after controlling the effect of maternal age.

Anthropometric variavles and reproductive performances:

In both the religious groups, the number of live-births, infant and juvenile mortality was regressed separately with some selected anthropometric variables like weight, height, bi-iliac diameter, body mass index and body fat. Of these anthropometric variables, maternal height and bi-iliac diameter are found to be significantly associated with live-births, even after controlling the effect of maternal age. On the other hand, infant mortality is significantly associated with maternal body weight, body mass index and body fat. No significant relationship is found between juvenile mortality and anthropometric variables.

Adult body dimensions:

As far as adult body dimensions are concerned, attempts have been made to present the findings according to villages and economic condition. It is found that there are significant differences between villages with regard to certain anthropometric characters like sitting height, bi-iliac diameter and biacromial diameter. Consequently, villages belonging to the same cluster, according to Sanghvi's distance analysis, were pooled together to find out the probable effect of economic condition on adult body dimensions. It is found that anthropometric variables are also very much influenced by the economic condition.

Physical Growth:

Anthropometric data, collected from five villages, were pooled together. No attempt has been made to show the differences between villages and/or religious groups as the sample size for the present study is not adequate enough. However, attempt has been made to present our findings according to age, sex, and economic condition. It is found that the boys have higher mean values of many anthropometric measurements than girls at all ages, except during adolescent period, when the girls have higher values than the boys. Generally, adolescent growth spurt occurs between 11 and 12 years in girls and between 13 and 14 years in boys. In most of the measurements the maximum gain in growth occurs at 12 and 14 years in girls and boys, respectively.

With few exceptions, the effect of economic condition on physical growth of children are also found to be clearly perceptible in respect of many anthropometric measurements and indices.

Haemoglobin Content:

Data were presented according to sex, religion and economic condition. Following are the findings:

(i) The mean values of haemoglobin content among the CH males and females are 13.99 $\pm$ 2.25 g/dl and 13.65 $\pm$ 2.56 g/dl, respectively. Among the NCH, these mean values are found to be 13.77 $\pm$ 2.39 g/dl and 13.00 $\pm$ 2.23 g/dl, respectively. In both the

religious groups, the haemoglobin content for both males and females is above the recommended level (WHO Scientific Group,1968b).

(ii) The difference between the two religious groups with regard to haemoglobin content is found to be significant for females ($z = 2.10$, $P < 0.05$), but not significant for males($z = 0.71$, $P > 0.05$).

(iii) Among the CH, the frequencies of aneamia are 26.67 % and 21.21 % in males and females, respectively; whereas among the NCH, these frequencies are 30.77 % and 30.97 %, respectively.

(iv) With respect to economic condition, it is found that the haemoglobin content tends to increase with the increasing income level in both the religious groups, though the differences among the three income groups are significant only among the CH.

Bio-social Factors:Their Implications in the Present Study:

As far as the present findings are concerned, it is observed that health traits, taken for the present study, are associated with some bio-social factors. It is also observed that the nutritional intakes in the present population are related to economic condition. All these associations are attributable to the variation in biological traits within the War Khasi population. Further, the quantitative aspects of health traits in the present population are different from those reported for other popula-

tions. Furthermore, it is also observed that there are inter and intra village variations with regard to body dimensions in the present population. On the bases of these findings, it is really very difficult to give a straight forward answere whether genetics or environment is more infuential in regulating the variation in health traits of the present population.

Genetic differences between the War Khasi and other populations with respect to morphological characters cannot be ignored, considering the growth performance of the War Khasi children with reference to the international and/or local standards. Moreover, our earlier findings with respect to marriage pattern in the present population (Khongsdier, 1994a) suggests that there is a strong possibility that each village and/or religious group might have possessed its own biological entity (i.e. because there is a strong tendency towards village as well as towards religious endogamy). The difference in anthropometric characters between villages of this population seems to support our earlier contention. We hope that future studies with several genetic markers will throw much more light on what we have suggested here and elsewhere(Khongsdier, 1991, 1994a).

From an environmental point of view, it may be suggested that the variation in health traits within the War Khasi population is mainly due to the difference in environmental quality like levels of dietary intake, economic inequality, etc. Our present findings on variation in adult body dimensions within the same village, or variation in health traits within the War Khasi population may have some implications in this context.

In view of the above circumstances.it seems that both genetics and environment have their respective role in bringing about human variation - either of them is sometimes more infuential or both of them are at times interacting with each other. The ways how the biological processes correspond to the interaction between genetical and environmental factors are very complex. So, whatever it may be, natural selection seems to operate on human population(s) with a different magnitude and intensity. With respect to differential fertility and mortality in the present population, it is found that selection intensity is more relaxed in the CH than in the NCH (Khongsdier, 1994b). This relaxation of selection pressure can also be seen with repect to variation in other health traits of the present population like adult body dimensions, physical growth,haemoglobin content, etc. It is observed that the higher income groups have higher values of adult body dimensions, better growth performance of children and higher haemoglobin content than the low income group. This may be due to the fact that the people in higher economic strata are having better dietary intakes, child care, sanitation and medical facilities, thereby having lower mortality rate, better growth performance, etc. In short, they are more adaptable to their environment and, as a result, selection pressure on them is more relaxed. In fact, selection is not simply a process which elimiates the trait(s), but also a process which regulates viability and well-being of individuals.

In the present study, we have dealt with limited parameters relating to nutrition and health status of the War Khasi. Of course, whatever we have presented is based on our field observations. We hope that some future studies with more parameters will throw much more light on the bio-social aspects of the War Khasi.

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