Chapter I

INTRODUCTION

Anthropology

Anthropology is the study of man in time and space. Its research and work focus on human population living in an ecological niche. It is the study of human behavior with all prospective. That exploration of what it means to be human ranges from the study of culture and social relations, to human biology and evolution, to languages, to music, art and architecture, and to vestiges of human habitation. It considers such fascinating questions as how peoples’ behavior changes over time, how people move about the world, why and how people from distant parts of the world and dissimilar cultures are different and the same, how the human species has evolved over millions of years, and how individuals understand and operate successfully in distinct cultural settings. Anthropology includes four broad fields—cultural anthropology, linguistics, physical anthropology and archaeology. Each of the four fields teaches distinctive skills, such as applying theories, employing research methodologies, formulating and testing hypotheses, and developing extensive sets of data.

Anthropologists often specialize in one or more geographic areas of the world—for example, West Africa, Latin America, the British Isles, Eastern Europe, North America and Oceania. In addition, anthropology studies focus on particular populations in a locale or region. Some
anthropologists study cultural practices, such as Pyrennes' Basques use of cooperatives in their economic system, which must be modified to fit the overarching Spanish or French legal structures. Other examples of cultural practices studied by anthropologists include marriage rituals among Scots-Irish Americans in a suburban North Carolina community, Morris dancing on May Day among southwestern English village inhabitants, and aesthetic and linguistic aspects of Trinidadian calypso and "road songs." Physical anthropologists observe biological behavior, attempting to understand ongoing human evolution and the human adaptations to particular environments, such as maternal physiological response to pregnancy, the effects of altitude on maternal and fetal well-being, perhaps performing comparative studies of physiological responses to short-term high altitude residence (e.g., Euro-Americans and African Americans in Colorado) versus longer-term high altitude residence (e.g., indigenous Quechua-speakers in Peru or Sherpas in Nepal). Historical archaeologists help preserve aspects of the recent past, such as settlement patterns in the western U.S. plains. Archaeological studies generally involve teams of specialists who work with domesticated plant remains, indicators of animal life, and the manmade artifacts produced or imported into a particular area.

Anthropologists are careful observers of human beings and their behavior, maintaining an intense curiosity: What does it mean to be human? Why do people behave in particular ways? What are the
historical and environmental pressures that helped shape the experience and behavior of a specific group of people? What are universal facts of human life?

**Physical Anthropology**

Physical or Biological anthropology a main branch of anthropology which studies physical development of the human species defined as scientific study of within and between population(s) variations. It also plays an important part in paleoanthropology which studies the human origins and evolution through fossil evidences and dating methodologies to determine matters such as time and manner. It also studies the effect of nature and environment on bipedality, forensic anthropology which studies the analysis and identification of human remains for legal purposes. It draws upon human anthropometrics by taking body measurements, human genetics which studies inheritance of diseases and human osteology studies bones and includes neuro-anthropology, the study of brain evolution, and of culture as neurological adaptation to environment.

Physical anthropologists in India have been systematically studying physical characteristics of the peoples since about the turn of this century. The data collected in these early studies provided ample evidences of enormous anthropometric variation among different Indian populations. The overt goal of most of the studies conducted until
about 1950 was typological—to classify the peoples of India into a number of “racial” types. (Risley HH, Guha BS, Sarkar SS)

It was in 1951 that S.L. Washburn laid a distinction between the pre-1951 and post-1951 physical anthropology referred as Old and New Physical Anthropology, respectively. Before 1951 physical anthropology was considered to be a descriptive study of biological parameters to an understanding of their causes. From 1951 onwards mathematical models formulated for population biology have become popular for understanding the causes of variation and co-existence of genetic traits. Thus the orientation of physical anthropology has changed from description to causes to models.

In the descriptive type of physical anthropology, G.W. Lasker has identified five major areas of interest according to which relevant techniques for investigation were devised.

1. The form of bones and teeth.
2. Determination of age and sex and ethnic group from bones and teeth.
3. Human growth and development.
4. Composition of the body and its variation.
Although in Lasker’s formulation, dermatoglyphics did not figure, it occupied an important place in physical anthropology prior to 1951. Therefore, for completing the list of the old interests, the inclusion of dermatoglyphics is imperative. Since 1951, the various dermatoglyphic traits occupied an important place in biological anthropology. But it should not be forgotten that these interests listed by Lasker are instrumental in generating a wealth of data, still valuable for accomplishing newer interests. These fields have not been discarded by biological (physical) anthropologists when the New Physical Anthropology, the result of the consanguinity between evolutionary and adaptational theory on the one hand and genetics on the other, had gained ground. With the “New Physical Anthropology”, the interests which have come to stay are:

1. Serological studies

2. Biochemical genetics especially of various polymorphic systems.

3. Studies of evolutionary factors such as mutation, natural selection and gene flow.

4. Primatological studies, of their biology and behaviour.

5. Demographic studies, especially of factors that affect inbreeding and genetic drift and the biological consequences of formal kinship and alliance systems.
6. Anthropometric and anthroposcopic studies, with reference to nutritional factors and ensuing demographic characters.

7. Ecological studies dealing with biological and cultural adaptations.

Physical anthropology has achieved new strides after Washburn’s 1951 statement. For grasping the laws and processes of human evolution, molecular evidences have been marshalled, leading to the advent of microscopic work in the area. Human cytogenetics has made an outstanding contribution towards the knowledge of adaptation and evolution. Evolution at the genic (elemental) level is that which is being sought through DNA analysis using recombinant techniques. Thus, we have come a long way from morphological studies (morphological, behavioural, anthropometric, and dermatoglyphic traits - the mode of inheritance of all these characters is still rather unclear) to those of genetic or classical markers (blood groups and protein markers), and to the newly discovered molecular techniques which have provided a new direction and a whole battery of powerful polymorphic systems to study genetic diversity (Cavalli-Sforza and Feldman 2003; Jorde and Wooding 2004). The question, what happens to genes with degradation in biotic environment, acquires a primary place. With these newer and still newer interests, different kinds of techniques have been enunciated to understand nature-nurture relationship in a better fashion. Moreover, there has been a concomitant advancement in statistical methods and we are now in a position to make use of many parameters (Collins et al.
Medical Anthropology is dedicated to publishing papers that situate the relationship between human behavior, social life, and health within an anthropological context. It provides a forum for inquiring into how knowledge, meaning, livelihood, power, and resource distribution are shaped and how, in turn, these phenomena go on to shape patterns of disease, experiences of health and illness, and the organization of treatments. We welcome papers that focus on empirical research as well as those that focus on methodological and theoretical issues. Our goal is to bring to our readership work that both exemplifies and expands ways of understanding the biological, cultural, and politico-economic dimensions of illness and healing. Medical Anthropology invites papers on a wide range of topics, including (but not limited to): the political ecology of disease; the interface of the micro- and macro-environments that affect health; the globalization of medical meanings and resources; the politics of responsibility as it relates to sickness and health care; gender and health; ethnomedical and ethnopharmaceutical systems; medical pluralism and social transformation; the moral, political, and interpersonal contexts of bodily suffering; the social meanings of disease categories and ideals of health; the cultural and historical conditions shaping medical practices and policies; the social organization of clinical interactions; the uses and effects of medical
technologies; and the commercialization and commodification of health and medicine. Papers are expected to reflect medical anthropology as a vital, emergent area of social science scholarship—one that is empirically sound; theoretically and methodologically sophisticated; and unfailingly attentive to bio-cultural, historical, and cross-cultural perspectives on health. The subject matter covered in Medical Anthropology is relevant not only to health care professionals who recognize the importance of attaining a better understanding of the socio-cultural dimensions of health, but also to any social scientist who has an interest in health-related issues.

The populations of India and other South Asian countries offer great opportunities to study socio-cultural and genetic variability. Perhaps, nowhere in the world people in a small geographic area are distributed as such a large number of ethnic, castes, religious and linguistic groups as in India and other South Asian countries. All these groups are not entirely independent; people belong concurrently to two or more of these groups. People of different groups living side by side for hundreds or even thousands of year try to retain their separate entities by practicing endogamy.

India is a multicultural country. Anthropologists are committed to grasping the dynamics of communities and populations. As anthropology combines the premises of biological as well as socio-cultural study, it looks at the diverse sections of human beings with
dual perspective, one derived from its branch called biological anthropology, and the other from social/cultural anthropology. How communities and populations continue to retain their identity, in social and cultural terms on one hand and biological on the other, and how they acquire the characteristics of the others because of cultural borrowing or interbreeding are the questions anthropologists systematically investigate.

India with about 1000 million people has the second largest population in the world and it is one of the world’s top twelve megadiversity countries and has vast diversity of human beings, fauna, flora and environmental regimes. Its present population includes stone-age foodgatherers, hunters, fisher-folk, shifting cultivators, peasant communities, subsistence agriculturists, nomadic herders, entertainers, as well as those engaged in mechanized and chemicalized agriculture, mechanized fishing, tapping offshore oil and natural gas, running atomic power plants and producing computer software. India has been peopled by human groups carrying a diversity of genes and cultural traits. We have almost all the primary ethnic strains Proto-Australoid, Mediterranean, Mongoloid, Negrito and a number of composite strains. It is a homeland of over 4000 Mendelian populations, of which 3700 endogamous groups are structured in the Hindu caste system as ‘jatis’. Outside the preview of caste system there
are a thousand odd Mendelian populations which are tribal autochthones and religious communities.

Like any other plural society, India offers a cauldron where the processes of unification as well as of fragmentalisation are unceasingly taking place. This presents a situation of cultural, biological and environmental richness and diversity, and one where the constant interactions between communities are aiding the formation of bridges, thus creating a sense of unity. It is in these terms that India offers an ideal case for examining unity in diversity both biological and socio-cultural perspectives. (Bhasin et al. 1994; Lahr and Foley 1998; Bhasin and Walter 2001; Cann 2001; Bamshad et al. 2004). In the present paper an attempt has been made to give an outline of Indian population milieu.

**Human Genetics**

Physical anthropologists have keen interest in the study of human genetics where it studies the inheritance as it occurs in human beings. It encompasses a variety of overlapping fields including: Classical genetics, cytogenetics, molecular genetics, biochemical genetics, genomics, population genetics, developmental genetics, clinical genetics, genetic counseling and so on. Genes can be the common factors of the qualities of the most human-inherited traits. Study of human genetics can be useful as it can answer questions about human nature, understanding the disease, development of
effective disease treatment and understanding the genetics of human life. Inheritance of traits by human is based upon Gregor Mendel’s model of Inheritance. He deduced that inheritance depends upon discrete units of inheritance, called factors or genes. (Nussbaum et al. 2004) When these units break down genetic disease may result, and it is often through these genetic mistakes that we are able to work out what happens in the normal situation. There are several ways in which the study of human genetics differs from that of other animals. First of all it is directly relevant to us, as individuals, as parents and as decision-makers. Secondly although experimentation in humans is limited, enormous amounts of detailed observational data are available. Most of the topics in this course relate to things we now understand because of some diseases, but much has also been learnt from 'normal' variation. We also benefit from looking at the behavior of genes and their interaction with the environment not only in cells and in individuals but also in families and in populations.

Human genetics explains the inheritance pattern occurs in human beings. It encompasses a variety of overlapping fields including classical genetics consists of technique and methodologies of genetics, cytogenetics explains the structure and function of the cell, especially the chromosomes, molecular genetics studies the structure and function of genes at molecular level, biochemical genetics involves with the molecular basis of biological activity, genomics concerning the stury
of the genomes of organisms includes intensive efforts to determine the entire DNA sequence of organisms and fine scale genetic mapping efforts, population genetics studies allele frequency distribution and change under the influence of the four main evolutionary processes like natural selection, genetic drift, mutation and geneflow, developmental genetics process by which organisms grow and develop like cell growth, differentiation and morphogenesis, clinical genetics or medical genetics is the speciality of medicine that involves the diagnosis and management of hereditary disorders, genetics of counseling is a process by which patients or relatives at risk of an inherited disorder are advised of the consequences and nature of the disorder and so on.

Inheritance of traits by human is based mostly upon the works of Gregor Mendel’s model of inheritance. He deduced that inheritance depends upon discrete units of inheritance, called factors of genes (Nussbaum 2007). Genes are a fundamental unit of inheritance. Genes can be defined as a sequence of DNA in the genome that is required for production of a functional product. Genes have both minor and major effects on human characteristics. Genes have a strong influence on human behavior and physical stature. From eye to Intelligence Quotient (IQ) are largely inheritable. Human genes have become prominent in the nature versus nurture debate.
Mainly the inheritance will occur in four basic factions:

1. **Autosomal dominant inheritance:** Autosomal traits are associated with a single gene on an autosomal (non-sex-chromosome) - they are called “dominant” because a single copy-inherited from either parent- is enough cause this trait to appear. This often means that one of the parents must also have the same trait, unless it has arisen due to a new mutation. Examples of autosomal dominant traits and disorders are Huntington’s disease, achondroplasia,

2. **Autosomal recessive inheritance:** An autosomal recessive trait is one pattern of inheritance for a trait, disease, or disorder to be passed on through families. For a recessive trait or disease to be displayed two copies of the trait or disorder needs to be presented. The trait or gene will be located on a non-sex chromosome. Because it takes two copies of a trait to display a trait, many people can unknowingly be carriers of a disease. From an evolutionary perspective, a recessive disease or trait can remain hidden for several generations before displaying the phenotype. Examples of autosomal recessive disorders are albinism, Cystic Fibrosis, Tay-Sachs disease.

3. **X-linked and Y-linked inheritance:** X-linked genes are found on the sex X chromosome. X-linked genes just like autosomal genes have both dominant and recessive types. Recessive X-linked
disorders are rarely seen in females and usually affect only males. This is because males inherit their X chromosome and all X-linked genes will be inherited from the maternal side. Fathers only pass on their Y chromosome to their sons, so no X-linked traits will be inherited from father to son. Females express X-linked disorders when they are homozygous for the disorder and become carriers when they are heterozygous. X-linked dominant inheritance will show the same phenotype as a heterozygote and homozygote. Just like X-linked inheritance, there will be a lack of male-to-male inheritance, which makes it distinguishable from autosomal traits. One example of a X-linked trait is Coffin-Lowry syndrome, which is caused by a mutation in ribosomal protein gene. This mutation results in skeletal, craniofacial abnormalities, mental retardation, and short stature. X chromosomes in females undergo a process known as X inactivation. X inactivation occurs when one of the two X chromosomes in females is almost completely inactivated. It is important that this process occurs otherwise a woman would produce twice the amount of normal X chromosome proteins. The mechanism for X inactivation will occur during the embryonic stage. For people with disorders like trisomy X, where the genotype has three X chromosomes, X-inactivation will inactivate all X chromosomes until there is only one X chromosome active. X inactivation is not only limited to females, males with Klinefelter syndrome, who have an extra X chromosome, will also undergo
X inactivation to have only one completely active X chromosome. Y-linked inheritance occurs when a gene, trait, or disorder is transferred through the Y chromosome. Since Y chromosomes can only be found in males, Y linked traits are only passed on from father to son. The testis is determining factor, which is located on the Y chromosome, determines the maleness of individuals. Besides the maleness inherited in the Y-chromosome, there are no other Y-linked characteristics.

Through the modern technologies in comparison with classical genetics there are some of the inheritable studies which have been incorporated in the human genetics those are:

1. Pedigree analysis: A pedigree is a diagram showing the ancestral relationships and transmission of genetic traits over several generations in a family; square symbols are almost always used to represent males, whilst circles are used for females. Pedigrees are used to help detect many different genetic diseases. A pedigree can also be used to help determine the chances for a parent to produce an offspring with a specific trait. Four different traits can be identified by pedigree chart analysis: autosomal dominant, autosomal recessive, x-linked, or y-linked. Partial penetrance can be shown and calculated form pedigrees. Penetrance is the percentage expressed frequency with which individuals of a given genotype manifest at least some degree of a
specific mutant phenotype associated with a trait. Inbreeding, the mating between closely related organisms of traits can clearly be seen on pedigree charts. Pedigree charts of royal families have a high degree of inbreeding, because it was customary and preferable for royalty to marry another member of royalty. Genetic counselors commonly use pedigrees to help couple determine if the parents will be able to produce healthy children.

2. Karyotype: It is a very useful tool in cytogenetics. A karyotype is a picture of all the chromosomes in the metaphase stage arranged according to length and centromere position. A karyotype can also be useful in clinical genetics, due to its ability to diagnose genetic disorders. On a normal karyotype, aneuploidy can be detected by clearly being able to observe any missing or extra chromosomes. Giemsa banding, g-bandng, of the karyotype can be used to detect deletions, insertions, duplications, inversions, and translocations. G-bandng will stain the chromosomes with light and dark bands unique to each chromosome. A FISH, fluorescent in situ hybridization, can be used to observe deletions, insertions, and translocations. FISH uses fluorescent probes to bind to specific sequences of the chromosomes that will cause the chromosomes to fluoresce a unique color (Nussbaum 2007).
3. **Population genetics:** Population genetics is the branch of evolutionary biology responsible for investigating processes that cause changes in allele and genotype frequencies in populations based upon Mendelian inheritance (Freeman 2007). Four different forces can influence the frequencies: natural selection, mutation, gene flow (migration), and genetic drift. A population can be defined as a group of interbreeding individuals and their offspring. For human genetics the populations will consist only of the human species. The Hardy-Weinberg principle is a widely used principle to determine allelic and genotype frequencies.

**Diabetes Mellitus**

It is also called as diabetes. It is a metabolic disease in which a person has high blood sugar, either because the body does not produce enough insulin or because cells do not respond to the insulin that is produced. This high blood sugar produces the classical symptoms of polyuria where frequent urination is observed, polydipsia where increased thirst and polyphagia where increased hunger is observed in humans. Mainly three types of diabetes are observed:

- **Type 1 Diabetes:** It results from the body’s failure to produce insulin and presently requires the person to inject insulin. Also referred to as insulin-dependent diabetes mellitus (IDDM) or juvenile diabetes.)
• **Type 2 Diabetes:** It results from insulin resistance, a condition in which cells fail to use insulin properly, sometimes combined with an absolute insulin deficiency. Formerly referred to as Non-Insulin-Dependent Diabetes Mellitus (NIDDM) or adult-onset diabetes.

• **Gestational Diabetes:** It is when pregnant women, who have never had diabetes before, have a high blood glucose level during pregnancy. It may precede development of type 2 DM.

Other forms of diabetes mellitus include congenital diabetes, which is due to genetic defects of insulin secretion, cystic fibrosis-related diabetes, steroid diabetes induced by high doses of glucocorticoids, and several forms of monogenic diabetes.

**Type 1 Diabetes:** It is also pronounced as Type 1 diabetes, T1DM, IDDM of juvenile diabetes. It’s a form of diabetes that results from autoimmune destruction of insulin-producing beta cells of the pancreas. The subsequent lack of insulin leads to increased blood and urine glucose. The classical symptoms are polyuria, polydipsia, polyphagia and weight loss (Cooke 2008). It’s a polygenic disease meaning many different genes contribute to its onset. Depending on locus or combination of loci, it can be dominant, recessive or somewhere in between. The strongest gene IDDM1 is located in the MHC Class II region on chromosome 6, at staining region 6p21. Certain variants of this gene increase the risk for decreased histocompatibility
characteristic of type 1. (Bluestone 2010). Several alleles of HLA-DQB1 are associated with an increased risk of developing type 1 diabetes (Todd 1990 and 1997, Redondo 2001). There are also variants that appear to be protective (Bluestone 2010). The risk of a child developing type 1 diabetes is approximately 10% if the father has it, approximately 10% if a sibling has it, approximately 4% if the mother has type 1 diabetes and is/was aged 25 or younger when the child is/was born, and approximately 1% if the mother is/was over 25 years old when the child is/was born. Some of the environmental factors can influence expression of type 1. A study showed that for identical twins, when one twin had type 1 diabetes, the other twin only had type 1 30%–50% of the time. Despite having exactly the same genome, one twin had the disease, where as the other did not; this suggests that environmental factors, in addition to genetic factors, can influence disease prevalence. Other indications of environmental influence include the presence of a 10-fold difference in difference among Caucasians living in different areas of Europe, and a tendency to acquire the incidence of the disease of the destination country for people who migrate (Knip 2005). There is a growing body of evidence that diet may play a role in the development of type 1 diabetes, through influencing gut flora, intestinal permeability, and immune function in the gut; wheat in particular has been shown to have a connection to the development of type 1 diabetes, although the relationship is poorly understood (Mikael Knip 2009).
Its incidence varies from 8-17 in one lakh in Northern Europe and U. S. with high about 35 in one lakh in Scandinavia which includes the three kingdoms of Denmark, Norway and Sweden and to a low of one in one lakh in Japan and China (Kasper 2005). It is fatal unless treated with insulin. Injection is the most common method of administering insulin along with other methods like insulin pumps and inhaled insulin. Pancreatic transplants have been used. Pancreatic islet cell transplantation is experimental through growing. Most of the people who develop type 1 Diabetes are otherwise healthy. Although the causes of type 1 Diabetes are still not fully understood and believed to be of immunological origin. Type 1 Diabetes can be distinguished from type 2 Diabetes via a C-peptide assay, which measures endogenous insulin production. The treatment must be continued indefinitely in all cases. Treatment is not intended to significantly impair normal activities and can be done adequately if sufficient patient training, awareness, appropriate care, discipline in testing and dosing of insulin is taken. However, treatment remains quite burdensome for many people. Complications may be associated with both low blood sugar and high blood sugar, both largely due to the non-physiological manner in which insulin is replaced. Low blood sugar may lead to seizures or episodes of unconsciousness and requires emergency treatment. High blood sugar may lead to increased fatigue and can also result in long term damage to organs.
**Type 2 Diabetes:** Formally it is also called as non-insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes. It’s a metabolic disorder that is characterized by high blood glucose in the context of insulin resistance and relative insulin deficiency (Kumar 2005). This type of diabetes patients require regular checkups of their blood sugar and if the condition progresses medications may be needed. Often affecting the obese. Long term complications from high blood can include increased risk of heart attacks, strokes, diabetic retinopathy where eye sight is affected and kidney failure can occur. In some extreme cases circulation of limbs is affected, potentially requiring amputation. Loss of hearing, eyesight and cognitive ability has also been linked to this condition. Apart from classical symptoms of type1 diabetes Type 2 diabetes has been associated with an increased risk of cognitive dysfunction and dementia through disease processes such as Alzheimer’s disease and vascular dementia. Researchers have shown that reduced glucose tolerance has deleterious effects on memory in the elderly, and concomitant hippocampal atrophy (Convit 2003). Although type 2 Diabetes is determined primarily by life styles and genes, dietary compositions may affect both its development and complications (Riserus 2009). A numver of lifestyle factors are known to be important to the development of type 2 diabetes. In one study, those who had high levels of physical activity, a healthy diet, did not smoke, and consumed alcohol in moderation had an 82% lower rate of diabetes. When a normal weight was included, the rate was 89% lower. In this study, a
healthy diet was defined as one high in fiber, with a high polyunsaturated to saturated fat ratio, and a lower mean glycemic index (Mozaffarian 2009). Obesity has been found to contribute to approximately 55% of cases of type 2 Diabetes and decreasing consumption of saturated fats and trans fatty acids while replacing them with unsaturated fats may decrease the risk (Riserus 2009). Dietary fat intake is linked to diabetes risk (Salmeron 2001). A 2010 meta-analysis of eleven studies involving 310,819 participants and 15,043 cases of type 2 diabetes (Malik 2010) found that "SSBs [sugar-sweetened beverages] may increase the risk of metabolic syndrome and type 2 diabetes not only through obesity but also by increasing dietary glycemic load, leading to insulin resistance, β-cell dysfunction, and inflammation." Environmental toxins may contribute to recent increases in the rate of type 2 Diabetes. A weak positive correlation has been found between the concentration in the urine of bisphenol A, a constituent of some plastics, and the incidence of type 2 Diabetes (Lang 2008). There is also strong inheritable genetic connection in type 2 Diabetes especially first degree relatives with type 2 increases risk of developing substantially. Risk for type 2 Diabetes decreased as human first began migrating around the world, implying a strong environmental component has affected the genetic-basis. There is a stronger inheritance pattern for type 2 Diabetes. Those with first-degree relatives with type 2 Diabetes have a much higher risk of developing type 2 diabetes, increasing with the number of those relatives.
Concordance among monozygotic twins is close to 100%, and about 25% of those with the disease have a family history of diabetes. Genes significantly associated with developing type 2 Diabetes, include TCF7L2, PPARG, FTO, KCNJ11, NOTCH2, WFS1, CDKAL1, IGF2BP2, SLC30A8, JAZF1, and HHEX (Lyssenko 2008, McCarthy 2010). KCNJ11 (potassium inwardly rectifying channel, subfamily J, member 11), encodes the islet ATP-sensitive potassium channel Kir6.2, and TCF7L2 (transcription factor 7-like 2) regulates proglucagon gene expression and thus the production of glucagon-like peptide-1. (Rother 2007). Moreover, obesity (which is an independent risk factor for type 2 Diabetes) is strongly inherited (Walley 2006). Various hereditary conditions may feature Diabetes, for example myotonic dystrophy and Friedreich's ataxia. Wolfram's syndrome is an autosomal recessive neurodegenerative disorder that first becomes evident in childhood. It consists of diabetes insipidus, diabetes mellitus, optic atrophy, and deafness, hence the acronym DIDMOAD (Barrett 2001). Gene expression promoted by a diet of fat and glucose, as well as high levels of inflammation related cytokines found in the obese, results in cells that "produce fewer and smaller mitochondria than is normal," and are thus prone to insulin resistance.

**Gestational Diabetes:** It is also called as gestational diabetes mellitus (GDM) a condition in which women without previously diagnosed diabetes exhibit high blood glucose levels during pregnancy (especially
during third trimester of pregnancy). It is widely accepted as a disease only in the United States, there is same question whether the condition is natural during pregnancy. Gestational diabetes is caused when the body of a pregnant woman does not secrete excess insulin required during pregnancy leading to increased blood sugar levels. It has a very few symptoms and it is most commonly diagnosed by screening during pregnancy. Diagnostic tests detect inappropriately high levels of glucose in blood samples. Gestational diabetes affects 3-10% of pregnancies, depending on the population studied, (Moore et al., 2005) so may be a natural phenomenon. As with diabetes mellitus in pregnancy in general, babies born to mothers with gestational diabetes are typically at increased risk of problems such as being large for gestational age (which may lead to delivery complications), low blood sugar, and jaundice. Gestational diabetes is a treatable condition and women who have adequate control of glucose levels can effectively decrease these risks. Most patients are treated only with diet modification and moderate exercise but some take anti-diabetic drugs, including insulin (Donovan 2010). Women treated for gestational diabetes, generally have smaller birth weight babies, leading to other problems, such as survival rate of premature and early births, particularly male babies.

**Global Scenario of Diabetes Mellitus**

Diabetes is one of the most common (with worldwide distribution) and most important metabolic diseases that is one of the leading
causes of morbidity and mortality throughout worldwide. Practically any organ system of the body can be affected by diabetes and has become a major health problem in most of the parts of the world. Long standing inadequately managed or untreated cases of diabetes lead to complications which cause blindness, end stage renal disease, increase risk for stroke, ischemic heart disease, peripheral vascular disease, peripheral neuropathy, lower extremity amputations due to involvement of foot etc. The World Health Organization has already declared that diabetes has reached epidemic proportions, as number of diabetes patients or prevalence has gone up dramatically over last few decades, from only 30 millions in 1985 to 135 millions in 1995, 177 millions in 2000 and more than 200 millions by 2010 and World Health Organization (WHO) estimates by current trend that by 2025 the number of diabetes patients will be more than 300 millions. The increase in number of diabetes patients will be mainly in developing countries such as India, China and other highly populated developing countries. Although the prevalence of type-1 diabetes as well as type-2 diabetes is increasing worldwide, the rise of type-2 diabetes is occurring much faster than type-1 diabetes, may be because of increasing obesity and sedentary lifestyle (reduced activity levels) as countries become more industrialized.

According to the Centers for Disease Control and Prevention (CDC), the prevalence rate of diabetes in United States was approximately 7% of the population or more than 20 millions; in 2005
(approximately 30% of individuals with diabetes do not know they have diabetes). CDC also estimated that the prevalence of diabetes among individuals below 20 years was 0.22%, 9.6% among individuals above 20 years of age and 20.9% among individuals above 60 years of age. The prevalence of diabetes among men and women was not significantly different. The prevalence of type-1 diabetes and type-2 diabetes has considerable geographic variation. Scandinavian countries have the highest incidence of type-1 diabetes e.g. in Finland, the incidence is 35/100,000 per year and Pacific Rim has lowest rate type-1 diabetes e.g. in Japan and China, the incidence is 1–3/100,000 per year). North Europe and North America have intermediate rate (8–17/100,000 per year) of type-1 diabetes. Prevalence of type-2 diabetes and IGT (impaired glucose tolerance, which is prediabetic state), is highest in certain Pacific islands, intermediate in India and the United States, and low in Russia, which may be due to genetic, behavioral, and environmental factors. Prevalence of diabetes can also vary among different ethnic populations within a given country or geographical area, e.g. in the United States according to CDC estimate in 2005, among individuals of age above 20 years of age, the prevalence was 13.3% in African Americans, 9.5% in Latinos, 15.1% in Native Americans (American Indians and Alaska natives), and 8.7% in non-Hispanic whites and Asian-American or Pacific-Islander ethnic groups in Hawaii have twice the risk of diabetes compared to non-Hispanic whites.
Indian Scenario of Diabetes

India already has the largest number of diabetes patients in the world and the number is only going up steadily, although in terms of total population it is second to China. Hence many experts term India as “diabetes capital” of the world.

At present there are more than 20 million diabetic patients in India, which is estimated to go up to more than 55 millions by 2025. Among the Indians migrated to Europe and United States, the prevalence of diabetes and insulin resistance (which is considered pre-diabetic state) is very high, compared to local population. In 1970s the prevalence of diabetes was approximately 2% among urban populations in India, but at present the prevalence is more than 12%. A recent study conducted in 6 different cities supports the prevalence rate, which shows very high prevalence in Chennai (13.5%), Bangalore (12.4%), Hyderabad (16.6%), Mumbai (9.3%), Delhi (11.6%) and Kolkata (11.7%). In the last two decades there is a marked increase in the prevalence of diabetes among Indians, especially in urban areas. Among rural and semi urban areas there is increase in prevalence of diabetes, but the increase is slower. The reason for dramatic increase in prevalence of diabetes has been attributed to 1. Lifestyle change due to modernization and industrialization. 2. Ageing of population. 3. Lower birth weight. Statistics have shown that more than 25% of the children born in India are of low birth weight. Low birth weight with stunting growth and muscle wasting which is followed by overweight
and obesity in later life have been postulated to contribute to diabetes and the insulin resistance syndrome. In India the prevalence of diabetes is the highest among affluent class, unlike in developed countries where the prevalence is highest in low socioeconomic class. The difference in prevalence among different socioeconomic classes is due to difference in the stage of epidemiological transition between India (and other developing countries) and developed countries.

All forms of diabetes have been treatable since insulin became available in 1921, and type 2 Diabetes may be controlled with medications. Both type 1 and 2 are chronic conditions that usually cannot be cured. Pancreas transplants have been tried with limited success in type 1 DM; gastric bypass surgery has been successful in many with morbid obesity and type 2 DM. Gestational diabetes usually resolves after delivery. Diabetes without proper treatments can cause many complications. Acute complications include hypoglycemia, diabetic ketoacidosis, or nonketotic hyperosmolar coma. Serious long-term complications include cardiovascular disease, chronic renal failure and retinal damage. Adequate treatment of diabetes is thus important, as well as blood pressure control and lifestyle factors such as smoking cessation and maintaining a healthy body weight.

As on 2000 at least 171 million people worldwide suffer from diabetes, or 2.8% of the population (Wild S 2004). Type 2 Diabetes is by far the most common, affecting 90 to 95% of the U.S. diabetes population.
Aims and Objectives of the study

The main aim of this research is to find more prevalence of world populations "by integrating genetic knowledge, derived by applying the techniques for studying diabetes, with knowledge of history and anthropology ".

- Identify the scenario and burden of diabetes in the Bellary district with urban and rural populations through family studies. The comprehensive clinical analysis would provide useful insights for accurate diagnosis of persons with diabetics (PWD) for further investing in the Indian populations.

- Identify various cut-off values of anthropometric measurements on abdomen, chest, upper arm, Calf, and comparison of different skin fold measurement through various anthropometric measurements for Diabetes Mellitus.