

Effects of alcohol in body

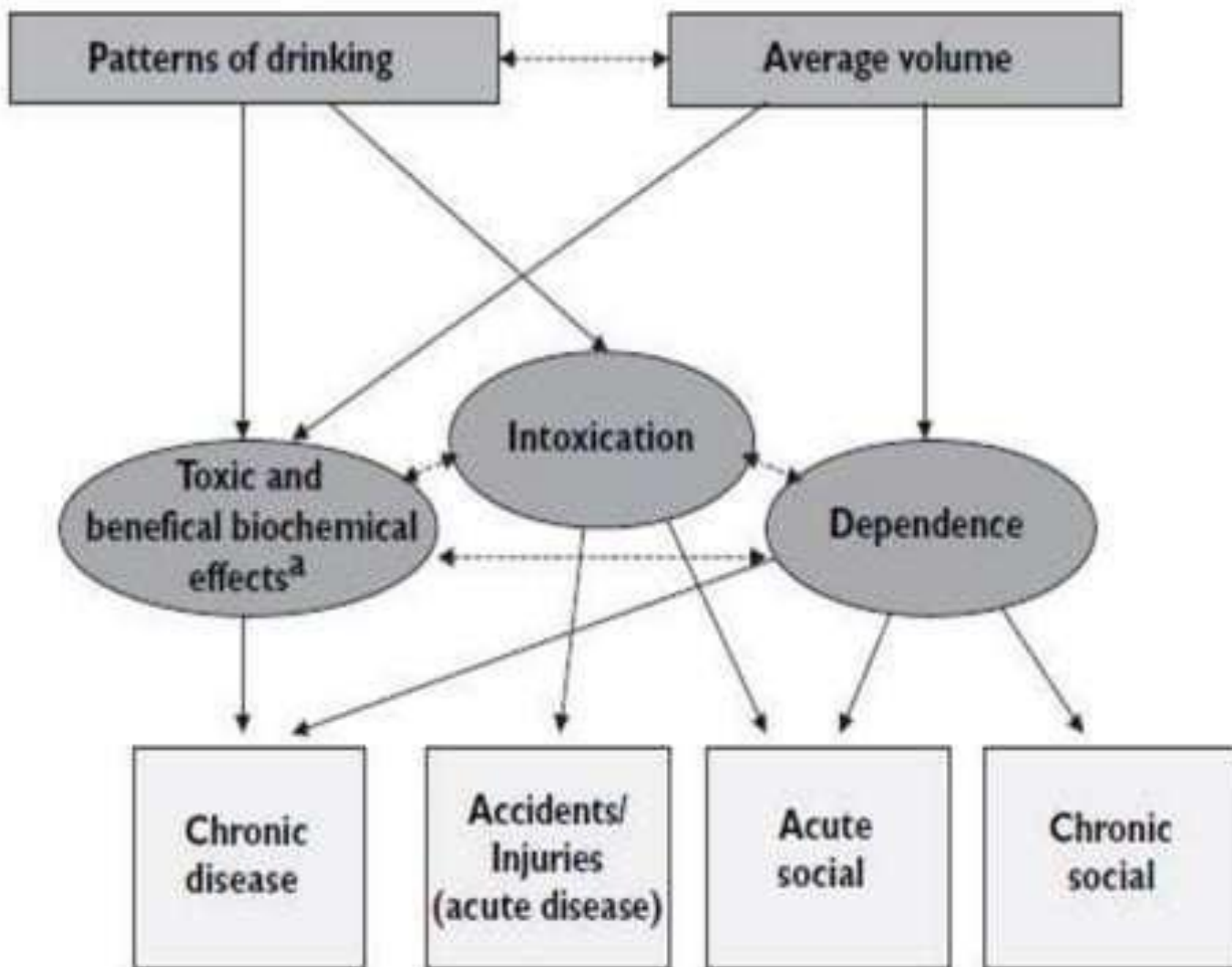
Presenter- Dr. Gautam Chakma

Introduction

- Term alcohol referred to ethyl alcohol/ ethanol, predominant alcohol in alcoholic beverages.
- Alcohol use in human history-played important role in social interactions /politics /religion/medicine/ nutrition.
- Evidence suggests-fermented beverages existed 10,000 B.C.

- Alcohol use associated with –alcoholism/abuse /tolerance(metabolic-cellular-adaptive)/dependence have social complications/various medical consequences
- Hazards of drinking known since ancient times
- Recent yrs, acknowledged as human/public health problem.

Alcohol consumption consequences



Beneficial effect

- Drinks <3 /d potential beneficial effects
- Increasing HDL/decreasing aggregation of platelets- decrease risk CAD/embolic strokes.
- Cardioprotective role- elevate tissue plasminogen activator/decreased fibrinogen concentrations/inhibition of platelet activation
- Red wine-flavinols and related substances- inhibit platelet activation.
- Modest drinking-decrease risk for vascular dementia/Alzheimer's disease.
- Potential healthful effects disappear-regular consumption >3 drinks/d

Nutritional Impact of Ethanol

- A drink contains 70–100 kcal
- Interfere with absorption/ decreases storage modestly- folic acid /B₆/B₁/ B₃/A.
- Heavy ethanol load in fasting inhibit gluconeogenesis- transient hypoglycemia within 6–36 h.
- Cause temporary abnormal GTT for 2–4 weeks.
- Alcohol ketoacidosis- decrease in fatty acid oxidation/poor diet/recurrent vomiting.
- Increase in serum ketones/mild increase in glucose/ large AG/mild-mod increase in serum lactate / hydroxybutyrate-lactate ratio 2:1-9:1

The Effects of Ethanol on Organ Systems

- Alcohol-distributes throughout body/affecting all systems
- Alter nearly every neurochemical process in the brain.
- Exacerbate most medical conditions,
- Affect any medication metabolized in the liver
- Temporarily mimic many medical-psychiatric conditions.

GIT

- Esophagus-esophageal reflux/Barrett's esophagus/traumatic rupture of the esophagus/Mallory-Weiss tears/esophageal cancer.
- Alcohol-dependent smoker 10 fold increased risk of developing esophageal cancer.
- Higher blood alcohol concentrations-decrease in peristalsis/lower LES pressure occur.

- Stomach-heavy alcohol disrupt gastric mucosal barrier cause acute/chronic gastritis.
- Stimulate gastric secretions by exciting sensory nerves buccal/gastric mucosa-release gastrin/histamine.
- Beverages 40% alcohol direct toxic effect on gastric mucosa seen chronic heavy drinkers/moderate/short-term alcohol use
- Alcohol no role pathogenesis of peptic ulcer disease.
- Alcohol exacerbates clinical course/severity ulcer symptoms/ synergistically with *Helicobacter pylori* delay healing .
- Acute bleeding from the gastric mucosa uncommon.

- Intestines- chronic diarrhea malabsorption in the small intestine -frequent loose stool/rectal fissures /pruritus ani
- Structural and functional changes in the small intestine- flattened villi/digestive enzyme levels decreased. These changes frequently are reversible after a period of abstinence.
- Treatment- replacing essential vitamins/electrolytes/slowing transit time/ abstaining from all alcoholic beverages.

- Pancreas- acute /chronic pancreatitis
- Acute pancreatitis single heavy alcohol use/prolonged heavy drinking
- Acute pancreatitis-direct toxic metabolic effect of alcohol on pancreatic acinar cells/fatty acid esters -cytokines play a major role
- 2/3 of pts develop chronic pancreatitis. .
- Many patients with chronic pancreatitis develop a chronic pain syndrome.
- Liver -fatty infiltration of the liver, hepatitis, and cirrhosis.

Central Nervous System

- Ethanol primarily CNS depressant-moderate amounts effect like barbiturates/benzodiazepines,severe intoxication-general anesthesia
- Little margin between anesthetic actions-lethal effects (respiratory depression).
- 10% alcohol drinkers progress to chronic abuse with tolerance/dependence/craving
- Chronic alcohol abuse-loss of both white/gray matter - particularly frontal lobes, extent of damage- amount/duration/older alcoholics
- Ethanol neurotoxic,loss of brain tissue, reduces brain metabolism/increased metabolism during detoxification/malnutrition/ vitamin deficiencies

Effect on NT

- Affects almost all NT systems
- Acute intoxication-greater GABA/diminished NMDA receptor activity-anticonvulsant/sleep-inducing/antianxiety/muscle relaxation
- Withdrawal diminished GABA /enhanced NMDA actions
- Physical dependence-withdrawal syndrome include sleep disruption/autonomic sympatheticactivation/tremors/seizures.
- Some individuals delirium tremens characterized by hallucinations/delirium/ fever/tachycardia/can be fatal.
- Acutely increases dopamine level ventral tegmentum/related brain regions-continued alcohol use/craving/relapse.
- During intoxication dopamine pathways changes-increases stress hormones feelings of reward / withdrawal -depression
- Changes opioid receptors release of beta endorphins.
- Also affect serotonin,nicotinic acetylcholine systems,cannabinol receptors
- Craving and drug-seeking behavior-psychological dependence.

Neurological conditions

- Acute-35% drinkers blackout /disturbed sleep-snoring - exacerbate sleep apnea-disturbing dreams/impaired judgment-coordination- increasing risk of accidents-injury/hangover syndrome-temporary cognitive deficits.
- Chronic-peripheral neuropathy-10%/cerebellar degeneration-atrophy cerebellar vermis 1% /1 in 500 full Wernicke's-Korsakoff's syndromes/brain atrophy -50% of chronic alcoholics
- After drinking very heavily for days-wks cognitive problems/temporary memory impairment lasting for wks-months
- Alcoholic dementia syndrome-irreversible cognitive changes in the context of chronic alcoholism

Psychiatric

- 2/3 of alcohol-dependent individuals meet the criteria for a psychiatric syndrome DSM-IV.
- Half preexisting antisocial personality impulsivity/disinhibition-alcohol/drug dependence
- Common comorbidity-dependence on illicit substance
- Psychiatric syndromes temporarily during heavy drinking/subsequent withdrawal- 40% alcohol-induced mood disorder, 10–30% alcohol-induced anxiety disorder, 3–5% alcohol-induced psychotic disorders.

Hematological

- Microcytic anemia-chronic blood loss /iron deficiency.
- Macrocytic anemias may occur in the absence of vitamin deficiencies.
- Normochromic anemias – effect of chronic illness on hematopoiesis.
- Morphological changes-development of burr cells, schistocytes, and ringed sideroblasts.
- Reversible thrombocytopenia, $< 20,000/\text{mm}^3$ are rare.

Immunological

- Leukopenia/alteration of lymphocyte subsets/decreased T-cell mitogenesis/changes in immunoglobulin production.
- Depressed leukocyte migration into inflamed areas may account in part for the poor resistance to *Klebsiella pneumoniae*/listeriosis/tuberculosis.
- Alcohol consumption alter distribution/function of lymphoid cells by disrupting cytokine regulation
- Alcohol appears to play a role in the development of infection
HIV suppress CD4 T-lymphocyte function/concanavalin A-stimulated IL-2 production/enhance replication of HIV.
- Moreover, alcohol abuse higher high-risk sexual behavior.

CVS

- Hypertension-heavy alcohol use can raise diastolic/systolic blood pressure
- Women may be at greater risk than men .
- Hypotheses- direct pressor effect unknown mechanism/increased intracellular Ca^{2+} levels/ stimulation of the endothelium to release endothelin/ inhibition of endothelium-dependent NO production.
- Another hypothesis/indirect effect-abstain before a physician visit -acute withdrawal-elevation in BP
- Oxidized LDL has been implicated in several steps of atherogenesis
- Prevalence attributable hypertension - 5-11%

- Cardiac Arrhythmias-prolongation QT/prolongation of ventricular repolarization/sympathetic stimulation
- Chronic alcohol use-SVT, AF, atrial flutter.
- VT may be responsible fo unexplained sudden death-observed in alcohol-dependent
- During continued alcohol use-arrhythmias become resistant to treatment –cardioversion/digoxin/CCB

- Cardiomyopathy-dose-related toxic effects/ depress cardiac contractility -lead cardiomyopathy -global hypokinesis.
- Fatty acid ethyl esters play a role
- Women- greater risk
- 40-50% pts with alcohol-induced cardiomyopathy who continue to drink die within 3 to 5 years- abstinence primary treatment.
- Alcohol-induced cardiomyopathy better prognosis stop drinking

- Stroke-increased incidence of hemorrhagic/ischemic stroke
drink >40-60 g/d
- Many stroke follow prolonged binge drinking in younger patients.
- Etiology-cardiac arrhythmias-thrombus /high BP/acute increases SBP-alterations in cerebral artery tone/head trauma.
- Effects on hemostasis/fibrinolysis/blood clotting could prevent-precipitate acute stroke
- The effects of alcohol on the formation of intracranial aneurysms are controversial,

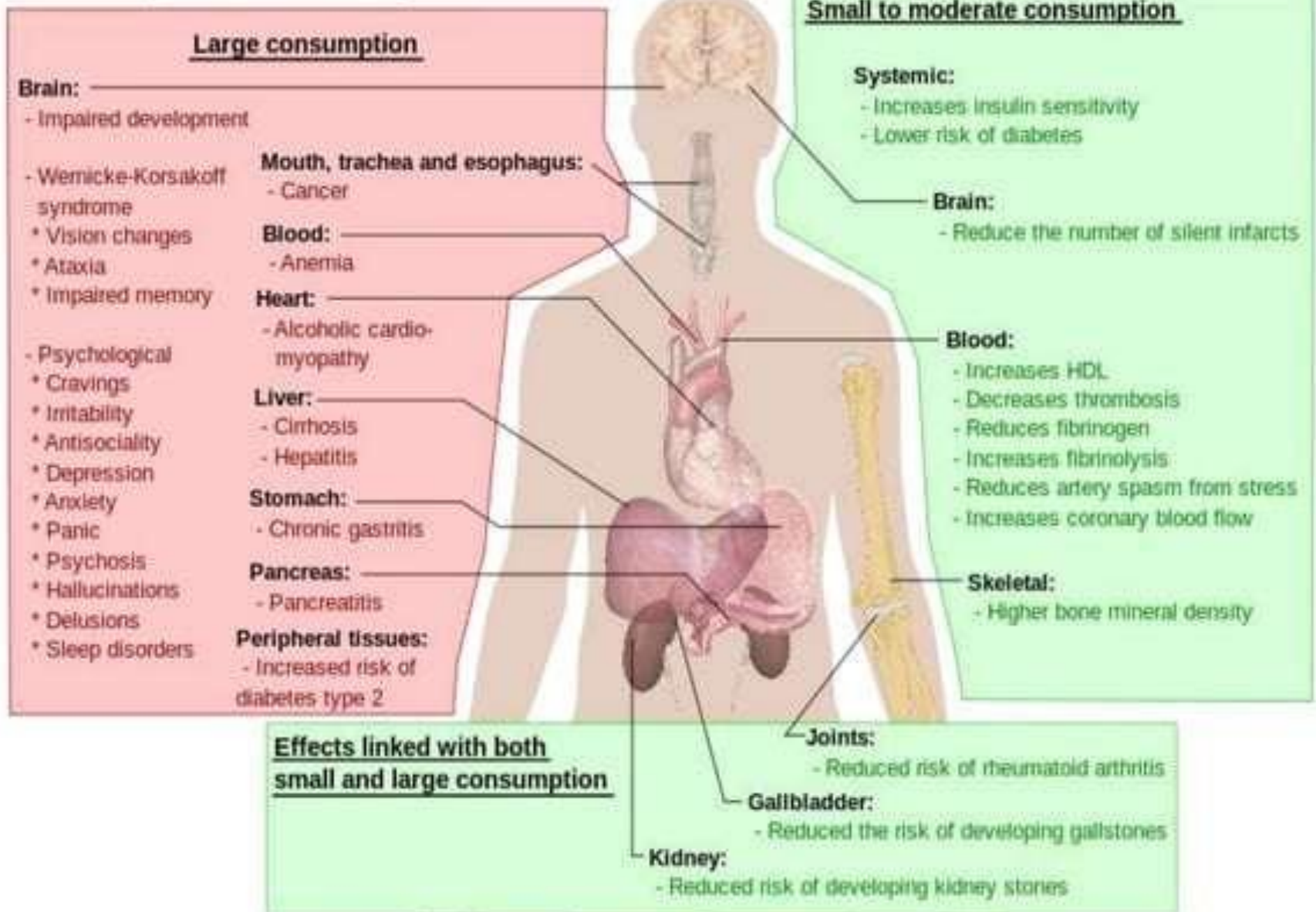
- Skeletal Muscle -decreased muscle strength,increased CK/decreased glycogen store /skeletal myopathy

- Body Temperature -feeling of warmth because alcohol enhances cutaneous/gastric blood flow/increased sweating – heat lost more rapidly/internal body temperature falls.
- Central temperature-regulating mechanism itself becomes depressed/fall in body temperature may become pronounced.
- Alcohol is a major risk factor hypothermic death
- Patients with ischemic limbs secondary to peripheral vascular disease susceptible to cold damage

- Diuresis -alcohol inhibits release of vasopressin
- Alcoholics withdrawing from alcohol exhibit increased vasopressin release and a consequent retention of water, as well as dilutional hyponatremia

Potential long-term effects of Ethanol

Red - generally "bad"
Green - generally "good"



Reproduction

- Drinking in adolescence -affect normal sexual development and reproductive onset.
- Modest ethanol doses decrease erectile capacity/testicular atrophy with shrinkage of the seminiferous tubules/decreases in ejaculate volume/lower sperm count
- Women can result in amenorrhea/decrease ovarian size/absence of corpora lutea with associated infertility/increased risk of spontaneous abortion

Teratogenic effects

- Heavy drinking during pregnancy results in the rapid placental transfer of both ethanol and acetaldehyde
- FAS- children born to alcoholic mothers -a cluster of craniofacial abnormalities/CNS dysfunction/pre-postnatal stunting of growth/Hearing, language-speech disorders incidence 0.5 -1/ 1000 live births
- Craniofacial abnormalities-maternal drinking first trimester – microcephaly/long-smooth philtrum/shortened palpebral fissures/a flat midface-epicanthal folds.
- CNS dysfunction-hyperactivity/attention deficits/mental retardation/learning disabilities
- MRI -decreased volumes in the basal ganglia/corpus callosum/cerebrum/cerebellum
- FAE/alcohol-related neurodevelopmental disorders-do not meet all diagnostic criteria of FAS with physical/mental deficits consistent with partial phenotype
- Risk- amount /trimester/maternal age/genetics/multidrug abuse
- Apart from the risk of FAS/FAEs- high amounts of alcohol first trimester-chances of spontaneous abortion.

Effect in acute intoxication

BAC (g/100ml)	Effects on the body
0.01 - 0.05	Increase in heart and respiration rates
	Decrease in various brain center functions
	Inconsistent effects on behavioral task performances
	Decrease in judgment and inhibitions
	Mild sense of elation, relaxation and pleasure
0.06 - 0.10	Physiological sedation of nearly all systems
	Decreased attention and alertness, slowed reactions, impaired coordination, and reduced muscle strength
	Reduced ability to make rational decisions or exercise good judgment
	Increase in anxiety and depression
	Decrease in patience
0.10 - 0.15	Dramatic slowing of reactions
	Impairment of balance and movement
	Impairment of some visual functions
	Slurred speech
	Vomiting, especially if this BAC is reached rapidly
0.16 - 0.29	Severe sensory impairment, including reduced awareness of external stimulation
	Severe motor impairment, e.g. frequently staggering or falling
0.30 - 0.39	Non-responsive stupor
	Loss of consciousness
	Anaesthesia comparable to that for surgery
	Death (for many)
0.40 & greater	Unconsciousness
	Cessation of breathing
	Death, usually due to respiratory failure

Table 7: Major disease and injury conditions related to alcohol (proportions attributable to alcohol use worldwide)

	Men	Women	Both
Malignant neoplasms			
Mouth and oropharynx cancers	22%	9%	19%
Oesophageal cancer	37%	15%	29%
Liver cancer	30%	13%	25%
Breast cancer	n/a	7%	7%
Neuropsychiatric disorders			
Unipolar depressive disorders	3%	1%	2%
Epilepsy	23%	12%	18%
Alcohol use disorders: alcohol dependence and harmful use	100%	100%	100%
Diabetes mellitus			
Cardiovascular disorders			
Ischaemic heart disease	-4%	-1%	2%
Haemorrhagic stroke	18%	1%	10%
Ischaemic stroke	3%	-6%	-1%
Gastrointestinal diseases			
Cirrhosis of the liver	39%	18%	32%
Unintentional injury			
Motor vehicle accidents	25%	8%	20%
Drownings	12%	6%	10%
Falls	9%	3%	7%
Poisonings	23%	9%	18%
Intentional Injury			
Self-inflicted injuries	15%	5%	11%
Homicide	26%	16%	24%

Source: Room et al, 2005

Injury burden due to alcohol use

Road Traffic Injuries	20-25% of night time crashes (30-40% of total road traffic injuries occur during night time) are associated with acute and heavy alcohol consumption. One third of brain injuries are after drinking alcohol.
Suicides	20-25% of completed suicides and 30-35% attempted suicides among men are linked to long-term use of alcohol
Violence	Nearly one third to one half of domestic violence, spousal abuse, crime and violence against children and elderly are committed under alcohol influence
Falls	Nearly 15-20% of falls are due to alcohol consumption

Source: Gururaj, 2005

SOCIAL CONSEQUENCES OF DRINKING

Social consequences related to alcohol use: areas of enquiry

Personal and Family Life

- ✦ Domestic violence
- ✦ Emotional and health impact on spouse, parents and children
- ✦ Psychological problems
- ✦ Stigma
- ✦ Economic problems
- ✦ Impoverishment and poverty related issues

- Social problems
 - ✦ Homelessness
 - ✦ Crime and other offences
- Occupational problems
 - ✦ Unemployment
 - ✦ Absenteeism
 - ✦ Reduced production
- Risky behavior
 - ✦ High risk sexual behavior
 - ✦ Drinking and driving

Children and alcoholism

- Alcoholics are more likely to have an alcoholic father, mother, sibling or a distant relative indicating a genetic predisposition.
- Alcoholism in the parent is specifically associated with an increased risk to alcoholism in the off spring. The risk is 4 to 9 times when compared to general population.
- Higher levels of co-dependence, faulty and inconsistent child rearing practices.
- Fetal alcohol syndrome
- Psychiatric problems: high levels of stress, greater occurrence of depression, anxiety, conduct disorder, and attention deficit hyperactivity disorder.
- Cognitive problems: Lower IQ, lower performance and verbal scores, academic problems, lesser motivation, and below average school performance.
- Behavioral problems: Lying, stealing, fighting, truancy, being overactive, impulsive, and greater risk for delinquency with higher degree of deviant behavior.
- Psycho-social problems: decreased personal and social competence leading to lower success rates, lower social adjustment and peer acceptance, and decreased coping ability.
- Higher risk of abuse: Emotional, physical and sexual abuse.

- Recent data indicate increasing consumption of alcohol/harmful effects across all sections of Indian society.
- Mass casualties-illicit liquor intake still occur.
- India 2004, crude estimates-total expenses for managing consequences of alcohol > revenues earned from alcohol taxes.

Thank you