CHAPTER-I

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"In nature's infinite book of secrecy, a little I can read."
- (W. Shakespeare, Anthony and Cleopatra)

Problem of study:

Peace, happiness, and health are the three prime goals of all human beings. These in turn, give them strength, stamina, achievements, and status in society. Attainment of material and spiritual success of human beings can not be realized if their basic or biological needs including eating, drinking, excreting etc are not accomplished. Food and drink have been basic to our existence. Although food and drink are unequivocally essential for our physical survival, we do not always regard food and drink in terms of provider of energy for the sustenance of our physical body alone. In fact, food and drink convey many meanings, and help us in meeting a number of personal, social, economic, and cultural needs. Therefore, the meaning and definition of food and drink are contextual, temporal and culture specific. At the ideological level, every society or culture has its own belief, notion, attitude, knowledge, taste and perception about food and non-food, drink and non-drink, sacred food and polluted food, superior drink and inferior drink etc, which are rooted in the framework of cultural logic of specific society or community. Similarly, at the manifestational or operational level, different societies have their institutional mechanisms that help the members of the society in meeting food and drink needs in accordance with their ideological framework and material resources.
In the accomplishment of production, distribution and consumption of food and drink, the social, economic, political institutions of communities weld to function as integrative socio-cultural system within the given ecological milieu.

Alcohol is a generic term used for many different chemical compounds. The type of alcohol consumed by humans is 'ethyl alcohol' or 'ethanol'. According to Oxford Advanced Learners' Dictionary, “alcohol includes drinks of different kinds that make people drunk.” It is an organic product, whose concentration differs from one drink to another. The place of alcohol in society as an artefact has been of much interest to many scholars. When one attempts to understand the interactive dimensions of alcohol and human behaviour, it is observed that studies on alcohol are not only confined to practitioners of hard sciences, but also to scholars of social and behavioural sciences too. Anthropologists have been known for their expertise in the study of primitive and pre-literate societies, in which preparation and drinking of alcoholic beverages constitute an important and inalienable component of their socio-cultural traditions and customs.

The ethnographic writings on the social, cultural, economic and behavioural aspects associated with alcohol preparation and use as observed and encoded by several scholars, led to laying the foundation for the development of distinctive perspective on drinking. The anthropological perspective as what Heath (1987) stated is to look into wide range of interconnected socio-cultural realms that are linked to drinking of alcoholic beverages. Mary Douglas (1987) stated that anthropologists have a frankly different focus on alcohol. She stated that enriched by felicitous bi-product of field research of ethnographers, anthropologists do not necessarily treat it as a problem, while other scholars especially sociologists and medical scientists working on drinking habits of people have regarded the effects of alcohol drinking as serious social and health problems.
Anthropologists do not consider drinking leads to serious social problem in indigenous tribal communities and alcoholism seems to be virtually absent in many societies where drunknessness is frequent, highly esteemed and actively sought (Heath, 1975). They set out purposefully to change the assumptions of other writers on alcohol. The present study of Bondo-Highlander is of similar kind, as the people prepare and consume different types of alcoholic beverages throughout the year. To them, alcoholic beverages serve many functions in their social, cultural, economic, and political life. It is a well-known fact that the place of alcohol is an integral part of life and cultures of Bondo-Highlanders and no social and cultural activities seem to carry relevance without alcohol. This practice of preparation and consumption of indigenous alcoholic beverages is continuing since ages. What is most surprising is that not withstanding intake of alcoholic beverages very regularly throughout the year; the community members are not found complaining any critical symptom of alcoholic dependence or alcoholism as observed in other tribal communities of India. The oblivious inquisitiveness for any researcher is to search for the multiple factors playing their respective roles in protecting and /or preventing the population from the ill effect of alcoholic dependence or alcoholism. In the present context, the Bondo are culturally a unique, ancient, primitive tribal community of Orissa who are known for the formidable reputation as an aggressive and homicidal population addicted to alcohol. Therefore, The genesis of the present study lies in unfolding the association of genetical, socio-cultural and environmental factors which are associated with the institutions of alcohol drinking and in understanding the role of bio-cultural factors as mechanism of adaptation of the Bondo that continue to protect them from adverse effects of alcoholism. The study has been carried out keeping in view three interconnected domains i.e. a) anthropological (socio-cultural), b) genetical, and c) environmental that have strong bearing on alcohol and culture of drinking alcohols and its outcome.
Two operational categories of individuals or populations may be defined based on drinking habits

a) Alcohol consumers or drinkers,
b) Perpetual drinkers or fully alcoholic dependent.

From methodological point of view, the target population should be clearly defined whether it is alcohol consumer or alcohol dependent. Alcohol dependency is defined as a condition that includes four symptoms such as Craving, Impaired control, Physical dependency, Tolerance. The details of alcoholism related clinical terminologies are mentioned in appendix – 3. However, alcohol consumers are those individuals who drink alcohol but are not totally dependent on alcohol or addicted to alcohol.

Perspectives on Alcohol Studies

Studies on alcohol and alcohol related issues have been trans-disciplinary in character. There has been wide range of activities in this field since seventies and a vast repertoire of literature has been accumulated from perspectives and concerns of several disciplines: natural, biological and social, psychological etc. Of many treatises so far written on alcohol, the publication of the five-volume encyclopaedia “The biology of alcoholism” is a landmark treasure of knowledge on alcohol related issues. The book combines an ambitious multi-disciplinary review of the ‘nature –nurture’ controversy over alcoholism with a detailed focus on practical relevance of trans-cultural understanding of the problem for preventive and arresting ill effects of alcoholism grappling large chunk of human populations of the world.

Anthropological perspective (socio-cultural) on alcohol seems to be quite distinct and interesting too in that it pays attention to the primacy of socio-cultural factors in determining both drinking patterns and their consequences legitimising alcohol as an artefact. What is interesting is that major findings of cross-cultural studies on alcohol have stated that alcohol related problems are rare, even where drinking is customary and drunkenness is commonplace.
Even in the United States of America alcohol, inducing problems were shown to have seen only in less than 10% of population who are drinkers. The common view of racial/ethnic vulnerability to alcohol drinking was challenged. Anthropologists did not easily accept even the most pervasive notion that alcohol leads to anomie. This observation surprises non-anthropologists especially medical doctors and clinicians who have vociferously claimed and paid much attention to pathological consequences of drinking in terms of outbreak of morbidity, economic loss, family conflicts, social disruption etc in several developed western and industrialised societies. The essence of anthropological approach with strong ethnographic evidence is to understand the patterns of cross cultural variation in human beliefs and behaviours with respect to drinking of alcoholic beverages and to float the basic realisation that the effects of alcohol use are mediated by cultural factors than chemical, biological, or other pharmaco-physiological factors. Dwight B. Heath and A. M. Cooper (1981) made a brilliant review of anthropologically founded studies on alcohol developed between 1970 and 1980 and have shown that studies on alcohol have been highlighted in research perspectives of several related disciplines such as prehistory, ethnicity, non-literate studies, cross-cultural studies, human biology, cultural anthropology etc. With the rapid revolution in molecular biology and more particularly with the sequencing of entire human genome, biological or genetic factors contributing to reinforcement of protection against alcoholism have began to be realised in many societies. These new knowledge or insights have created renewed interests among biological anthropologists to study anthropology of food and drink from bio-cultural interface point of view, which was grossly lacking in the researches prior to 1990s. Mary Douglas in her article “A distinctive anthropological perspective” clearly stated that, “The general tenor anthropological perspective is that celebration is normal and that in most cultures alcohol is a normal adjunct to celebration.”
Drinking is essentially a social act, performed in a recognized social context. If the focus is to be on alcohol abuse, then the anthropologists' work suggests that the most effective way of controlling it will be through socialization. In an ideal comparative program in which anthropologists and medical researchers collaborate, the former would provide systematic analysis of the quantity and incidence of rules governing drinking. The comparative project would involve comparing degrees of alcohol imbibed by an average individual against the local pattern of rules about where, when, and what to drink, and in whose company.

The following review sheds light on several major dimensions of alcoholic studies and attempts are made to show how each discipline has its own theoretical and methodological vintage point in analysing of alcoholic habits and related behaviour observed in different human societies.

Prehistoric and historic dimension:

The evidence of consumption of alcohol is known from prehistoric times. After the introduction of agriculture during 10,000 to 5,000 BC, alcohol production possibly came into effect by a fermentation of barley, ferny, milk etc. by various populations. Allchin (1971) suggests that the true home of distillation is the Indian subcontinent, and what is now Pakistan in particular. Archaeological evidence now indicates that drinks were in regular use in this region in 500 BC and the use of distillation for the production of medicines, rather than beverage alcohol, is undoubtedly much older. The early Indian production of distilled spirits was probably a radical technological development from the fermentation process. There is considerable documentary evidence of the fermentation of sugar cane juice, grapes, and rice dating back to 1200 BC. During that period, people consumed a drink known as soma. This has been convincingly demonstrated by Wasson (1969) to have been made from the Fly-Agarics mushroom, Amanita muscaria, and would, therefore have had deeply intoxicating properties.
What Allchin and others writing on the subject seem to miss, however, is that references to soma date back to even earlier times. The Hindu Law of Manu, for example, which was written in about 1500 BC, contains far more references to soma than does the much later, and much better known, the Bhagavad-Gita. The first recipe the ‘Sumerian tablets’ noted earlier contains the world’s first recorded recipe - not for bread or other ‘staples’ of life - but for an alcoholic beverage. The production of beer is described, as we would expect, with reference to Mesopotamian myths. In this case, the story is of Enki, the third-ranked God of the Sumerian pantheon who prepares a feast for his father, Enhil. A second recipe, from a slightly later period, is in the form of a prayer to Ninkasi, the goddess of beer. Her name translates literally as “the lady who fills the Mouth”. We also find documentary evidence from this period of beer rations distributed to workers in the Sumerian palaces - each receiving about a litre per day. Similarly, recovered artefacts such as goblets and drinking straws, through which the unfiltered beer was drunk, testify to the commonplace nature of alcoholic beverage at this time. Katz and Voigt (1986) concluded that beer was an important food that was integrated into the mythology, religion, and economy of the Sumerians. These, and other, accounts from archaeologists and scholars of ancient history are fascinating and give insights into the role of alcohol and drinking traditions. More importantly, however, they also raise issues to do with the original purpose of grain growing itself among the Neolithic predecessors of the Sumerians. The question was whether grain grown primarily for making bread, with beer being simply a by-product, or was the production of an alcoholic beverage the main driving force behind this major shift towards stable agriculture. Historical studies on alcohol in Europe and the United States have often stressed the emergence of movements for temperance and prohibition (Engelmann, 1979; Harrison, 1971; Blocker, 1979; West, 1979; Rorabaugh, 1979; Pinson, 1980).
Hudson's (1979) anthology on the "Black drinks" and Waddell's survey on alcoholic behaviours of aboriginal south-west are worth mentioning in this context. Pan's (1975) critical analysis of the literature on colonial Africa and Marshall's (1975, 76) interpretation of the process of alcohol in Micronesia is exemplary documents on introduction of alcohol in several countries. The glimpses of Indian sculpture depicting alcohol consumption are represented in figure – 1.1.

![Drinking Couple - Sanchi Stupa](image)

**Fig. 1.1: Drinking Couple - Sanchi Stupa**

Physiological dimension:

Alcohol is chemically known as ethanol. The effects of ethanol on bodily functions such as brain, heart, and liver are dependent on concentration of ethanol over time and pharmacokinetics of enzymes involved in the metabolism. The pharmacokinetics of ethanol is mediated through three processes: a) Ethanol absorption in the small intestine [rate of rise of blood alcohol concentration (BAC)] b) distribution of ethanol in body water c) elimination of ethanol from the body through metabolic processes that occur in liver first to acetaldehyde and then to acetate.
Most of the metabolism of alcohol and aldehyde is carried out in the liver, although extra-hepatic metabolism has also been demonstrated in the stomach, gut and upper aero-digestive tract (Wight and Ogden, 1998) including some potential metabolism due to oral micro flora in the oral cavity (Homann et al. 1997, 2000 and Muto et al. 2000). Ethanol elimination occurs mostly by the action of enzyme alcohol dehydrogenase (ADH) (Eriksson et al. 2001) and aldehyde dehydrogenase (ALDH) systems via oxidation of ethanol to acetaldehyde and acetic acid (Bosron and Li 1986). Pawan (1972) clearly sketched the pathways of alcohol metabolism in man (Fig. 1.2).

**Fig. 1.2: Pathways of alcohol (ethanol) metabolism in man.**

ADH: Alcohol Dehydrogenase; MEOS: Microsomal Ethanol Oxidizing System; SER, Smooth Endoplasmic Reticulum.

It is well recognized that the primary alcohol or ethanol is absorbed with out much change along the whole length of the digestive tract. Absorption takes place rapidly from the stomach (about 20%), and most rapidly from the small gut (about 80%).
The rate of absorption after drinking is affected by several factors: for example, the volume, the concentration (10 - 20% solutions are most rapidly absorbed) and the nature of the alcoholic drink, the presence or absence of food in the stomach, the rate of gastric emptying, the permeability of the gastric and intestinal tissues, and individual variations. After absorption into the blood stream, alcohol is distributed quickly throughout the total body water (Pawan 1972).

Epidemiology of Alcoholism:

Consumption of alcohol is viewed differently in different societies according to their cultural norms. The use of alcohol is contextual. It is used as food because of its vitamin and mineral content. It is used as a stimulant and a means of entertainment and leisure time activity. Alcohol consumption or alcohol habits is about how much a person drinks at some particular time or period where as alcohol dependence is more about the effects that alcohol has or had in the person, their behaviour, their neurophysiology and their relationship with other people. Several scholars have tried to differentiate between alcohol consumption and alcohol dependency based on nature- nurture study. Alcoholism is thought to be a multifactorial disease with complex mode of inheritance in addition to the influence of psychological and social factors (WHO 1993). As per the definition proposed by National Council on Alcoholism and Drug Dependence (NACDD) and the American Society of Addiction Medicine (ASAM), alcoholism is a primary, chronic disease with genetic, psychosocial, and environmental factors influencing its development and manifestations. The disease is often progressive and fatal. It affects so many vital organs of our body like liver and heart. It is characterized by continuous or periodic impaired control over drinking, pre-occupation with the drug alcohol, use of alcohol despite adverse consequences, and distortions in thinking, most notably denial.
Alcohol addiction is a common and complex disorder; many other traits that are associated with the risk for alcoholism also cluster in families and have genetic underpinnings. Addictions are psychiatric disorders that are associated with maladaptive and destructive behaviours, and that have in common with the persistent, compulsive, and uncontrolled use of alcohols. Addictive agents induce adaptive changes in brain function. These changes are the bases for tolerance and for the establishment of craving, withdrawal and affective disturbance, which persist long after consumption ceases (Roberts and Koob 1997). This self-maintaining and progressive neurobiology of addictions makes them chronic and relapsing disorders.

The alcohol addiction is a worldwide public-health crisis, and exerts corrosive effects on family and communities, leading even to the narco-political and narco-economic domination of countries and religions (WHO, 1983). World Health Organization in the year 1983 declared Alcohol related problems as major health problems, which are responsible for 3.5% of disability, adjusted life years (DALYs) lost globally (Murray and Lopez 1996). Alcohol affects all aspects of human life and causes hazards to health and welfare. Heavy alcohol reduces life expectancy by 10 – 12 years besides affecting productivity in developed and developing nations (Grant 1985).

Alcohol as a disease agent causes acute and chronic intoxication, cirrhosis of liver, toxic psychosis, gastritis, pancreatitis, cardiac myopathy, and peripheral neuropathy. Also mounting is the evidence that it is related to cancers of mouth, pharynx, larynx, and oesophagus. Alcohol is an important etiological factor in suicide, accidents, social, and family disorganization, crime and loss of productivity. Increasing percentage of young people has started drinking alcohol in increased frequency and quantity thus constituting serious hazards to health, welfare, and life (WHO, 1980).
The World Health Organization (WHO) estimated that there are two billion alcohol users (WHO-Global Status Report on alcohol, 2004: http://www.who.int/substance_abuse/publications/en/global_status_report_2004_overview.pdf). Alcohol related disorders affect 5 - 10 per cent of the world's population each year. According to the 1993 World Development Report, this accounted for 2 per cent of the global burden of disease (World Bank, 1993). Alcoholism until lately has largely been perceived as a male problem and alcohol research has, as a result, been androcentric and insensitive to the gender implications of alcohol use. Recent research has however established that even though less women drink alcohol than men, the biomedical and other consequences of women's alcohol use may be greater than their male counterpart. Also gender and gender roles (social expectations about how men and women should behave) differentially affect the drinking behaviour of women and men. While in some "wet" cultures like that in the United States of America, 60 per cent of all women drink alcohol, as opposed to 70 per cent of the men (Wilsnack et al, 1994), the comparative figures are significantly lower in a "dry" culture like India. Although India is known to be a 'dry' culture, alcohol use in some form has always existed in the country. Cultural attitudes towards alcohol use in India have been and continue to be highly ambivalent. "Sternly negative and prohibitive attitudes coexist with attitudes actually idealizing intoxication", and as a result, the use of alcohol has never become integrated into normal everyday life (Lal, 1978).
Situational Analysis of Alcohol in India: A country profile – India since centuries is known for production and consumption of different varieties of alcohol. Ancient India had the wisdom and knowledge of how to prepare beverages, but never encouraged its use as a virtue for most of its people. The available literature suggests that alcohol use did not pose a formidable health and social problem in ancient and medieval India (Singh and Lal, 1979; Mohan, 1990; Sharma, 1966).

The colonial period of 200 years witnessed a slow but steady rise in alcohol consumption, with significant change in the type of beverages consumed the pattern of drinking and social attitude towards alcohol consumption. The colonial administration apart from giving licenses to big distilleries, allowed local production of liquor. It may be stated that India’s struggle for freedom was nonetheless accompanied by demands voiced by the nationalists for prohibition of alcohol. Independent India introduced the Constitutional measures for the prohibition of alcohol. Article 47 of the Constitution of India [PART IV: DIRECTIVE PRINCIPLES OF STATE POLICY - Art.47: Duty of the State to raise the level of nutrition and the standard of living and to improve public health: The State shall regard the raising of the level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties and, in particular, the State shall endeavour to bring about prohibition of the consumption except for medicinal purposes of intoxicating drinks and of drugs which are injurious to health.], reads that ‘the state shall endeavour to bring about prohibition of the consumption of liquor except medicinal purposes of intoxicant drinks and drugs which are injurious to health. However, the reality is just the reverse. Production and sale of alcoholic beverages of different kinds have been encouraged ignoring Constitutional measures on the plank of generation of revenue. Although govt of India and State Govts has been, enforcing legal measures to restrict alcohol consumption and alcohol related social and health problems, the fact remains that preventive measures against alcoholism in India are more a slogan than an achievable reality.
It is not an exaggeration that India is known for producing and consuming more than hundred kinds of alcoholic beverages which could be grouped into four types i.e., a) India-made foreign liquor, b) country liquor, c) Illicit liquor, d) Beer. What is surprising is that a good deal of alcohol is produced illegally which have been found to have resulted in mortality in poor and lower economic class of India. Saxena (2004) estimated that per capita consumption is approximately 1.2 litters, which is very less as compared to figures from developed countries. Thus, India is viewed as having a population of fewer drinkers with a minority of heavy drinkers, a majority of abstainers. Rahman (2002) in a paper on Alcohol Prohibition and Addictive Consumption in India analysed a dataset compiled from 13 rounds of the National Sample Survey of India (NSS) between 1983-2000. The survey showed that approximately 11.7% of the sample reported consuming some form of alcohol. Arrack was the most widely consumed form of liquor although in the Southern States (Andhra Pradesh in particular) the quantity of toddy consumed was also high. 71% of the total sample reporting alcohol consumption in the last 30 days consumed arrack; the corresponding figure for toddy is 20% and 10% for Indian Made Foreign Liquor (IMFL). However, the consumption of IMFL has been steadily increasing, and in some states consumption IMFL is higher than the consumption of toddy. Beer and wine have the least coverage and is consumed mainly in urban areas - only 3% of the alcohol-consuming samples in rural areas report beer consumption.

It is a matter of great astonishment that no nation wide systematic epidemiological survey has been conducted on alcohol use.
However, relatively smaller number of studies focusing on several aspects of alcohol use have generated some interesting findings, which are summarised below:

a) Prevalence of alcoholism varies across states and populations with variable manifestation of mental disorders.

b) The figures for prevalence of alcoholic drinks show considerable variation across different regions of the country. Lower economic class shows higher prevalence rate. Rural-urban dichotomy is reflected in terms of consumption of alcohol. The prevalence rate is much greater in males than in females.

c) Clinical data suggest that more young people now indulge in heavy drinking than before. The prevalence of alcohol dependence may lie at 1% to 2% of adult population of India.

d) The table given below presents a bird’s eye view of problems that different populations face because of alcoholism.

Drinking prevalence, mortality, and morbidity from alcohol use in South-East Asia Region and some parts of India is furnished in Table 1.1.
Table 1.1: Drinking prevalence, mortality, and morbidity from alcohol use in South-East Asia Region and some parts of India

<table>
<thead>
<tr>
<th>Country</th>
<th>Parts of country or population</th>
<th>Prevalence rate</th>
<th>Alcohol dependency rate</th>
<th>Mortality</th>
<th>Morbidity due to alcohol consumption</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td></td>
<td>16.7%</td>
<td>1%</td>
<td>11.5%</td>
<td>16% liver cirrhosis, 1.43% cancer, 25% accident, 10% suicide</td>
<td>Saxena 2004, WHO 2004</td>
</tr>
<tr>
<td>India</td>
<td>Arunachal Pradesh</td>
<td>50.2%</td>
<td></td>
<td></td>
<td></td>
<td>Deswal et al. 2006</td>
</tr>
<tr>
<td>India</td>
<td>Goa</td>
<td>49%</td>
<td></td>
<td></td>
<td></td>
<td>Dhupadale et al. 2006</td>
</tr>
<tr>
<td>India</td>
<td>Andhra Pradesh</td>
<td>21%</td>
<td></td>
<td></td>
<td></td>
<td>WHO 2004</td>
</tr>
<tr>
<td>India</td>
<td>Rural Punjab</td>
<td>74%</td>
<td></td>
<td></td>
<td></td>
<td>Deb and Jindal 1975</td>
</tr>
<tr>
<td>India</td>
<td>Northern India</td>
<td>60%</td>
<td></td>
<td></td>
<td></td>
<td>Varma et al. 1980</td>
</tr>
<tr>
<td>India</td>
<td>Western India</td>
<td>24.7%</td>
<td>3%</td>
<td></td>
<td></td>
<td>Sundaram et al. 1984</td>
</tr>
<tr>
<td>India</td>
<td>Southern India</td>
<td>26%</td>
<td>50%</td>
<td></td>
<td></td>
<td>Chakravarthy 1990, Bang and Bang 1991</td>
</tr>
<tr>
<td>India</td>
<td>Delhi</td>
<td>26%</td>
<td></td>
<td></td>
<td></td>
<td>Mohan et al. 1992</td>
</tr>
<tr>
<td>Bangladesh</td>
<td></td>
<td>0.2%</td>
<td>20%</td>
<td></td>
<td></td>
<td>WHO 2004</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Balinese and Jakarta populations</td>
<td>40%</td>
<td>2.7%</td>
<td></td>
<td></td>
<td>WHO 2004</td>
</tr>
<tr>
<td>Myanmar</td>
<td></td>
<td>10%</td>
<td>10%</td>
<td>~10%</td>
<td></td>
<td>WHO 2004</td>
</tr>
<tr>
<td>Nepal</td>
<td></td>
<td>~8%</td>
<td></td>
<td></td>
<td></td>
<td>WHO 2004</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td></td>
<td>25%</td>
<td>34%</td>
<td>6%</td>
<td>0.12% liver cirrhosis, 0.6 Cancer</td>
<td>WHO 2004</td>
</tr>
<tr>
<td>Thailand</td>
<td></td>
<td>31.4%</td>
<td></td>
<td>4.7%</td>
<td></td>
<td>WHO 2004</td>
</tr>
</tbody>
</table>

(Source: Nayak et al., 2008; *Int J Hum Genet*, 8(1-2): 181-197)
Genetical Dimension:

Alcoholism is known to be multifactorial, polygenic disorder involving gene-with-gene and gene-with-environment interactions. Recently, with the unfolding of human genome it has been possible on the part of researchers to identify the roles of a host of factors contributing to onset of multifactorial diseases such as diabetics, hypertension, cardiovascular diseases, alcoholism etc. Addiction to alcohol or alcohol dependences is a disease for which, several candidate genes in metabolic and neurological pathways have been mapped. The genetic basis of alcoholism is well known. The elucidation of effects of genes would be beneficial for at least three reasons: 1) It would lead to identify some individuals at increased risk and could provide information about systems involved in the health consequences of alcohol dependence. 2) It may help us to understand the role of environmental factors in the development of alcoholism 3) It may help to develop personalized drugs or therapy for treatment of alcoholics. Findings from the human genome project, and large investments in biotechnology, have strengthened the belief of scientists and the public in realizing this goal in the near future (Weiland 2000).

Alcoholism is categorized into three types: type-I, II, and III. Cloninger (1990) distinguished type-I of alcoholism (low novelty seeking, high harm avoidance, high reward dependence) from type-II (male-limited) alcoholism (high novelty seeking, low harm avoidance, low reward dependence). Hill (1992) proposed a third type of alcoholism. Like type-II alcoholism, it is significantly influenced by genetic factors, but is not associated with any abnormal behaviour. Family, adoptee, and twin-based studies in relation to alcoholism revealed the role of hereditary factors as important determinants of alcoholism. Genetics and pharmacokinetics of alcohol determine variations of alcohol metabolism among alcohol users and therefore, influence alcohol drinking behaviour and induce risk of alcoholism.
Genetic studies utilizing twin and family approaches have clearly shown considerable role of genetic factors in alcohol dependence, albeit only few gene variants have been identified unambiguously (Stoltenberg and Burmeister 2000 and Nestler 2000). The result of family, twin and adoption studies suggest a significant genetic predisposition to the disease. Identifying novel genetic risk factors for common diseases is a global challenge in the post genomic era. Risk for alcohol dependence is likely to be the result of a large number of genes, each contributing a small fraction to the overall risk. The problem of genetic heterogeneity has been overcome in other areas of medicine and thus we are optimistic that this will also be true for investigations of alcohol dependence (Stoltenberg and Burmeister 2000; Wahlsten 1999; and Crabbe 2002). Recent molecular genetic researches carried out to identify potential causes of alcoholism have successfully identified several genes encoding the acetaldehyde metabolising enzymes that play major role in alcohol metabolism. Functional polymorphisms have been observed at various sites of genes encoding these enzyme proteins that act as one of the biological determinants significantly influencing drinking behaviour and the development of alcoholism and alcohol-induced organ damage. The most important pathways for ethanol metabolism in the body involve two reactions and two enzymes catalysing these two reactions. In the first reaction, ethanol is converted to acetaldehyde by the action of alcohol dehydrogenase enzyme (ADH) and in the second reaction, acetaldehyde is oxidised by enzyme aldehyde dehydrogenase (ALDH) to acetic acid. There are gene families for ADH and ALDH genes, which encode these two enzymes.
The main pathway of ethanol metabolism occurs by alcohol dehydrogenase (ADH) oxidizing ethanol to acetaldehyde, and aldehyde dehydrogenase (ALDH) converting acetaldehyde to acetate is given below.

Ethanol \[\rightarrow\] Acetaldehyde \[\rightarrow\] Acetate

\[
\begin{align*}
\text{CH}_3\text{CH}_2\text{OH} & \rightarrow \text{CH}_3\text{CHO} \rightarrow \text{CH}_3\text{CHOOH} \\
\text{Gene families'} & \uparrow & \uparrow \\
\text{Involved} & \text{ADH} & \text{ALDH}
\end{align*}
\]

There are seven ADH genes exist on a cluster extending \(-380\) kb on the long arm of chromosome 4 (i.e. \(4q21-23\)) and 17 ALDH genes located on the long arm of chromosome 12. However, the legacy of alcoholism among certain ethnic groups suggests that genetic factors can increase an individual’s vulnerability for this disease. The following description provides an insight with respect to our understanding of genetics of alcoholism, which is based on evidences, accrued from different types of genetic studies.

1) **Family Studies:** Alcoholism was regarded as a distinct disease that may be transmitted from generation to generation (Dawson and Archer 1992). A familial association could result from cultural factors tending to encourage heavy drinking in family members. On the other hand, drinking may be discouraged in some families for religious, cultural, or climatic grounds while in other families constraints on heavy drinking may be virtually non-existent. So “familial” does not necessarily mean “hereditary”. A critical review of studies of the familial incidence of alcoholism summarized 39 investigations published in English that comprised family data on 6,251 alcoholics and 4,083 non-alcoholics (Cotton 1979).
They clearly showed that regardless of the nature of the population of non-alcoholics studied, an alcoholic is more likely to have a mother, father, or a distant relative who is an alcoholic. When lifetime prevalence of alcoholism in relatives of alcoholics was compared to that in the general population, a four-fold increased risk in first-degree relatives and a two-fold increased risk in second-degree relatives were observed. Higher family incidence of alcohol use and abuse does not necessarily reflect a genetic determination of alcoholism. Heritable familial attributes as well as similarities in social environment of family members also appear to play a role in familial transmission of alcoholism.

2) **Twin Studies:** The twin study paradigm is a powerful method to understand the heredity of complex and heterogeneous trait disorders. Twin studies are because monozygotic twins (MZ) share identical genetic material, while dizygotic twins (DZ) share the same degree of genetic similarity as non-twin siblings. If genetic effects are present, then monozygotic twins should be more alike than dizygotic twins allowing an estimation of the genetic contribution. Differences between identical twins would presumably reflect environmental influences while differences between non-identical twins may be due to heredity, environment, or both (Agarwal 2001). Therefore, if alcoholism has a hereditary basis, MZ twin pairs should tend to be more similar in their drinking behaviour and alcohol-related problems than DZ twin pairs (Pickens et al. 1991). It has been clearly demonstrated that both genetic and environmental factors influence alcohol dependence (Heath et al. 1999). These studies examine traits that are not inherited in a Mendelian fashion, but show non-random familial distributions indicating genetic contributions (Vanyukov and Tarter 2000; and Jacob et al. 2001). Twin studies strongly indicate the presence of genetic risk factors for multiple aspects of alcohol dependence including initiation, contribution, amount consumed, and cessation.
In addition to estimating genetic liability, these studies provide further information about environmental contributions, identifying that which is shared and that which is non-shared.

3) **Adoption Studies:** A systematic approach to separate "nature" from "nurture" is to study individuals separated from their biological relatives soon after birth and raised by non-related foster parents and to compare them with respect to characteristics of alcohol abuse with both their biological and adoptive parents. It is based upon the premise that the genetic trait present in the affected biological parent will still be expressed in adoptee, regardless of the genotypic status and environmental circumstances of the foster parents. In studies of intact families, the effects of genetic and common environment are not separable. Adoption studies separate these effects because adoptee receives their genetic heritage from one set of parents and their rearing environment from another set. The degree to which adoptee resemble their biological relatives is a direct measure of genetic influence, while the degree to which they resemble their adoptive relatives is a measure of the influence of family environment. Adoption studies are capable of delimiting almost completely genetic and environmental influences on the variation in the liability to a disorder (except contributions of ante- and early postnatal environmental factors) (Heath et al. 1998). Extensive adoption studies conducted in Denmark and Sweden have provided substantial evidence that alcoholism is genetically influenced, and that there are distinct patterns of alcoholism with different genetic and environmental causes (Goodwin et al. 1974; Cloninger et al. 1981; Bohman et al. 1987). When the adopted away sons of alcoholic parents were compared to their siblings raised by the alcoholic biological parent, a remarkably similar rate of alcoholism was noted in both groups.
Subsequent adoption studies from other countries have clearly shown that children born to alcoholic parents but adopted away during infancy were at greater risk for alcoholism than adopted-away children born to non-alcoholic parents (Sigvardsson et al. 1996).

4) **Gender Differences in terms of heritability of Alcoholism:**

There is consistent evidence that relatives of women treated for alcoholism have higher risk for alcoholism than relatives of treated males (Prescott and Kendler 1999). Twin studies provide estimates of heritability of the liability to alcoholism in the range of 51% - 65% in females and 48% - 73% in males (Johnson et al. 1998; Prescott et al. 1999; Prescott and Kendler 1999; Kendler et al. 1994). Early studies found that genetic influences on alcoholism risk were clear in men but were less certain in women (McGue et al. 1992). However, subsequent studies, which explicitly addressed gender difference, found evidence for 64% heritability for women and men, even when data were weighted to adjust for selective attrition (Prescott et al. 1999). In addition, it has been noted that the genetic sources of vulnerability to alcoholism are partially, but not completely overlapping in men and women (Prescott et al. 1999). Heritability estimates were 66% in women and 42% - 75% in men for frequency of alcohol consumption, and 57% in women and 24% - 61% in men for average quantity consumed when drinking. Men (but not women) who are at increased genetic risk of alcohol dependence exhibited reduced alcohol sensitivity (Heath et al. 1999). This suggests that women in treatment tend to have higher liability than their male counterparts. Some evidences from molecular genetic studies support the existence of sex-specific loci (Paterson and Petronis 1999); a definitive answer to this issue will probably come from molecular rather than epidemiological studies.

5) **Mode of Inheritance:** Although adoption and twin studies have proven useful in answering the question of 'nature' versus 'nurture', the mode of inheritance of alcoholism is still an unresolved issue.
Heritability estimates vary somewhat depending on diagnostic criteria, with the highest heritability estimates obtained for Feighner Probable alcoholism (63%), Cloninger type II alcoholism (54%), and DSM – III alcohol dependence (52%) (Van den Bree et al. 1998). Certain diagnostic systems are more sensitive for detecting genetic influences and may be more appropriate for studies attempting to find genes for alcoholism (Van den Bree et al. 1998). While environmental effects explain most of the variation in initiation of drinking, genetic factors are more important in explaining frequency of intoxication (Viken et al. 1999). This study also observed similar genetic risk for males and females in the initiation of drinking, but suggested that either different genetic factors or different shared environmental factors were influencing the two sexes (Viken et al. 1999). It was also noted that specific genes are influencing the heritability for alcohol withdrawal syndrome (Schuckit 2000). None of the evidence hitherto put forward suggests that susceptibility to alcoholism is inherited via a simple Mendelian dominant/ recessive or sex-linked transmission pattern. Even if the inheritance of certain biological factors involved in alcoholism is assumed to be Mendelian, the effect of these factors on the development of complex disorders may still not fit a simple genetic model. A substantial degree of etiological heterogeneity in the alcoholism phenotype results in the ultimate manifestation of the disorder dependent on poorly understood gene-environment interactions.

6) **Characterization of High Risk and Low Risk Individuals:** It is not clear whether genetic risk is a major factor in initiation of drinking or drinking during adolescence (Stallings et al. 1999). In the past years, a number of investigators have tried, in prospective studies, to identify possible trait markers by studying young men and women at high risk for the future development of alcoholism based on their family history of this disorder. Having an alcoholic biological father is the best single predictor of future alcoholism in male offspring.
One method of determining whether there are neuro-psychological deficits before the onset of alcoholism is to study children who are at risk for becoming alcoholic. In a typical prospective study, young men and women at high risk for the future development of alcoholism are divided into Family History Positive (FHP) group, (who report an alcoholic parent or siblings) and Family History Negative (FHN) group (men and women who report no close alcoholic relative). The subjects are matched for demography and alcohol drinking history.

7) Gene Identification:

Family, twin and adoption studies have indicated that alcoholism has a strong genetic component (Reich et al. 1999). In searching for genes that contribute to alcoholism risk, several approaches like a) identification of polymorphic markers, b) linkage mapping of genes and c) identification of candidate gene approach, have been utilized in order to identify the genetic loci underlying alcoholism susceptibility.

a) Polymorphic markers: As part of the Human Genome Project, a large number of markers called micro-satellites have been mapped on the human genome. These markers are short stretches of two to four nucleotides and are repeated several times. These markers are highly polymorphic and transmitted across successive generations in a family. To find chromosomal regions and genes influencing alcoholism, researchers look for certain micro-satellite markers that may co-inherit with the disease across multiple generations.

b) Identifying Chromosomal Locations of Interest (Linkage Studies): Linkage mapping, also called positional cloning, is the process of systematically scanning the entire DNA contents (i.e., the genomes) of various members of families affected by the disorder using regularly spaced, highly variable (i.e., polymorphic) DNA segments whose exact position is known (i.e., genetic markers).
Using those families, investigators can identify genetic regions associated or “in linkage” with the disease by observing that affected members of the family share certain marker variants (i.e., alleles) located in those regions more frequently than would be expected by chance. These regions can then be isolated, or cloned, for further analysis and characterization of the responsible genes. Linkage mapping techniques have already resulted in the identification of several potential DNA regions that may contain susceptibility genes for alcoholism (Reich et al. 1999). The primary advantage of linkage mapping is that investigators need no prior knowledge of the physiology or biology underlying the disorder being studied, which is important for complex disorders like alcoholism.

A very close location of the alcohol dehydrogenase (ADH) genes was identified on chromosome 4q (Saccone et al. 2000; Reich et al. 1998; Long et al. 1998); the ADH genes have been associated with protective effects in Asians (Reich et al. 1998). Evidence for linkage to chromosome 4q in both a South-Western American Indian tribe and in Americans of European descent strongly supports a role for genes in this location in influencing risk for alcohol dependence. Linkage to chromosome 4p has also been seen near the β1 GABA receptor gene (Long et al. 1998). In a Finnish sib-pairs study (Lappalainen et al. 1998), antisocial alcoholism showed weak evidence of linkage with a location on chromosome 6 and significant evidence of linkage to the Serotonin receptor 1B G861C. In a South-Western American Indian tribe, significant sib-pair linkage to chromosome 6 was also seen (Lappalainen et al. 1998).

Multipoint methods provided the strongest suggestions of linkage with susceptibility loci for alcohol dependence on chromosomes 1 and 7, and more modest evidences for a locus on chromosome 2 (Reich et al. 1998). The best evidence for linkage has been seen on chromosome 11p (D11S1984), in close proximity to the DRD4 dopamine receptor and tyrosine hydroxylase (TH) genes (Long et al. 1998).
Results from numerous studies analysing sib-pair linkage for alcoholism are published in an issue of Genetic Epidemiology, 1999; 17 Supplement 1. Many identified sites on chromosome 10q, which may be related to genetic variation in the CYP2E1 gene (10q24.3) that can inactivate ethanol.

To understand genetic contributions to alcohol drinking behaviours, many aspects of the behaviour need to be assessed as independent endo-phenotypes since different gene variants may affect these various behavioural aspects of alcohol dependence differentially. Large studies of multiple gene variants and clearly defined phenotypes will lead to better understanding of the specific genes and the mechanisms involved. Whereas the linkage mapping approach is an unbiased search of the entire genome without any preconceptions about the role of a certain gene, the candidate gene approach allows researchers to investigate the validity of an “educated guess” about the genetic basis of a disorder. This approach involves assessing the association between a particular allele (and set of alleles) of a gene that may be involved in the disease (i.e., a candidate gene) and the disease itself. The major difficulty with this approach is that in order to choose a potential candidate gene, researchers must have an understanding of the mechanisms underlying the disease (i.e., disease patho-physiology). In contrast with linkage mapping studies, however, studies of candidate genes do not require large families with both affected and unaffected members, but can be performed with unrelated case and control subjects or with small families (e.g., a proband and parents). Further more, candidate gene studies are better suited for detecting genes underlying common and more complex diseases where the risk associated with any given candidate gene is relatively small (Collins et al. 1997; Risch and Merikangas 1996).

C) Candidate Genes Involved in Alcohol Dependence: Candidate gene studies are better suited for detecting genes underlying common and more complex diseases where the risk associated with any given candidate gene is relatively small.
Association studies with candidate genes remain conceptually the simplest of genetic studies where specific biological hypotheses can be tested in a design similar to a classical case-control study (Kwon and Goate 2000; Stoltenberg and Burmeister 2000). Candidate gene studies often test one gene, and often one allele, at a time.

More recently, multiallelic / multigenic interactions have been examined by testing for the effect of two markers and their statistical interaction (Longmate 2001). This new approach makes particular sense when the genes / proteins studied are known to belong to interacting systems and when the phenotype, such as dependence, is thought to be oligogenic (e.g., dopamine receptors and dopamine biosynthetic and derivative enzymes). With the application of novel techniques (e.g., single nucleotide polymorphisms (SNPs) scored on DNA chips), extremely large datasets will be required for sufficient statistical power, but the findings will be much more informative than testing single alleles and single genes (Stoltenberg and Burmeister 2000). Currently the best candidate allelic variants (as everyone has the same genes) fulfil at least two criteria: a) the variant has been shown to alter function or regulation, and b) the variant has a good likelihood of being biologically relevant (Stoltenberg and Burmeister 2000) (Table 1.2).

**GABA:**

The principal inhibitory neurotransmitter in the brain is $\gamma$-amino butyric acid (GABA$_\alpha$). Binding of GABA to ionotropic GABA$_\alpha$ receptors causes the opening of an integral chloride-ion channel, thus changing the membrane potential of neurons and thereby exerting a crucial role in regulating brain excitability. GABA$_\alpha$ receptors are sensitive to ethanol and are believed to mediate many of its effects, including anxiolysis, sedation, motor in-coordination, tolerance, and dependence (Grobin et al. 1998). GABA$_\alpha$ receptors are pentameric assemblies of subunits; 17 mammalian subunits are known, which are classified into $\alpha$ (1-6), $\beta$ (1-3), $\gamma$ (1-3), $\delta$, $\varepsilon$, and $\rho$ (1-3) types.
In addition, the $\beta_2$, $\beta_3$, and $\gamma_2$ varieties occur in alternatively spiced forms. Most GABA receptors contain $\alpha$, $\beta$ and $\gamma$ subunits (Meheta and Ticku 1992). Most of the genes encoding human GABA$_A$ receptor subunits are organized in clusters of GABRA2, GABRA4, GABRB1, and GABRG1 on chromosome 4p$^{12}$ (Russek 1999). GABRA5, GABRB3 and GABRG3 encoding the $\alpha_5$, $\beta_3$ and $\gamma_3$ subunits, are on chromosome 15q11.2-q12 (Sinnett et al. 1993).

The findings of Wallner et al. (2003) demonstrate that high alcohol sensitivity of GABA$_A$ receptors requires the co-expression of either $\delta$ or the $\beta_3$ subunit with $\beta_2$, markedly decreases the alcohol sensitivities of GABA$_A$ receptors. The $\delta$ subunit may play an important role in determining the enhancing actions of modulator agents other than alcohol.

There have been several studies of the potential association of genes encoding GABA$_A$ receptor subunits with alcoholism. Parsian and Cloninger (1997) examined micro satellite polymorphisms in GABRA1 and GABRA3 in a sample of alcoholics and controls of Western European descent, and found no significant association with alcoholism or with type I and type II subunits of alcoholics. Parsian and Zhang (1999) found association between a micro satellite polymorphism in the GABRB1 gene and alcoholism in the same population. There have been several papers examining the gene cluster on chromosome 5.

Sander et al. (1999) examined single nucleotide polymorphisms in GABRA6, GABRB2, and GABRG2 in 349 German alcoholics and 182 ethnically matched controls, and found no significant association with alcohol dependence or withdrawal or familial alcoholism. Loh et al. (2000) carried out association studies of five polymorphisms in GABA subunit genes on chromosome 5 in Japanese, and found no association of any with alcoholism or alcoholism without concurrent antisocial personality disorder, but a marginal association of one polymorphism in GABRG2 for alcoholism with antisocial personality disorder.
In a Scottish population, Loh et al. (1999) reported association between alcoholism and polymorphisms in GABRA6 and GABRB2.

**ii) Dopamine System:**
Polymorphisms of genes in the dopamine system are plausible functional candidate genes for alcohol dependence. An association was made between a 5' polymorphism (A48G) and alcohol use, but not all studies conform a role for Dopamine receptor D1 (DRD1) in alcohol use (Sander et al. 1995; Hietala et al. 1997). The results for both the DRD1 and DRD2 genes, which have opposing effects on cyclic AMP, were consistent with negative and positive heterosis, respectively. These results suggest a role for genetic variants of the DRD1 gene in some addictive behaviour, and suggest an interaction of genetic variants at the DRD1 and DRD2 genes.

The DRD2 minor A1 allele was, a decade ago, first reported to have association with severe alcoholism (Hietala et al. 1997; Dobashi et al. 1997). Although many studies have not found an association with dependence, some association with severity of drinking may exist (Pastorelli et al. 2001; Sander et al. 1995; Noble et al. 2000). However, no association was found between the A1 polymorphism and age at onset of alcohol dependence (Anghelescu et al. 2001). In family association studies no evidence for a role of DRD2 was found (Edenberg et al. 1998; Goldman et al. 1997). In summary, DRD2 may not alter risk for alcohol dependence, but alcohol-dependent patients with the DRD2 A1 allele may have greater severity of their disorder across a range of the drinking problem indices (Connor et al. 2002). There are few examples where the DRD2 genetic variation has been examined in conjunction with other genes. For example variants of both the DRD2 and GABA\textsubscript{A} receptor subunit genes were associated with risk for alcoholism; however, when combined, the risk for alcoholism was more robust than when these variants were considered separately (Noble et al. 1998). Likewise, there was a stronger association of a DRD2 and ADH2 variants together on risk for alcoholism than either gene variant alone (Amad et al. 2000).
Reddy et al. (2007) studied SNPs at the two sites of NPY and DRD2-Taq1 loci among 28 hierarchical caste and tribal groups of India and tried to correlate with their traditionally known average drinking behaviours. If NPY-C confers protection against alcoholism and DRD2-TaqA1 allele is susceptible to alcoholism, they concluded that although the trend of allele frequency in the hierarchical groups suggests an association with their drinking behaviours case control studies are required to infer the nature of this association. As these two alleles at NPY and DRD2-Taq1 show opposing trends of average allele frequency with hierarchical positions of the studied populations, the authors have tested further for possible co-adaptation of these alleles but could not find convincing evidence.

Studies of DRD3 and alcoholism demonstrated no significant association (Henderson et al. 2000; Parsian et al. 1997), regardless of sensation seeking score, addictive or psychiatric co morbidity, alcoholism typology, and clinical specifics of alcoholism. Even when tested in alcoholics in the presence of active or inactive ALDH2, no association with DRD3 was observed (Higuchi et al. 1996).

One study found a significantly increased allele frequency of DRD3 S9 in alcohol-dependent individuals with delirium suggesting it may confer genetic susceptibility to some aspects of the effects of alcohol (Sander et al. 1995). Van Tol et al. (1992) described the existence of at least 3 polymorphic variations in the coding sequence of the human D4 receptor. A 48-bp sequence in the putative third cytoplasmic loop of the receptor was found either to exist as a direct repeat sequence (D4.2), as a 4-fold repeat (D4.4), or as a 7-fold repeat (D4.7). Two other variant alleles were detected.

Expression of the cDNA for the 3 cloned receptor variants showed different properties for the long form (D4.7) as contrasted with the shorter forms with respect to clozapine and spiperone binding.
These variations among humans may underlie individual differences in susceptibility to neuropsychiatry disease and in responsiveness to antipsychotic medication.

Human personality traits that can be reliably measured by rating scales show a considerable heritable component. One such instrument is the tridimensional personality questionnaire (TPQ), which was designed by Cloninger et al. (1993) to measure 4 distinct domains of temperament—novelty seeking, harm avoidance, reward dependence, and persistence—that are hypothesized to be based on distinct neurochemical and genetic substrates. Cloninger et al. (1993) proposed that individual variations in the novelty-seeking trait are mediated by genetic variability in dopamine transmission. Individuals who score higher than average on the TPQ novelty seeking scale are characterized as impulsive, exploratory, fickle, excitable, quick-tempered, and extravagant, whereas those who score lower than average tend to be reflective, rigid, loyal, stoic, slow-tempered, and frugal. Hutchison et al. (2002) found an association between alcoholism and DRD4 receptor variation. In a study of 20 abstinent alcohol-dependent men, a significant correlation was found between apomorphine-induced growth hormone release and the 'novelty seeking' score of the individual (Wiesbeck et al. 1995). This supported Cloninger's hypothesis by giving neuroendocrine evidence that this personality dimension is related to dopaminergic activity, albeit in the tuberoinfundibular dopaminergic system which is not directly associated with human personality traits. In 2 groups of Finnish subjects (193 psychiatrically screened normal controls and 138 alcoholic offenders), Malhotra et al. (1996) determined DRD4 genotypes and assessed novelty seeking with the TPQ.

In the control individuals, they found no significant association between novelty seeking and the 7-repeat allele despite similar allele frequencies and the use of the same personality measure as employed by Ebstein et al. (1996).
The group of alcoholic offenders had significantly higher novelty seeking than control individuals; however, Malhotra et al. (1996) could not replicate the previous association in this group. They suggested that DRD4 might require revaluation as a candidate gene for personality variation.

The ALDH2*2 allele of the aldehyde dehydrogenase-2 gene is considered to be a genetic deterrent for alcoholism; however, Muramatsu et al. (1996) found that 80 of 655 Japanese alcoholics had the mutant allele. They postulated that these alcoholics had some other factors which overcame the adverse effects of acetaldehydemia and that this factor might reside in the 'reward system' of the brain in which dopamine plays a crucial role. Therefore, Muramatsu et al. (1996) studied variation at the DRD4 locus and found in the alcoholics a higher frequency of a 5-repeat (5R) allele of the DRD4 receptor 48-bp repeat polymorphism in alcoholics with ALDH2*2 than in 100 other alcoholics and 144 controls. They found that alcoholics with the 5R allele also abused other drugs more often. Chang et al. (1996) presented data that urged caution in the interpretation of DRD4 association studies in mixed populations. They focused particularly on the expressed polymorphism in exon 3 which may have functional relevance. This polymorphism (an imperfect 48-bp tandem repeat coding for 16 amino acids; alleles had been reported with 2 to 10 repeats) was found to be universal, suggesting that it is ancient and arose before the global dispersion of modern humans. They described diversity of allele frequencies for this expressed polymorphism among different populations and emphasized the importance of population considerations in the design and interpretation of association studies using the polymorphism. DRD4 is one of the most variable human genes known. Most of this diversity is the result of length and single-nucleotide polymorphism (SNP) variation in a 48-bp VNTR in exon 3, which encodes the third intracellular loop of this dopamine receptor. Variant alleles containing 2 (2R) to 11 (11R) repeats are found, with the resulting proteins having 32 to 176 amino acids at this position. The frequency of these alleles varies widely.
The 7R allele, for example, has an exceedingly low incidence in Asian populations yet a high frequency in the Americas (Chang et al. 1996). Although initial studies suggested that the 7R allele of the DRD4 gene might be associated with the personality trait of novelty seeking, (Ebstein et al. 1996; Benjamin et al. 1996), the most reproduced association is that between the 7R allele and attention deficit-hyperactivity disorder. Ding et al. (2002) stated that 8 separate replications of the initial observation of an increased frequency of the DRD4 7R alleles in ADHD probands had been reported.

Dopamine transporter (DAT) 7 repeats tended to be higher, and that of 9 repeats lower, in alcoholic Japanese patients (Dobashi et al. 1997); however, no association was found between DAT and alcoholism (Pastorelli et al. 2001; Parsian and Zhang 1997) even in family-based studies (Schmidt et al. 1998). An increased prevalence of the 9-repeat allele in alcoholics displaying withdrawal seizures or delirium has been observed (Schmidt et al. 1998). A polymorphism in the 3'-UTR (G2319A) of the DAT gene was associated with alcoholism (Ueno et al. 1999).

iii) CYP2E1:

Cytochrome P450 2E1 (CYP2E1) is an enzyme that is also able to metabolise ethanol to acetaldehyde and acetaldehyde to acetate (Howard et al. 2002). In humans, the levels of hepatic CYP2E1 were found to vary 50-fold in vitro while in vivo CYP2E1 activity was found to vary by 15-fold. The CYP2E1 gene is genetically polymorphic and CYP2E1 variant alleles have been associated with altered ethanol metabolism (Sun et al. 1999).

iv) Alcohol Dehydrogenase:

Alcohol dehydrogenase (ADH) enzyme metabolises alcohol to acetaldehyde. There are seven known ADH genes, such as ADH7, ADH1C, ADH1B, ADH1A, ADH6, ADH4, and ADH5. All these seven genes exist in a cluster of five classes (i.e., class I to class V) extending ~380kb on the long arm of chromosome 4 (i.e., 4q21-23).
Class I consists ADH1C, ADH1B, and ADH1A genes. This class I exists in a tighter cluster of ~77kb flanked upstream by class IV (ADH7) and downstream by class V (ADH6), class II (ADH4), and class III (ADH5) in respective order (Li, 2000; Osier et al. 2002).

Variants of different class I ADH genes have been shown to be associated with an effect that is protective against alcoholism (Osier et al. 2002). Although the greatest similarity is seen among the class I genes, all seven ADH enzymes are very similar in amino acid sequence and structure but differ in preferred substrates (Edenberg, 2000). Enzymatically active ADH is composed of two protein sub units. All class I iso-enzymes are found in liver, and consist of homo and hetero dimeric forms of the three α, β, γ subunits. The corresponding genes are ADH1A, ADH1B, and ADH1C.

![Fig. 1.3: Structure of ADH genes](image)

Two of the three class I genes are known to have alleles that produce enzymes that catalyse the oxidation of ethanol at different rates (Edenberg and Bosron 1997). At the protein level, allelic nomenclature based on protein differences is not adequate for analyses of individual polymorphic sites in the genome sequence of the gene cluster.
For instance, the allelic series for ADH1B (previously called "ADH2") encodes the \( \beta \) subunit of the dimeric enzyme. It is generated by variation at two different sites at the genomic level: the ADH1B*1 allele is composed of 47Arg and 369Arg, the ADH1B*2 allele is composed of 47His and 369Arg, and the ADH1B*3 allele is composed of 47Arg and 369Cys. Osier et al. 2002, had not seen the "double variant" (composed of 47His and 369Cys), but they assumed that it could exist. ADH1B*1 have high affinity and low capacity in contrast to ADH1B*2 and ADH1B*3 which have low affinity for ethanol and high capacity. The functional variants in the corresponding metabolic enzymes make the class I ADH genes obvious candidates for risk of developing alcoholism.

Alleles at two ADH genes that encode enzymes with higher Vmax values- namely, ADH1B*47His (previously called "ADH2*2"), at the Arg47His (exon 3) SNP, and ADH1C*349lle (previously called "ADH3*1"), encodes the \( \gamma \) subunits and at the Ile349Val (exon-8). SNPs have consistently been found at significantly lower frequencies in alcoholic individuals than in non-alcoholic controls in Eastern-Asian samples (Thomasson et al. 1991; Chen et al. 1996; Shen et al. 1997; Tanaka et al. 1997; Osier et al. 1999; Li et al. 2001). Collaborative studies on genetics of alcoholism (Reich et al. 1998) have shown evidence in favour of strong linkage between alcoholism and ADH gene located in chromosomes. The two functional variants i.e. ADH1B*47His and ADH1C*349lle are \(~21\) kb apart and have shown to have strong linkage disequilibrium. The distribution of ADH allele is highly variable in various populations. For instance, ADH1B*47His is present at frequencies > 0.33 in Eastern-Asian populations and < 0.25 in populations of other regions (Goedde et al. 1992; Thomasson et al. 1994; Neumark et al. 1998). The frequency of the gene is very low outside the Eastern Asian population. Other ADH genes such as ADH1C*349lle allele is found in European populations; ADH1B*369Cys is found in African American samples.
Linkage disequilibrium in the ADH gene family has been reported to exist for other sites such as between Stu I and Xba I in ADH1C and between Class I sites with either ADH4 site or ADH5 site. Osier et al. (2002) analysed samples from different regions of the World taking larger segment of ADH cluster (three Class I ADH genes and ADH7) and observed nominal significant pair wise linkage disequilibrium in some populations, between the ADH7 site and some Class I ADH sites, at moderate values and at a molecular distance as great as 100 kb.

ADH1B*2 allele frequency is lower in alcoholic populations indicating a protective role (Nakamura et al. 1996; Maczawa et al. 1995; Chen et al. 1999; Thomasson et al. 1994): the influence of this genetic variant is easier to demonstrate in populations which have low prevalence of the ALDH2*2 (Li 2000). There is evidence that ADH1C*349lle may play an important role related to alcohol abuse, health, and disease. Hines et al. (2001) demonstrated that ADH1C*349lle homozygous individuals are more protected from heart disease by moderate drinking than ADH1C*349Val homozygotes. In contrast to it Visapaa et al. (2004) reported highest ADH1C*349lle allele frequency in patients with oral cancer and cancer of the larynx. The allele ADH1C*349lle is a considerable risk factor for female breast cancer, especially when ethanol consumption is high (Freudenheim et al. 1999). It was hypothesized by Thomasson et al. (1991) that sensitivity to alcohol via fast production or slow removal of acetaldehyde determines protective of ADH 2*2, ADH 3*1 and ALDH 2*2 alleles among alcohol users. **Linkage disequilibrium between ADH 2 and ADH 3 and dominance by the ALDH 2*2 variant are important factors contributing to interactions between genes of the alcohol metabolising enzymes** (Chen et al., 1999).

v) **Aldehyde Dehydrogenase:**

So far, 17 ALDH genes (ALDH1, ALDH2, ..., ALDH17) have been identified in nine ALDH genotype groups (Brennan et al. 2004).
The isozyme mainly responsible for acetaldehyde oxidation is the mitochondrial class II ALDH (ALDH2), that has a micro molar Km value and high affinity for acetaldehyde (Lands, 1998) located on chromosome 12q24.2. The ALDH2 gene is polymorphic in humans, having two allelic forms, ALDH2*1 and ALDH2*2 caused by a point mutation at amino acid position 487, where substitution of Lysine for Glutamic acid that results from a transition of G to A at nucleotide 1510 (Hsu et al. 1985; Yoshida et al. 1991). The ALDH2 deficiency leads to an aversive response to alcohol due to elevated levels of acetaldehyde resulting in increased hangover symptoms (Wall et al. 2000) and the alcohol flush response (Li, 2000; Tanaka et al. 1997).

ALDH2*1 is a very active form found at high frequency among most ethnic groups, while the ALDH2*2 is inactive (or has very low activity) and is found at high frequency among Asians (e.g. Chinese, Japanese, Koreans). The ALDH2*2 has been demonstrated to be associated with substantial protection from alcoholism in Japanese (Okamoto et al. 2001; Nakamura et al. 1996; Maczawa et al. 1995), Han Chinese (Chen et al. 1999) and Koreans (Lee et al. 2001).

Genetic variation in ALDH2, tested in multiple ethnic groups, alters the amount of ethanol consumed (Tanaka et al. 1997; Okamoto et al. 2001; Sun et al. 1999) and risk for binge drinking (Luczak et al. 2001). An association with alcoholic liver disease was observed in some but not in all studies, and may be due to the effect on levels of consumption. ALDH2*2 homozygous individuals are unable to oxidize acetaldehyde and who are heterozygous do so inefficiently (Yoshida et al. 1984; Novoradovsky et al. 1995). About 50% of oriental people are different in the ALDH2 isozyme that can most efficiently detoxify acetaldehyde (Harada et al. 1981; 1985).
Fig- 1.4: Genomic structure of the ALDH2 gene presenting the various positions of the introns and exons.

The table No 1.2 presented below shows involvement of different gene variants in the development of alcoholism as well as in the protection of alcoholism.
Table 1.2: Different genes implicated in alcoholism

<table>
<thead>
<tr>
<th>Gene</th>
<th>Variant(s)</th>
<th>Phenotype</th>
<th>Reference</th>
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</thead>
<tbody>
<tr>
<td>ADH2 (ADH1B)</td>
<td>Arg47His</td>
<td>Protects from alcoholism</td>
<td>Chen et al. 1999; Osier et al. 2002; Whitfield 2002.</td>
</tr>
<tr>
<td>ADH3 (ADH1C)</td>
<td>Ile349Val</td>
<td>Protects from alcoholism</td>
<td></td>
</tr>
<tr>
<td>ALDH2</td>
<td>ALDH2*2</td>
<td>Protects from alcoholism Decreases amount of</td>
<td>Okamoto et al. 2001; Nakamura et al. 1996; Maczawa et al. 1995; Chen et</td>
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(Source: Nayak et al., 2008; Int J Hum Genet, 8(1-2): 181-197)
Socio-Cultural Dimension:

Social and cultural anthropologists view that all facets of learned human behaviour of man are product of culture in which he lives. All our normal behavioural patterns are guided and shaped by the social and cultural norms of the society. Like a cultured pearl, man is a cultured being, for man in society always imbibes culture (Mahapatra 2000). Food and drink being essentially products of culture show both similarity as well as difference across societies and cultures. Alcohol is generally understood as a chemical compound that has the property of intoxication apart from other properties. It is prepared both from nature and from culture. The place of alcoholic beverages in human societies is value oriented and they play wide range of roles in various social and cultural events of human societies. Every society has its own notion, attitude, knowledge, beliefs, and perception about different types alcoholic beverages consumed, which may be sub summed as drink ideology. The concept of drink ideology is comprehensive, diverse and it includes what people think and perceive about each of the different items that are considered as alcoholic drinks. What is interesting to observe that alcoholic beverages are regarded as food by some, others as a leisure time drink or a tranquilliser, by some group as a sacred offering, by others as sacrilegious, as a stimulant or as a poison or a commodity of trade or an appetiser and so forth. Similarly, the drink ways of a community like food ways are determined according to the ideology of the people revolving round alcoholic drinks. It includes all culturally approved patterns of activities and institutions associated with methods of preparation, distribution, consumption, and storage different types alcoholic drinks. The drinking habits on the other hand refer to selection of, preference for alcoholic drinks, and patterns of drinking behaviour of people in different drinking circumstances.
The drink ideology, drink ways, and drinking habits show variation across societies. There have been striking advances in the study of social and cultural aspects of alcohol drinking and problems connected with alcoholism in several societies across the globe. The following review broadly highlights the major findings of scholars who have made substantive contributions to the understanding of socio-cultural dimension of alcohol and its usages as cultural artefacts in different societies both primitive and modern. In this context what Heath (1982) stated "Socio-cultural variants are at least as important as physiological and psychological variants when we are trying to understand the interrelations of alcohol and human behaviour" bear significance even today. Generally, the socio-cultural dimension on alcohol related studies embraces the following themes:

- Socio-cultural variation studies
- Comparative ethnic studies
- Tribal /Non-literate studies
- Cross-cultural studies
- Symbolic and communication studies
- Problem oriented studies

**Social and cultural variation:**

As stated earlier alcohol is product of culture and it plays distinctive roles in the social and cultural spheres of different human communities. Enormous differences can be observed as to have different ethnic and cultural group handle alcohol For example, in some societies, it is used as food or an accompaniment to food; as a disinhibitor, an enhancer of pleasure and sociability, an effective relaxant; in others as leisure time drinks; it is considered as leveller of social status; pattern of sharing can help in understanding social organisation; symbolic, ritual and beliefs linked to alcohol are as important as its association in spending leisure and recreation; the beverage used in economic and political transactions.
Furthermore, the elaborate technologies associated with different types of alcohol production and consumption of alcohols not only show variation across cultures but also bear significance from the prospective of technological evolution and change. The anthropological literatures show how ways of drinking and thinking about drinking are learned by individuals with the context in which they learn ways of doing other things and thinking about them – that is, it is an aspect of culture about which patterns of belief and behaviour are modelled by a combination of example, exhortation, rewards, punishment, and the many other means, both formal and informal, that societies use for communicating norms, attitudes and values (Heath, D. B., 1982). Where alcohol is used as an important accompaniment of food, patterns of consuming and sharing alcohols help us understanding sociability feature of groups, symbolic, religious, and other beliefs systems associated with drinking of such beverages are of alcohol culture. The technology of production of alcoholic beverages is not similar, and the products are often used in economic and political transactions. Communications in alcohol-related contexts can be distinctive, and drinking has a special association with sex and with recreation in many societies. Since production and consumption of alcoholic beverages are intricately embedded in socio-cultural, socio-psychological, socio-political, socio-economic spheres of certain human communities since ages, the study of the structure and function of such socio-cultural institutions linked to alcohol production and consumption such as social organisation, beliefs and practices linked to religious, ritual celebrations and technological organisations, political and economic organisations etc are no less important as revealing the problems of adverse effects of alcohols.

Blum and Blum (1964) stated that, “...In those cultures where drinking is integrated in to religious rites and social customs, where the place and manner of consumptions are regulated by traditions, and where, moreover, self control, sociability 'knowing how to hold' ones liquor are matters of mainly pride, alcoholism problems at a minimum, recently introduced.”
On the other hand, in immoderate-drinking cultures, drinking is not governed by agreed-upon social standards, so that drinkers are on their own or must rely on the peer group for norms. Drinking is disapproved and abstinence encouraged, leaving those who do drink without a model of social drinking to imitate; they thus have a proclivity to drink excessively. Alcohol is seen as overpowering the individual’s capacity for self-management, so that drinking is in itself an excuse for excess. Since drinking is also a group affair, group drinking is clearly differentiated from drunkenness and associated with ritualistic or religious celebrations. It is seen that drinking is associated with eating, preferably ritualistic feasting. Both sexes and several generations are included in the drinking situation, whether all drink or not.

Several scholars have shown how the use of alcohol has helped them in identifying social hierarchies, social categories, or social classes in different societies (Ablon, 1976; Shukla, 1978; Wolcott, 1974; Angrosini, 1974; Heath, 1971; Jilke-Aall, 1974; LeMasters, 1975; A. Thomas, 1978; Read, 1980). Choice of beverage is a significant social status. Generally, imported or ‘foreign’ drinks have a higher status than ‘local’ beverages. For example in Poland, wine is regarded as a high status, middle class drink, while native beers and vodkas are ‘ordinary’ or working class. In France, by contrast, wine drinking is commonplace and confers no special status. It is also correlated with both wealth and adoption of modern method of agriculture and other realms as observed in Mexican village (De Walt, 1979). Sociologists have highlighted that excessive alcoholic drinking leads to “social anomie” leading to depression and psychiatric illness. However, many anthropologists consider it otherwise stating, “Social anomie leads to alcoholism”. The act of drinking is usually viewed as a pleasant and sociable one; drunken behaviour exemplifies a relaxation of cultural constraints.
Douglas (1987), very aptly stated that “drunkenness also expresses culture in so far as it always takes the form of a highly patterned, learned component which varies from one culture to another...The general tenor of anthropological perspective is that celebration is normal and that alcohol is a normal adjunct to celebration.” Ethnographic writings are replete with evidences that social solidarity and social integration are functions of alcohol habits and drinking is mostly a social affair and performed in a recognised social context. Every society possesses a social control mechanism to restrict adverse consequences of excessive drinking leading to alcoholism. However, the medical scientists completely disapprove the ethnocentric judgment of anthropologists that alcoholic habits do not lead to pathological and clinical manifestations of liver disorder. They are of firm opinion that problems of social relations in the form of familial or group disruption and economic and other psychological deprivations are looming large in urban centres where alcoholic drinks are consumed regularly. In this context, what Heath (1982) has stated carry immense value – “A population that drinks daily may have high rate of cirrhosis and other medical problems but few accidents, fights, homicides, or other violent alcohol-associated traumas; a population with predominantly binge drinking usually shows the opposite complex of drinking problems...A group that views drinking as a ritually significant act is not likely to develop many alcohol-related problems of any sort, whereas another group, which sees it primarily as a way to escape from stress or to demonstrate one’s strength, is at high risk of developing problems with drinking.”

Drinking is essentially a social act, performed in a recognized social context. If the focus is to be on alcohol abuse, then the anthropologists’ work suggests that the most effective way of controlling it will be through socialization (Douglas, 1987).
When alcohol consumption is accepted in any society as leisure time activity or as a means of celebration of life cycle ritual or a means to forge social bond etc, the drinking episode is seen accomplished and regulated by social customs and cultural norms, so that people learn constructive norms for drinking behaviour. Drinking is thus a form of ritual having definite realm of operation. It carves out the boundaries of inclusion and exclusion i.e. who are partners of drinking or insiders and who are not or the outsiders. Going with the phenomenological approach, one may premise that drinks constructs concentric world of phenomena or events. Mary Douglas (1987) stated that, “\textit{first drinks give the actual structure of social life as surely as if their names were levels affixed on expected forms of behaviour. Second, the manufacture of alcohol is an economic activity of consequence. Third, the ceremonies of the drinking construct an ideal world}”

There is no dearth of literature on socio-cultural aspect of alcoholic drinks. These drinks play wide range of roles in various cultures. The effects of alcoholic drinks on family organisation among urban middle-class America (Ablon, 1976) and among Irish and Jewish drinkers (Wolin et. al. 1980) have been extensively analysed. The hierarchical structure of caste is illustrated through the difference in the use of alcohol and drugs through the study of an Indian village (Shukla, 1978). Many authors have brought to surface how alcoholic drinks are used symbolically of white social status for Indians (Jilke-Aall, 1974; LeMasters, 1975; A. Thomas, 1978) and for women of LoBir who prepares, wealth and adoption of modern methods of agriculture and other realms in a Mexical village (Hagaman, 1980), harbinger of social integration among several ethnic communities, a means of building social credit as seen among Austrarian Aboriginal population. Social class implications find prominently in the studies of public drinking establishment (Le Master, 1975; A.Thomas, 1978).
Social integrative functions of alcoholic drinks are well illustrated in several ethnographic reports: (Robbins, 1977 on Bugandans; Collmann, 1979 on Australian Aborigins; Waddell, 1973,1975 on Papago; Parkin, 1972 on Giriama; and many others). The very process of alcoholic drinks is also recognised as a means for communication or as providing a sense of communities for Swiss villagers (Gibson and Weinberg, 1980). Very rightly stated by Jellinek (1977) that ".... through drinking together, people are able to identify each other and to form symbolic blood covenants; by drinking alone, one is able to achieve power, resurgence of life."

Having stressed on the importance of socio-cultural factors on drinking 'outcomes', we also recognize that this perspective in some cases has been taken to extremes, leading to a cultural reductionism, which is no more helpful than the biochemical reductionism of purely medical models. The cultural-reductionism tendency which leads otherwise intelligent anthropologists to make ludicrous statements such as "sex differences do not exist external to cultural perceptions of them" (McDonald, 1994) can also cloud their judgment on alcohol issues. Just as there are certain features of male and female anatomy, which clearly exist independently of cultural perceptions, there are equally obvious biochemical effects of ethanol (on psycho-motor functions, for example, and on the liver), which are independent of social and cultural factors. Both comparative studies and controlled experiments have demonstrated, however, that more often ethanol produces well-understood neuro-chemical changes but in many cultures people being ignorant of biochemistry of alcohol drinking recourse to recognise the effects of drinking purely in cultural terms. The wide variations in social and behavioural outcomes of drinking can only be explained with reference to cultural factors and to culturally determined beliefs about the effects of drinking (McAndrew and Edgerton, 1969; Marshall, 1979; Marlatt and Rohsenow, 1980; Holyfield et al, 1995; Peele, 1997).
That the behavioural outcomes of drinking are determined by cultural norms and Mandelbaum (1965) already highlighted the patterns. Mandelbaum states that, "When a man lifts a cup, it is not only the kind of drink that is in it, the amount he is likely to take and the circumstances under which he will do the drinking that are specified in advance for him, but also whether the contents of the cup will cheer or stupefy; whether they will induce affection or aggression, quiet or unalloyed pleasure. These and many other cultural definitions attach to the drink even before it reaches his lips". MacAndrew and Edgerton (1969) have provided overwhelming evidences to support Mandelbaum's statement, and to illustrate the learning process they summarized that "Over the course of socialization, people learn about drunkenness what their society 'knows' about drunkenness; and, accepting and acting upon the understandings thus imparted to them, they become the living confirmation of their society's teachings." Alcohol is not seen as obviating personal control; skills for consuming alcohol responsibly are taught, and drunken misbehaviour is disapproved and sanctioned in many societies.

Religious and ritual linkages of Indigenous alcoholic beverages have been described and analysed by several scholars: Shukla (1978), James (1972), Hagaman (1980), Omori (1978), Morris (1979), Carter (1977), Parkin (1972), among others. In a generalized discussion of ancient history, in the words of Jellinek (1977) "alcoholic beverages may have displaced water and milk in various cultures to become the ritual symbol par excellence, noting that its use gives a feeling of power, and "drunkenness can be a kind of shortcut to the higher life". However, other scholars do not completely accept this. Researchers have made explicit opinion that the conversion to charismatic sects or to traditional form of Protestantism often seems to have led to reduction in alcohol intake in several communities such as the Northern Athabscans, Zapotecs, Apache etc (Hippler, 1974; Kearney, 1970; Everett, 1980; Stevens, 1981).
It has been conventional in anthropology to think of drinking as a ritual act, used as an adjunct to religious rituals or a focal point of Dionysian rites (Heath, 1975; Jellinek, 1977). From this and other perspectives, alcohol has been analysed for its tension-reducing properties or its unifying effects in rituals of solidarity. In all societies, alcohol plays a central role in transitional rituals – both major life-cycle events and minor, everyday transitions. In terms of everyday transitions, cultures (such as the US and UK) in which alcohol is only used to mark the transition from work to play – where drinking is associated with recreation and irresponsibility, and regarded as antithetical to working – tend to have higher levels of alcohol-related problems. Cultures in which drinking is an integral part of the normal working day, and alcohol may be used to mark the transition to work (e.g. France, Spain, Peru), tend to have lower levels of alcohol-related problems. Shifts away from traditional pre-work or lunchtime drinking in these cultures could be a cause for concern, as these changes can indicate a trend towards drinking patterns and attitudes associated with higher levels of alcohol-related problems.

Alcohol is universally associated with celebration, and drinking is, in all cultures, an essential element of festivity. In societies with an ambivalent, morally charged relationship with alcohol (such as the UK, US, Scandinavia, Australia), 'celebration' is used as an excuse for drinking. In societies in which alcohol is a morally neutral element of normal life (such as Italy, Spain and France), alcohol is strongly associated with celebration, but celebration is not invoked as a justification for every drinking occasion. Rites of passage-the rituals making transition from one status or state in the life cycle to another, construct, facilitate and enhance the difficult passage from one social, physical or economic state to another and alcohol in some cultures is the centre elements of such ritual.
Economic implication of alcohol: Apart from socio-cultural aspects of alcoholic drinks, alcoholic beverages are regarded as valuable economic goods. Economic return from the production and sale of alcoholic beverages whether from industrial sector or from country made sources are analysed for different communities/nations. The emergence of market economy in the traditional hinter lands is seen playing a substantive role in terms of acquisition of new relationship with neighbouring groups and the social aspect of most drinking means that it can be used discreetly to create social capital. The impact of economic changes beyond the local community, as relates to alcoholic beverages, has been focus of inquiry of different scholars who described the changes among seventeenth-century Canary Islanders (Steckley, 1980), the nineteenth-century Akan (Dumett, 1974), and South Africans (Onselen, 1976). Temperance movements and prohibition had even longer and deeper impacts on some Western nation-states than is often realised (e.g., Everest, 1978; Blocker, 1979; Fahey, 1980). Familial and individual differences in wealth was noticed when the Giriama shifted from palm-wine production, largely a redistribution economic system, to copra for an international market, (Parkin, 1972). Much the same thing happened when the Chiga began to sell sorghum rather than using it for the beer for economic reasons (Omori, 1978).

Sex and recreation – Many people believe that alcohol consumed in small doses act as a sexual stimulant, although it is unequivocally a depressant drug in large amounts. It is also associated with leisure and other forms of recreation in many societies (Lex, 1980). It is claimed that increased leisure results in increased drinking (Juhasz, 1973). The links between marihuana, beer, and song are analysed for the Tsonga (Johnston, 1973; Jones, 1975). Bach and Schaefer (1979) reported that the rate of drinking is inversely to the tempo of country music in some US bars.
Drinking plays an important part in social clubs of Blacks in Bermuda (Manning, 1979); the commercial bar as a kind of social club can be seen among men who emphasize their homosexuality (Read, 1980) or among others who emphasize their “blue-collar” social status (Thomas, 1978); the “after-hours club” combining illegal drinking with sexual liaison is presumably a widespread urban phenomenon (Roebuck and Frese 1976). (Cited from Heath, 1987).

**Comparative ethnic/religious studies:**

The importance of socio-cultural factors associated with drinking habits is according to many scholars a dominant discourse in anthropology of drinking and in socio-cultural perspectives of alcoholism. Several scholars have demonstrated ‘Ethnicity’ or more appropriately ‘ethnic group variation’ in terms of alcohol customs, use. They have shown how social, cultural, traditions, belief systems, with respect to values and attitudes differ across ethnic groups and across social groups in alcohol use. Bales (1962), in his classical work conducted between Jews and Irish American in relation to alcohol drink, demonstrated that introduction of Jews children to wine is seen in a sacred ritual context in contrast with Irish pattern in which children are not supposed to drink till they reach adolescent. Blaine (1980), Glassner and Berg (1980), opined that religious and symbolic associations with alcohol were crucial in preventing alcoholism before cultural change. Contrastingly, among Irish, drinking is viewed as a most of badge of ethnic pride (Stivers, 1978; Dawson, 1977). Recent studies however show that alcohol related psychiatric problems are frequent among Irish in Ireland (Brody, 1973; Scheper-Hinghs, 1979 and Burns, 1980) suggesting that heavy drinking may be as much as symptoms as a cause; O’Carroll’s (1979) observation on Irish-American is that abusive drinking may be treated as a reaction to psychosexual and authoritarian tensions imposed by Catholicism. Italian Americans are known for using wine as workday beverages.
Several anthropologists and sociologists have highlighted American's, Polish-American's drinking habits, and associated problems. The relation of alcohol to religion has been of interest because abstinence from alcohol on religious grounds is important to some Muslims. A brief volume (Badri, 1976) shows minor variations in ideal patterns, focusing on the Koran and related texts, rather than on behaviour. Despite strict prohibition, the growth of alcohol-related problems is being recognised in Saudi Arabia (Al-Qthami, 1978), and in Bahrain (Alsafar, 1974). Some intensive studies of drinking in Japan, both rural and urban, are undertaken. The emergence of "bar culture" as an alarming response to recent impact of conflicting Western values is viewed detrimental to traditional Japanese culture (Gedig, 1979). In China, "traditional" views are reported for Chinese in Hong Kong (K. Singer, 1972), including medicinal and social uses, tempered by "Confucian moderation".

**Tribal /Non-literate studies:**

It is an undisputed fact that most non-literate societies have been consuming alcoholic beverages as part of their cultural celebrations since long, a few have shown to have alcoholism or drinking problem; drinking and drunkenness are common in such societies. The cultural meaning attached to different kinds of alcohol and their use vary across non-literate societies. Heath (1987) reviewing literatures on alcohol studies conducted on non-literate societies opines that there is no dearth of literature on this aspect. A bibliography on alcohol and world cultures (Heath and Cooper, 1981) shows vivid documentation of alcoholic practices according to region and by 'tribal community'. Heath (1981) brilliantly presented the review in a concise form in the paper. Showing the contribution of scholars to alcohol studies according to gross region, the work of Pan's (1975) monograph on Africa, Hamorth's (1980) on Zambia, the ethnographic works of Jame (1972) on Uduk, Eguchi's (1975) on the Hide, Hagman's (1980) on LoBir, Obayemi's (1976) on Yoruba; Omori (1978) on Chiga, M. Robbins' (1977) on Buganda) are noteworthy publications.
The place of alcoholic beverages on Oceania populations has been analysed by scholars namely M. Marshall and Marshall, 1975, 1976, Freund and Marshall, 1977.

The catastrophic impact of alcohol on aboriginal population of Australia and North America and New Zealand is brought to fore by Australia (1977), Collmann (1979), and Graves et al. (1979a, 1979b). Similarly, all ethnographies on Latin America have some allusion to drinking and drunkenness. The literature on native North America peoples is massive on both alcohol use and its policy implication (Mail and Mc Donantd 1980; May 1977; Leland 1980; Heiderreids 1976; Baker 1977; and Board 1975). Several dimensions of alcoholic habits and their implication on the degree of vulnerability of American Indians to alcoholism and mental health problems have come to realise. The Honigmanns (1970) and others have shown the out come of alcoholic behaviours of several ethnic groups of Artic -sub-artic populations. The population groups of North West and Southern Western regions of U.S.A were studied by different authors for understanding the culture of alcoholic drinks and related behavioural outcome (Jilek, 1974, 1981; Jilek-Aall, 1974, 1981; May, 1976; Kenmitzer, 1972; Fairbanks, 1973; Stratton et al., 1978; Waddell and Everett, 1980; Levy and Kuntz, 1974; LeLand, 1975). Except ethnographic description, no in-depth studies on alcohol have been undertaken in recent years concerning tribal populations in Asia (Rao and Rao 1977, Westermeyer 1971, Shukla 1978).

**Cross-cultural studies:**

Drinking practices vary substantially among different societies. An understanding of such differences can help researchers, clinicians, and policymakers to develop prevention, diagnostic, and treatment measures as well as overall alcohol policies that would be appropriate for a given country. Accordingly, Bennett et al. (1998) have conducted cross-cultural analyses of drinking patterns and practices on three countries (India, Mexico, and Nigeria).
These three countries differ substantially in their ethnic and cultural characteristics, including the role that alcohol plays in daily life. To gain a better insight into the attitudes toward alcoholic beverage preferences, gender and age differences in alcohol consumption patterns, drinking contexts and drinking patterns, alcohol-related problems, approaches to prevention and treatment, and drinking indicators in each nation, cross-cultural researches on alcohol were conducted. These analyses demonstrate that no single definition of "normal" drinking, problem drinking, or alcohol dependence can apply equally to all countries or cultures.

Researchers have derived important insights about alcohol and alcohol-linked behaviours from cross-cultural research on drinking practices. According to Heath (1986), some of the most significant generalizations that derive from cross-cultural study of the subject are: a) in most societies, drinking is essentially a social act and as such, it is embedded in a context of values, attitudes, and other norms; b) these values, attitudes, and other norms constitute important socio-cultural factors that influence the effects of drinking, regardless of how important biochemical, physiological, and pharmaco-kinetic factors may be in that respect; c) the drinking of alcoholic beverages tends to be hedged about with rules concerning who may and may not drink how much of what, in what contexts, in the company of whom, and so forth; d) often such rules are the focus of exceptionally strong emotions and sanctions; e) the value of alcohol for promoting relaxation and sociability is emphasized in many populations; f) the alcohol related problems are linked with modalities of drinking, and usually also with values, attitudes and norms about drinking; g) attempts at prohibition have been successful except when couched in terms of sacred or supernatural rules.
Heath (1982) opined that “Ways of drinking and of thinking about drinking are learned by individuals within the context in which they learn ways of doing other things and of thinking about them—that is, whatever else drinking may be, it is an aspect of culture about which patterns of belief and behaviour are moulded by a combination of example, exhortation, rewards, punishments, and the many other means, both formal and informal, that societies use for communicating norms, attitudes, and values.” McAndrew and Edgerton (1969) mentioned that, “Over the course of socialization, people learn about drunkenness what their society ‘knows’ about drunkenness; and, accepting and acting upon the understandings thus imparted to them; they become the living confirmation of their society’s teachings.” Thus, how we learn to drink and continue to drink is determined most by the drinking we observe, the attitudes about drinking we pick up, and the people we drink-with. Skog (1991) mentioned that, “Individual drinkers tend to model and modify each others’ drinking and, hence, there is a strong interdependence between the drinking habits of individuals who interact....Potentially, each individual is linked, directly or indirectly, to all members of his or her culture....” Klein (1991) emphasizing on wine as a choice for integrative social occasion mentioned that, “In our society wine is clearly considered the beverage of choice for integrative social occasions. Its use is associated with sociability and the enhancement of pleasure...and is usually moderate in nature. Few, if indeed any, major alcohol-related problems are thought to arise from the consumption of wine. Wine is deemed most appropriate for consumption at home, usually during mealtime -- which, it should be noted, is yet another drinking occasion that has been related to moderate alcohol intake....”

Throughout history, wine and other alcoholic beverages have been a source of pleasure and aesthetic appreciation in many cultures. As per Heath (1995), “In most of the cultures...the primary image is a positive one.
Usually drinking is viewed as an important adjunct to sociability. Almost as often, it is seen as a relatively inexpensive and effective relaxant or as an important accompaniment to food... Its use in religions is ancient, and reflects social approval rather than scorn.... Most people in the United States, Canada, and Sweden, when asked what emotions they associate with drinking, responded favourably, emphasizing personal satisfactions of relaxation, social values of sociability, an antidote to fatigue, and other positive features...." Moderate drinking is to some extent a recommended recipe in the Italian, Spanish, French, Greek, and Jews culture. Recently from cross-cultural researches have brought to focus five ambiences that formed to be correlated with non-abusive drinking practices and low rate of alcoholism. These conditions are a) group drinking associated with ritualistic or religious celebrations, b) drinking associated with eating or ritualistic eating, c) both sexes and several generations are involved, d) drinking is divorced from defects of personal problem, e) no violence or oppression during drinking (Zinber, 1981). "A literature review provides evidence of five major informal controls -- cultural recipes that describe what substances should be used in what amounts to achieve what effects: learning to use through association with others who teach people what, when, why, how, where, and with whom to use; sumptuary rules specifying eligibility requirements for use; sanctions that reinforce the learning of substance use conventions and norms; and everyday social relations that make it expedient for people to use in some ways and inconvenient to use in others" (Maloff, 1982).

Human Relations Area Files (Heath 1987) provides a good deal of information on cross-cultural perspective on drinking based on studies made through controlled comparison and by the co-relational "holocultural" method. Further M. Bacon provided two brief reviews (1973, 1980) on alcohol studies, suggested some interesting aspects of sex differences in drinking (1976), and outlined the "dependency-conflict theory" (1974).
"Showing how drunkenness tends to occur most often in societies that combine indulgent and dependent child-training with demands for individualism and independent child-training with demands for individualism and independence among adults". In a challenge to this theory McClelland et al. (1972), proposed "power theory", which is cross-cultural in both its derivation and application, stresses that men drink alcoholic beverages in order to assuage their need for feelings of power. Frankel and Whitehead (1981) proposed "the distribution-of-consumption model" in conjunction with the "socio-cultural model" to explain underlying causation of alcoholic habits based on per-capita consumption of alcohol and alcohol related morbidity.

Data on alcohol-related problems were generated in Mexico, Zambia, Scotland, United States, and Canada, under the auspices of World Health Organization (Moser 1977). It is interesting to learn that Leland's (1976) survey of North American Indians groups provides little support for the view that they have special susceptibility to alcohol, and which was agreed by Schaefer (1981) and recent findings on physiological and biochemical studies as well. Attempts have been made also to focus cross cultural variation in beliefs and behaviours about alcohol taking samples from different countries which include China, US and Russia (Frankel 1980) and on different religions like: Western Christianity, Hindu-Buddhism, Judaism, and Confucianism (Maghbouleh 1979). Levy and Kunitz (1974); studied on the same aspects in a comparative manner on Naajo, Hopi and Apache Indians in Southwesternen United States, where as Waddell (1980) compared beliefs and behaviours about alcohol taking samples among Navajo, Taos, Papago and Apache in the same area; J. Honigmann (1980) on Eskimo population and Heath (1971) on two Bolivian communities.
Symbolic and communication studies:
a) Symbolic dimensions of alcohol in cultural setting:

Alcohol as a cultural object carries several meanings. The meaning is derived or interpreted according to its use in the socio-cultural, socio-economic, socio-psychological and socio-political contexts. Drinks as we have found can be used to convey an infinite variety of different and even contradictory messages. For example, a bottle of wine may in different societies or situations serve as a symbolic representation of contrasting features: tradition or modern, working class or the elite, the sacred or secular.... The meanings are symbolic in nature. From this perspective, culture can be seen as symbol systems with which the whole gamut of our life is organised in to an understandable set of actions and events (Gusfield, 1981). Clifford Geertz (1973), has stated this in an excellent fashion: "both so-called cognitive and so-called expressive symbols or symbol systems have, then, at least one thing in common: they are extrinsic sources of information in terms of which human life can be patterned – extra personal mechanisms for the perception, understanding, judgment and manipulation of the world. Culture patterns are "programs"; they provide a template or blueprint for the organisation of social and psychological processes.

The culture of drink manifests at two levels: a) the content of consumption and b) the context of consumption i.e. the setting and the participation. Marry Douglass (1984) in her own analysis of British

With the rise of interpretive theory in anthropology, the relation between alcohol and the passage from one realm to another was studied as text that was as a statement or language through which a message was being communicated. In-order to understand the meaning, emanating from alcohol and associated behavioural manifestation, the context is very important i.e. where it is occurring and on what kinds of occasions- and historical- the meaning that the past and the particular society have given it.

59
However, the interpretive perspective does not preclude the status of alcohol as expressive of a way of experiencing life and expressing culture. Joseph Gusfield (1987) in his article "Passage to Play: rituals of drinking time in American Society" made a brilliant exposition of symbolic interpretations of alcohol in different cultural settings. While analysing the meanings of alcohol in American culture, he stated that alcohol exists as a sign. It is understood as an affair that is synonymous with leisure or play nighttime attitude or weekend activity. As a form of food, alcohol is believed to be a disinhibitor (Levine 1978). Some think it as mood-selter and brings a dictomy between work and play. Social solidarity is viewed from the pattern of use of alcohol. Social hierarchical ordering is seen dissolved when alcohol is consumed or drunkenness exists in. Structure disappears with 'communication' (Turner 1969, 1977). It is also identified as marker of time and space for the transportation of the passion from one state of social position to another realm with different identity. Gusfield used the concept of 'frame' and 'key' to describe the use of alcohol in establishing period of play. The meaning of 'frame' is equated with the 'setting' whereas the meaning of 'key' is equated with devices used and conventions created. Illustrating the meaning of 'frame and key' in American society, he stated that the drinking symbolises an aftermath to work and prelude to leisure period. The 'cock tail hour' embodies the symbolism of a time between work and leisure with the expression. It is timework signals change of one frame of work- to another of play-. The festive character also changes with the change of frame. The drinking of alcohol serves as a means for solidifying personal relationship and functions as a cue to permit non-hierarchical relations, unregulated by the structure of organization. It also creates an atmosphere to explosive of the self to others.

Further, consumption of different varieties of alcohol is introduced in terms of their contrast of use. For example, Beer and wine, low alcohol content drinks are use more widely in more setting than does whiskey or gin.
The use of alcohol in meals may be analysed symbolically. For instance, whiskey or gin with higher concentration of alcohol may be served before meal whereas beer or wine may be offered or served as an accompaniment to the meal. What is interesting to observe that the higher the alcohol content, less it is viewed as nutrient, alcohol as a food or drink contributes in setting mood of social institution and friendliness. The cultural definition of alcohol is a liquid, which develops and sustains personal and solidary human relationship. The nature of relationship is anti-structure i.e. 'the rule bound rule oriented relationship' is blurred with alcohol entering into social space. On the other hand, the presence of alcohol takes on another meaning i.e. its nature of unpredictability.

b) Alcohol - A remission of social tension:

More often, it is seen that alcohol consumption adds fuel to unregulation of social order. It generates angry worlds, promotes denunciations and exposure severance. The image of alcohol as a harbinger of anti-structure is gradually fading away with its negative manifestations as a risky-role release. Colonial American did not generally perceive alcohol as inherently evil. The rise of prohibition movement and temperance in USA for restricting alcohol consumption on the ground of its ill effects on health registered impact on the American people in selecting alcohol for drinks. It is the opinion of many scholars (Gusfield, 1963; Levine, 1978; Spitzer, 1983; Lears, 1981; Bell, 1976; Gouldner, 1980; LeMasters, 1975) that dialectically opposite perspective emerged in construct to rationality as a product of science and technology in the post-modern work, the perspective of romanticism, joy and freeness. The use of alcohol symbolises a temporal life style that facilitates self-expression without being crazed under the rules of social control mechanism. It symbolizes a remission of social control. Joseph Gusfield (1987) says that there is an underlying uniformity of meaning reviewing round the alcohol.
Despite the occurrence of wide divergence in life style and conceptions of leisure represented in the presence or absence of alcohol. Drinkers or non-drinkers see the use of alcohol the same transformation of the framework to play. One of the examples to demonstrate laxity of concept work synonymous with abstinence of alcohol is the use of alcohol during work time in the construction activities by male members, which partially surrounded to factory discipline of industrialized world. Similarly, the use of alcohol at business echeons in modern organization violates its symbolic adherence to play time. Gusfield said, in both these examples, the meaning of alcohol is homogeneous. “What differs is the context of the rituals in the drinking act. The meaning follow the same code; speak the same language.”

a) Alcohol consumption as a means of cultural remission:

Alcohol consumption as a means of ‘cultural remission’ has a restrictive operational entity due to institution of prohibitive social and legal laws such restrictive arenas of cultural remissions according to others are toying with their self-controlled mechanism. Heath (1991) points out that: “... just as drinking and its effects are embedded in other aspects of culture, so are many other aspects of culture-embedded in the act of drinking.” In all societies, alcoholic beverages are used as powerful and versatile symbolic tools, to construct and manipulate the social world such as: a) as labels defining the nature of social situations or event b) as indicators of social status, c) as statements of affiliation, d) as gender differentiators.

An imaginative “just-so story” approach to the symbolism of alcohol in broad cultural-historical perspective was offered by Jellinek (1977), who posits it as successor to water and blood as the quintessential symbol, “the stream of life.” Emboden (1977) explained the evolution of the cult of Dionysus, emphasizing links between the god of wine and shamanistic traditions.
The implication of alcoholic beverages in religious symbolism is by no means limited to societies in which the substance itself is defied. Carter (1977) calls drinking a foundation of sacred ritual among the Aymara, beer is an offering and has other sacred values among the LoBir (Hagaman 1980), and the Quechua (C. Wagner 1978), and so forth. Alcohol is an ideal presentation from aspiring low-level patrons in small communities (Waddell 1980, Collmann 1979). Alcohol is similarly an important part of the balanced reciprocity that often obtains in parties associated with reciprocal labour-exchange (Hagaman 1980, Kennedy 1978). Not all symbolic associations are unequivocal, however, and ambivalence is often reflected in the meanings attributed to alcohol. Maghbouleh (1979) relates attitudes toward alcohol to attitudes toward witchcraft and asceticism in Western Christianity, Hindu-Buddhism, Judaism, and Confucianism. Mary Douglas (1966) makes the distinction between the interest in food as material and as symbolic by referring to eating as a “field of action. It is a medium in which other levels of categorization becomes manifest.” Levi-Strauss' *The Raw and the Cooked* is, perhaps, the most seminal work in this approach to the study of food as a symbol and as a medium of communication (Levi-Strauss 1969).

Mandelbaum’s (1965) brief inventory of cross-cultural similarities in drinking practices includes the significant generalisation: “Drinking together generally symbolizes durable social solidarity – or at least amity – among those who share a drink.”

“At the simplest level, alcohol is a substance that is shared: almost all drinking rituals and etiquettes involve sharing. Even where separate cups are used, sharing is prescribed. In many cultures, alcohol is shared not only with fellow drinkers, but also with the Gods and with the dead. The rules governing drinking stipulate not only that alcohol should be consumed in a social context and shared but that this sharing should be conducted in a friendly manner, with frequent expressions of goodwill and amity between participants.”
Drinking-places:

Consumption of alcohol is usually related to cultural territory. Drinking is, in all cultures, essentially a social activity, and most societies have specific, designated environments for communal drinking. Cross-cultural differences in the physical nature of public drinking-places reflect different attitudes towards alcohol. Positive, integrated, non-Temperance cultures tend to favour more 'open' drinking environments, while negative, ambivalent; Temperance cultures are associated with 'closed', insular designs.

Cross-cultural researches also reveal significant cross-cultural similarities or 'constants' with respect to drinking place. These are:

1) In all cultures, the drinking-place is a special environment, a separate social world with its own customs and values

2) Drinking-places tend to be socially integrative, egalitarian environments

3) The primary function of drinking-places is the facilitation of social bonding.

Context of the environment of alcohol uses

The inter relationships among several components of environments in which people live, the alcoholic beverages they consume, and the problems they experience in different community settings are analysed by social and behavioural scientists. Such research arises from a view of community settings and alcohol problems that takes into account both individual drinking behaviours and the environmental contexts in which these behaviours occur. According to this approach, drinking in different settings exposes drinkers to different risks and these risks become greater with the continued use of alcohol.
The availability of alcohol at different places where people may drink affects drinking practices and shapes the incidence, prevalence, and geographic distribution of alcohol-related problems in the community (Stockwell and Gruenewald 2001). The different places where drinkers may use alcohol also change in response to the demand for alcohol and in response to changes in community systems that meet this demand (i.e., changes in alcohol availability policy) (Holder 1998). Regulations and policies related to the availability and use of alcohol provide an opportunity for policymakers to affect the geographic distribution of alcohol problems and create safer communities. Most current ecological studies dealing with the interactions of individual drinking practices with the drinking environment are based on observation that alcohol problems occur in environmental settings, and environmental settings may be changed through community action understanding drinking environments.

According to Single and Wortley (1993) there are three complementary ways of obtaining information about the role of the alcohol environment in alcohol use and related problems: a) asking people when and where they drink, b) examining the geographic distribution of drinking-related events, and c) obtaining information on drinking places and their relationships to drinking outcomes.

The first and most customary way to gather information about drinking environments is simply to ask people where they drink, the circumstances of their drinking and their drinking behaviours. This survey approach collects general information about the use of drinking venues (e.g., bars, restaurants, at home), the relationships between drinking patterns and drinking locations, and the relationships between drinking behaviours and problem outcomes. Surveys are useful for studying how people interact with their environments, such as whether people purchase alcohol along with other goods or whether beer drinkers are more likely than wine drinkers to drink and drive.
The second way of obtaining information about drinking environments is to examine the geographic distribution of drinking-related events, such as the locations of alcohol-related crashes, arrests for public drunkenness, and other alcohol-related problems. This approach draws on archival data, such as police reports, and emphasizes the importance of mapping to understanding alcohol problems. If there is a regular and predictable geographic distribution of problem events (e.g., alcohol-related crashes), then some feature of the environment (e.g., locations of high traffic flow) must be related to those problems. The third approach to obtaining information about the alcohol environment and its relationships to alcohol problems is more difficult. It requires the identification of specific environmental features of the community related to alcohol use (e.g., alcohol outlets), and the empirical examination of the relationships between these environmental features and problem outcomes. This third approach is particularly useful in cases where neighbourhood alcohol problems are not necessarily related to the drinking behaviour of local residents.

Is Alcoholism a Problem? Contrasting opinions!

Most non-anthropological scholars who deal with alcohol tend to focus primarily on various problems that they consider important from its adverse effect on health and society, whereas most anthropologists tend to focus more on the use. For anthropologists, alcoholism is not a serious problem in many societies that use alcohol. Several studies have attempted to discern what kinds of events or symptoms are labelled problematic by various populations because of prolonged alcoholic habits. The World Health Organisation's first multinational study on drinking focuses on "Community Responses to Alcohol-Related Problems" (Moser 1977). Anthropologists are of the opinion that aggression and criminality are not always a bi-product of alcoholic habits of native populations. The problems in American Indians in USA are more exargeted than expected.
Making a causative link of drinking with homicide and suicide is not corroborated with compelling evidences. The suicide and homicide rate in wet areas of USA have lower rate than the dry area. However, a frequent association between alcohol and apression was separated in urban centres in western culture. The distilled liquor makes men more violent than fermented beverages, which may be a factor that contributes to aggression (Boyatnis, 1975). The socially integrative function of drinking loom large in western culture then among an integral community an observation that very often reported by ethnologists. However, in traditional societies, when drinking is culturally inappropriate, it leads to strain in social fabrics especially when drinking leads to economic depression for kins and others. Among the Cheyenne and Arapaho, frequent drunkenness and neglect on the part of parents seem to result in several emotional deprivations among children (Albaugh and Albaugh, 1979). While acknowledging the validity of Horton's (1943) thesis "the primary function of alcoholic beverages in all societies in the reduction of anxiety, a number of anthropologists are of the opinion that migration, acculturation and other kinds of stress in urban centres culminate in heavy drinking in several populations due to anxiety, anomie and tension.

M.K. Bacon (1973) stressed that less emphasis has been given to study culture of drinking, as compared to problem oriented study: "In spite of their prevalence, through time and across societies, drinking customs per se have received relatively little attention from research workers. Instead, research in this field has been dominated by a social problem orientation and has focused mainly on deviant aspects of drinking...This differential emphasis...undoubtedly reflects multiple origins: the negative image of drinking bequeathed by the Temperance Movement, the disease concept of alcoholism associated with the medical profession, and the realistic and urgent need to control drug-induced incompetence in an increasingly mechanized world."
Similarly Heath (1987) opined that, "... whereas most anthropologists who study alcohol tend to focus on belief and behaviour, paying at least as much attention to 'normal' as to 'deviant' patterns, most others who study alcohol tend to focus on 'alcoholism', variously defined, by implying that habitual drinking is invariably associated with some kind of problem or kinds of problems." Although their focus on non-problematic drinking led Room (1983) to accuse some ethnographers of 'problem deflation', it is clear that the phenomenological approach in itself does not by any means deny or minimize the fact that alcohol can be a social problem in certain cultures. On the contrary, the study of drinking as a complex socio-cultural phenomenon has led to a better understanding of the specific cultural factors associated with problematic, anti-social drinking patterns, as well as identifying the characteristic features of drinking-cultures, which do not exhibit these tendencies. Perhaps the most valuable contribution of this approach has been, as Heath (1987) points out:

"... the fundamental realization that many of the outcomes of [alcohol] use are mediated by cultural factors rather than chemical, biological or other pharmaco-physiological factors."

The attitudes that characterize both ethnic groups and individuals with the greatest drinking problems are being propagated as a national outlook.... A range of cultural forces in our society has endangered the attitudes that underlie the norm and the practice of moderate drinking. The widespread propagation of the image of the irresistible dangers of alcohol has contributed to this undermining" (Peele, 1984). "It is important to realize that drinking problems are virtually unknown in most of the world's cultures, including many where drinking is commonplace and occasional drunkenness is accepted. This suggests that even a technologically advanced culture might have something to learn from other cultures.... To speak of adopting traits from other cultures is problematic, because each culture is itself a complex web of interrelationships in which the parts have more meaning to each other than in isolation.... Nevertheless, it is apparent that certain ways of thinking and acting with respect to alcohol, ways that are consistently associated with drinking problems, might fruitfully be rejected, while others, those that correlate with unproblematic drinking, might well be fostered" (Heath, 1982).
Blum and Blum (1969), stated that, "...In those cultures where drinking is integrated into religious rites and social customs, where the place and manner of consumption are regulated by tradition and where, moreover, self-control, sociability, and 'knowing how to hold one's liquor' are matters of manly pride, alcoholism problems are at a minimum, provided no other variables are overriding. On the other hand, in those cultures where alcohol has been but recently introduced and has not become a part of pre-existing institutions, where no prescribed patterns of behaviour exist when 'under the influence,' where alcohol has been used by a dominant group the better to exploit a subject group, and where controls are new, legal, and prohibitionist, superseding traditional social regulation of an activity which previously has been accepted practice, one finds deviant, unacceptable and asocial behaviour, as well as chronic disabling alcoholism. In cultures where ambivalent attitudes toward drinking prevail, the incidence of alcoholism is also high." Alcohol problems are not simply a result of how much people drink. One popular approach to reducing drinking problems is to reduce the overall amount of alcohol a society consumes. However, it is remarkable how little correspondence there is between the amount of alcohol consumed (per person) in different societies and the problems this alcohol consumption generates. Heath (1982) mentioned that, "Different societies not only have different sets of beliefs and rules about drinking, but they also show very different outcomes when people do drink.... A population that drinks daily may have a high rate of cirrhosis and other medical problems but few accidents, fights, homicides, or other violent alcohol-associated traumas; a population with predominantly binge drinking usually shows the opposite complex of drinking problems.... A group that views drinking as a ritually significant act is not likely to develop many alcohol-related problems of any sort, whereas another group, which sees it primarily as a way to escape from stress or to demonstrate one's strength, is at high risk of developing problems with drinking."
From the foregoing review, one gets a clear signal that anthropologists have quite distinct focus on alcohol. They do not necessarily treat consumption of alcohol or alcoholic habits as a problem and alcoholism is 'virtually' absent even in many societies where drunkenness is frequent, highly veneered, and actively sought. However, such a firm stance to some extent puzzles sociologists, clinical psychologists and health service practitioners, who have been quite vociferous in treating alcoholism as a serious social and health problem in societies where drunkenness is ubiquitous. Dwight Heath in his concluding remarks raised the relevance of anthropological issue of alcohol and alcohol related behaviours and some implications that ought to be of interest to behavioural scientists and to health science practitioners as well. He did not find any logic to revise some of the most significant generalizations that have been generated from cross-cultural studies on alcohol. These are as follows.

1) In most societies, drinking is essentially a social act and as such, it is embedded in a context of values, attitudes, and other norms.

2) These values, attitudes, and other norms constitute important socio-cultural factors that influence the effects of drinking, regardless of how important biochemical, physiological, and pharmacokinetic factors may be in that respect.

3) The drinking of alcoholic beverages tends to be hedged about with rules concerning who may and may not drink how much of what, in what contexts, in the company of whom, and so forth. Often such rules are the focus of exceptionally strong emotions and sanctions.

4) The value of alcohol for promoting relaxation and sociability is emphasized in many populations.

5) The association of drinking with any kind of specially associated problems – physical, economic, psychological, social relational, or other – is rare among cultures throughout both history and the contemporary world.
6) When alcohol-related problems do occur, they are clearly linked with modalities of drinking, and usually also with values, attitudes, and norms about drinking.

7) Attempts at Prohibition have never been successful except when couched in terms of sacred or supernatural rules.

The social anthropological perspective, which seeks to pay greater attention to alcohol and its diverse meanings and rules in cultures, has been of great interest to wide range of public and scholars. Although, social anthropologists have set aside the ‘racial question’ in earlier alcohol studies, have began to realize the heritability of alcoholism, which unquestionably runs in families. In disapproving the American Medical Association’s labelling of ‘alcoholism’ as a disease or a handicap or disability, anthropologists prefer to look into several kinds of behaviour seem to be inappropriate that various populations identify as problematic and to suggest for implementation of programme of education, prevention and treatment. For them, violence behaviour is a learned behaviour and not an out come of alcoholism.

The emphasis on practical application of anthropology to alcohol related problems lies in identifying what kinds of alcohol whether ‘traditional’ or ‘commercial’ is implicated to have been creating economic deprivation, psychological distress, social anomic and physical disability problems in populations and the intensity of the problems in quantitative terms. Furthermore, while dealing with ‘social problems’, in terms of promising areas for further research, the anthropological generalization that has been made on alcohol studies should not be repudiated or obscured without scientific reasoning.

The study of alcohol culture of any society, whether in terms of ideology, social relations, material culture, or other respects, may help us to unravel important insights about socio-cultural systems.
Environmental Dimension:

Haeckel in 1870 coined the word 'Ecology' to mean the study of the economy of the household of animal organisms (Bates, 1953). Generally, the concept 'ecology' was broadened to mean the scientific study of complex interaction between living organism and their surround. Since then, ecological or environmental components have been pervasively incorporated in the study of biological organism and with the passages of time; it has become one of the most popular areas of biology. In fact, study of all biological systems of living beings whether in the test tube or in the laboratory, or in the natural environment, have become more meaningful and significant only when analysed and interpreted within ecological context. Human ecology emerged as a distinct area of study with emphasis on the study of interaction between human beings and their environment. There are two distinct component of environment: the biophysical environment and socio-cultural or man-made environment.

When anthropologists, more specifically, cultural anthropologists, borrowed the term ecology, they also tuned it to their own particular uses. Their intellectual exercises are chiefly oriented towards man and his activities vis-à-vis nature. They have always been aware of man's nurturing in his environment not as a biological species but as a biocultural species. The tendency to adopt ecological perspectives in anthropological analysis of society and culture was initially mooted in the framework of environmental determinism, which stressed that every cultural characteristics of any society has roots in environment. The support for strong influence of environment on cultural features came from the studies of human geographers like Montesquieu, Ratzel and Huntington.

Their views in achieving some sort of generalisation on nature-culture relationship that environment decides the nature of culture were not fully accepted by Boas and his disciples, who conversely insisted that the immediate cause of cultural phenomena is other cultural phenomena.
They rather held a possibilistic view which emphasizes that "culture acts selectively, if not capriciously, upon their environment, explaining some possibilities while ignoring others: that it is environment that is passive, an inert configuration of possibilities and limits to development, the decisive force of which lies in culture itself and in the history of culture" (Sahlins, 1968).

In the beginning of the twentieth century, the ecological vintage point in anthropology was scientifically explained by Julian Steward under the rubric 'cultural ecology' or 'ecological study of culture' (Steward, 1955). In anthropology, cultural-environmental research was not considered ecological until Julian Steward used the term 'cultural ecology'. He defined cultural ecology as "the study of the adaptive process by which the nature of society and an unpredictable number of features of culture are affected by the basic adjustment through which man utilises a given environment". His method of cultural ecology lays stress on reciprocal causality or dialectic interplay of culture and environment. Through empirical analysis, he put forward that the influence of environment is more felt in some sector of culture, which he prefers to call as 'cultural core', than other sectors. The culture-core consisted of the economic sector of society, those features that are "more closely related to subsistence activities and economic arrangements." In Stewardian approach, the subsistence economic organisation affects other sector of culture. He pleaded for a cross-cultural comparison based on the effects of the environment upon the culture-cores. Steward's analysis of cultural ecology hardly synchronizes the interplay of environment (human and non-human) on biology of man and his concept of culture-core did not carry many aspects of social structure. Nevertheless, Steward's ecological analysis based on the framework of cultural adaptation has been regarded as a cornerstone in ecological anthropology.
A broader purviews of cultural ecology could be demonstrated by Anderson (1973) who focused on culture as a means of adaptation to environment and the human adaptations to varied environments have been made possible through social-cultural institutions and behavioural responses. Man's major behavioural adaptation is culture (Alland, 1972), and that these cultural adaptations permit human groups to cope with varying environments more efficiently and speedily than genetic adaptation. Andrew Vadya, Roy Rappaport and Robin Fox (1970) on the other hand laid stress on incorporation of biological perspective in cultural ecology since man is a bio-cultural being and human adaptation to environment has been both biological and cultural. They instead, preferred to give a 'populationistic approach' to ecological analysis on the ground that the human population is, more or less, a "bounded unit" subject to quantitative description and analysis and interact intricately with non-human unit for sustenance. The human populations are not merely aggregate of individuals in any given territory but function as communities with distinctive life-style. The structural and functional continuance of human communities rest on the reciprocity with one another in complicated patterns, of food and energy relations, of protection and support, of competitions and co-operation. However, these relationships are not diffused all of a sudden or at random, with the biosphere, rather from a complex network of mutual causality or systems of relationships among themselves in course of time. Very rightly commented by Bennett (1976), that the history of human-environment relationship, especially since the emergence of Homo sapiens, has featured a growing absorption of the physical environment in to the cognitively world of human events and action. In that case, 'human ecology' is a myth, and that there is only Human society: people and their wants, and the means of satisfying them. Ecologically speaking there is a continuum between culture and nature; the growth incorporation of nature in to culture and culture to nature is a transition that several societies experience.
Since man is endowed with the cognitive capability to assimilate the properties of nature into domain of culture, the primary behavioural adaptation is cultural and cultural adaptations permit human groups to cope with varying environments more speedily than biological adaptations. The culture-environment dualism fades away, when culture becomes the Environment sinequanon for man. With humans, the interplay is between some much-generalized genetic factors, an important sociocultural milieu, and the physical world. This concept of system analysis in ecology is applicable to all living communities including man (Odum, 1971). The use of ecological system approach to study Biology-Culture-Environment relationship became more viable with the seminal work of several scholars (Anderson, 1973; Sahlins, 1977; Linton, 1952), more prominently the work of Clifford Geertz (1963), who made an initial attempt to apply ecosystem theory to agricultural ecology in his 1963 book “Agricultural Involution: The Process of Ecological Change in Indonesia”. In his introductory chapter, he defends the approach as follows:

“This mode of analysis is of a sort which trains attention on the pervasive properties of systems qua systems (system structure, system equilibrium, system change) rather than on the point-to-point relationships between paired variables of the “culture” and “nature” variety. The guiding question shifts from, “Do habit conditions (partly or completely) cause culture or do they merely limit it?” to such more incisive queries as: “Given an ecosystem defined through the parallel discrimination of culture core and relevant environment, how is it organized?” “What degree and type of stability does it have?” ... . (p. 10).

In the next chapter, Geertz defines “two types of ecosystems” – swiddening or shifting cultivation, and wet-rice production. Swiddening, in contrast to rice paddy, is “integrated into, and, when genuinely adaptive, maintains the general structure of the pre-existing natural ecosystem into which it is projected...". (p. 16), whereas rice culture more drastically recognizes the nature structure.
Well and good, but the phrase “when genuinely adaptive” is of course the sleeper: later in the chapter, he notes how swiddening, under various social pressures, can turn destructive when the interval between cultivation is shortened. He also suggests that the rice system tends to result in human population concentrations, due to its capacity for increasing yield and needs for labour, whereas the swidden system results in a dispersal of population due to its inherently limited yield. These and other conclusions have been subjected to criticism: for example, extensive agriculture apparently can support large, concentrated populations given the requisite social and political organization (e.g., Dumond’s claim, 1961), as supported by a number of observational studies of modern Maya swiddening — that swiddening in Yucatan was adequate to supply the Maya cities. The issue illustrates the point that, when dealing with human systems such as agriculture, an analysis of the “natural” properties of the cultivation as ecosystemic does not tell us what the long-range potentialities may be. Although swiddening may be closer to Nature, wet rice production has perhaps less degradational potential, since even with the pressures of increasing population and corresponding intensification of production, the system, according to Geertz, is “virtually indestructible”. However, both systems can turn destructive if they are not maintained properly, or if certain social features require them to produce more than the resources can sustain. The key variable is the social system — that is, human needs, skills, anxieties, population — all of which can be in interaction with subsistence techniques — but are not “determined” by these techniques. Their long-run function is to push subsistence systems to produce at varying rates.

Within the ambit of theoretical perspectives stated above on man-environment relationship, one of the objectives of the present study is to illuminate the linkages of physical and techno-economic environmental factors with the production, consumption and distribution of alcoholic beverages of the Bondo-Highlanders since different types of alcoholic beverages are produced from nature with the help of indigenous cultural apparatus.
The physical conditions include all objects, forces, situations, and relations of the physical world to which individuals are sensitive or which produce reaction in them. The external environment also includes an array of social conditions, standards, institutions, and cultural phenomena.

The external physical environment on this planet is the life-sustaining force – which include both biotic and abiotic components. That is why in ancient time mountains, rivers, trees, and air were deified. Seeing the vital link between the animate and the inanimate, their preservation and protection were ensured. Even today, people consider rivers sacred and worship the peepul, the banyan tree, and the tulsi plant without realising their significance.

In Orissa, a number of primitive tribes are preserved with their respective cultural identities amidst varied natural habitats. Synchronic and diachronic investigations among these tribes suggest that during the course of the last thousand years or so, these tribes have been classified under different economies according to their subsistence pattern and have adapted to different geographical environments. It will be difficult to categorise the tribes of Orissa into some exclusive economies but combination of them. For example, the practice of food gathering as a supplementary economic activity is noticed among the settled agriculturists. In this perspective, Forde (1968) while delineating a number of groups at diverse levels of cultural achievements and in different regions of the world stated that “people do not live at economic stages, they possess economies”. He further envisaged that “the adoption and practice of anyone does not imply or necessitate the complete abandonment of another, nor have any people been known to rely exclusively on one alone”.

Forest as an integral part of tribal ecosystem: Like all ecosystems, forest constitutes a natural ecosystem with four components viz. abiotic substances, producers, consumers, and the Decomposers.
The stability of an ecosystem is concomitant to the collective functions of these components and are manifested in a series of relationships involving the transfer of energy between the elements which the ecosystem composes. Forest is a dynamic natural community, an assemblage of populations of plants, animals, fungi, and bacteria that live in an environment and interact with one composition, structure, environmental relations, development, and function (Whittaker, 1970). Forest is a citadel of diversity of species. It is composed of plant communities or units of vegetations, developed and stratified in accordance with definite biological laws. The distributional pattern, the growth habits, and the ongoing competition among communities are well featured and continued to remain in consonance with the environmental entities and abiotic elements.

Man forms an important part of many ecosystems which he has often modified to serve his own particular needs and forest is one such type. Since the origin and evolution of man, forest ecosystem has been playing the pivotal role in supplementing necessary means in the form of food webs. As is evident from Palaeolithic to the beginning of Neolithic, forest was the only feeding ground of early hominids. At the advent of agricultural revolution during Neolithic cultural phase early human activities gradually shifted from forest-based subsistence to agriculture-based subsistence, which does not imply that, the dependency on forest resources was absolutely abandoned. The Neolithic men have equally utilised the forest resources as the wood for construction of huts, fire-use, fencing and making of composite tools. Even at present, the tribal communities in India largely occupy forested regions keeping harmony with nature, which continues, undisturbed in the interior areas. The forests not only provide them food, material to build houses, fuel for cooking, light and warmth, fodder for their cattle but also satisfy the deep-rooted sentiments. Their folklore revolves around the forests.
Their way of life is intimately connected with forests right from birth to death. In the time of distress, forests are their last succour.

For the majority of tribals, alcoholic beverages are cultural objects and are derived from both natural and man-made sources. Alcoholic beverages have definite place in the social and cultural lives of tribals and without these beverages the true expression and vibrations of different facets of tribal culture are hardly conceivable. The alcoholic beverages are identified in different local names in different culture both modern and primitive. When we make an analysis of linkage of physical environmental elements with procurement and production of alcoholic beverages, it is the general observation that a large chunk of tribal groups derives alcohol directly from plant resources such as Tala, Kahjuri, and Saap. Besides that, Mahula flower, jackfruit, mango, cashew fruits, food grains and millets are processed through the applications of their respective technologies for the production of several types of alcoholic beverages. The technology of production of alcoholic beverages contribute an important cultural resource of the tribal groups. It is continuous with the local ecology at one hand and local culture at the other. It is the material and non-material means of which the group’s alcoholic resources are gathered, prepared, distributed, stored and reproduced for repetitive uses.

Against the backdrop of literatures cited above on alcohol related studies, the present study aims to highlight the possible role of genetical, socio-cultural and environmental factors in influencing the drinking habits of the Bondo-highlanders— a primitive tribal community of Orissa.

Alcohol culture of tribal India: A brief account

The place of alcoholic beverages in tribal /non-literate societies is a significant entity. Mostly a good number of tribal communities of India consume different types of alcoholic beverages either as a food or as a supplementary food item.
There exists a wide variation with respect to types of alcoholic beverages consumed by tribal groups. The techniques or the methods of preparation and pattern of consumption also vary from one tribe to another despite persistence of similarity.

The method of production, consumption and sharing of different types of alcohol in different tribal communities and their linkages with the social, cultural, economic, behavioural make up and health implications of the populations have been brought to focus by a number of social scientists and health scientists.

The alcoholic beverages can be categorized into three groups, i.e., 1) alcoholic beverages produced from fermented rice or millets (without distilled), 2) alcoholic beverages from different plant juice (without distilled), 3) distilled alcoholic beverages. Except some tribes of Kerala and Nilgiri, almost all other tribes of India consume some kind of alcoholic beverages (Rao, 1971). Pingale (1973) stated that Monpas tribes of Arunanchal Pradesh prepared an alcoholic beverage “bang chang” with ground cereal or millet, and liquors prepared by using Mahua flowers. Pratap (1975) stated that tribals of Srikakulam district of Andhra Pradesh prepared liquors from fermented mango juice and consumed it about 1-2 lit. /day. Nutrition News (1996) reflects that the consumption of toddy, tapped from palm and Sago trees was a common practice among the tribes in southern and central India. This news also reflects that the tribes of Manipur and Nagaland consumed “Zu” a beer, brewed from rice and flavored with different herbs, collected from the surrounding forest whereas, tribals of Andaman and Nicobar Islands did not distill any liquor but consumed the Indian make foreign liquor, which they procured from the non-tribals of the plains. Singh and Palta (2004) reflect that the Abujhmara tribe of Chhattisgarh use of Mahua spirit is as a major alcoholic beverage and with it other alcoholic beverages like Salphi and Chind rus, which are a fresh or fermented juice of Sago palm (Caryota urens) and wild date palm is also consumed.
They also mentioned that this tribe also consumed Landa (rice beer) an other alcoholic beverage, which is very common and made by boiling equal proportions of rice or Kosra (Kutki) and Madia (Ragi) flour and then fermenting it. Singh and Palta (2004) also stated that, for Abjuhmarias' social and religious life, alcoholic drinks play a significant role and alcoholic drinks like sulphi, chind and landa are taken on all occasions. SenGupta, (1978) surveyed dietaries and nutrition aspect of several tribes of India, in which he also considered the different types of alcoholic beverages consumed by the different tribes for nutritional assessment.

A list of alcoholic beverages consumed by different tribal groups of India is mentioned below.

<table>
<thead>
<tr>
<th>Name of tribe</th>
<th>Alcoholic juice</th>
<th>Fermented alcoholic beverage</th>
<th>Distilled alcoholic beverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kolha (Orissa)</td>
<td>Tadi</td>
<td>Diang (rice)</td>
<td>-</td>
</tr>
<tr>
<td>Kuvi Kondha (Orissa)</td>
<td>Sarta</td>
<td>Diang (rice)</td>
<td>-</td>
</tr>
<tr>
<td>Dongria Kondha (Orissa)</td>
<td>Salap,</td>
<td>Pendam (rice or ragi)</td>
<td>Mahuli Mad</td>
</tr>
<tr>
<td>Porroja (Orissa)</td>
<td>Salap</td>
<td>Diang, Landa (rice or ragi)</td>
<td>-</td>
</tr>
<tr>
<td>Gadaba (Orissa)</td>
<td>Sapung</td>
<td>Pendam (rice or ragi)</td>
<td>-</td>
</tr>
<tr>
<td>Saora (Orissa)</td>
<td>-</td>
<td>-</td>
<td>Mada</td>
</tr>
<tr>
<td>Munda (Orissa)</td>
<td>-</td>
<td>Handia (rice)</td>
<td>-</td>
</tr>
<tr>
<td>Paudi Bhuiya (Orissa)</td>
<td>Salap, Sarta,</td>
<td>Diang (rice)</td>
<td>-</td>
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<tr>
<td></td>
<td>Tadi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bhumij (Orissa)</td>
<td>-</td>
<td>Harta (rice)</td>
<td>Fulee</td>
</tr>
<tr>
<td>Abujhmaria</td>
<td>Salphi, chind rus</td>
<td>Landa (rice or ragi)</td>
<td>Fulee</td>
</tr>
<tr>
<td>Khasi (Assam)</td>
<td>-</td>
<td>Handi (rice)</td>
<td>-</td>
</tr>
<tr>
<td>Padam (Assam)</td>
<td>-</td>
<td>Apong (rice)</td>
<td>-</td>
</tr>
<tr>
<td>Galong</td>
<td>-</td>
<td>Poka (rice)</td>
<td>-</td>
</tr>
<tr>
<td>Nokte</td>
<td>-</td>
<td>Kham (rice)</td>
<td>-</td>
</tr>
<tr>
<td>Riang</td>
<td>-</td>
<td>Choowask (rice)</td>
<td>-</td>
</tr>
<tr>
<td>Jhaunsari</td>
<td>-</td>
<td>Pakhwar (rice)</td>
<td>-</td>
</tr>
<tr>
<td>Lepcha (Sikim)</td>
<td>-</td>
<td>Pakhwar (rice)</td>
<td>-</td>
</tr>
<tr>
<td>Monpas (Arunanchal Pradesh)</td>
<td>-</td>
<td>bang chang (rice)</td>
<td>Mahua liquor</td>
</tr>
<tr>
<td>tribes of Manipur and Nagaland</td>
<td>-</td>
<td>Zu (rice)</td>
<td>-</td>
</tr>
<tr>
<td>Tribals of Srikakulam district of Andhra Pradesh</td>
<td>-</td>
<td>Mango liquor</td>
<td>-</td>
</tr>
</tbody>
</table>
Objectives:

Keeping in view the referred studies and approaches stated above, the broad objectives of the present study are as follows:

a) To identify presence of protective ADH and ALDH2 gene families in the studied population.

b) To highlight the socio-economic, demographic and nature of alcoholic habits of the Bondo.

c) To study the drink ideology, drinking ways and drinking habits of the Bondo and socio-cultural beliefs and practices and social customs associated with alcoholic consumption

d) To study the relationship of environmental (Physical and Socio-cultural) factors with alcohol production, distribution, and consumption

e) To shed light on the mechanism of bio-cultural adaptation mechanism characteristic of the studied population with reference to alcohol habits.