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Impact of Alcohol on Drug Metabolism and Alcohol-Drug Pharmacokinetic Interactions in Alcoholics

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Review Article

ABSTRACT

The review mainly discusses the impact of alcohol on the drug metabolism and alcohol-drug pharmacokinetic interactions. Many drugs can interact with alcohol, thereby altering the metabolism or effects of alcohol on the drugs. Drugs may affect the pharmacokinetics of alcohol by altering gastric emptying and inhibiting gastric alcohol dehydrogenase. Liquor can influence the pharmacokinetics of medications by adjusting gastric exhausting or liver digestion system (by inciting cytochrome P450 2E1). Medications may influence the pharmacokinetics of liquor by modifying gastric exhausting and restraining gastric liquor dehydrogenase. Alcohol can affect the pharmacokinetics of drugs by altering gastric emptying or liver metabolism. Many alcohol-drug interactions occur at the level of actual metabolism. Alcohol intake can alter the pharmacokinetics of medications, including their absorption and metabolism. Conversely, alcohol pharmacokinetics can also be altered by medications. Drugs may affect the pharmacokinetics of alcohol by altering gastric emptying and inhibiting gastric alcohol dehydrogenase. The mechanism of alcohol-medication interactions and Some Specific Interactions are discussed.

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INTRODUCTION

Alcohol is referred to as ethyl alcohol and is an organic compound in which hydroxyl functional group bound to saturated carbon atom [1-6]. Chronic consumption of alcohol leads adverse effects to health, causes alcoholism, liver damage, and various cancers. The effects of alcohol (i.e., ethanol) on various tissues depend on its concentration in the blood [7-10]. If once the alcohol is consumed, it first absorbed by from the small intestine into the veins that collect blood from the stomach and bowels and from the portal vein, which leads to the liver, in liver, various enzymes act on it and the alcohol gets metabolised. This is called first pass metabolism.

Alcohol shows interaction with many medications, thereby alcohol alters the metabolism of the drug and drug alters the metabolism or effects of alcohol. Two types of alcohol medication interactions exist: (1) pharmacokinetic

interactions, in which alcohol interferes with the metabolism of the medication [11-16]. (2) pharmacodynamics interactions, in which alcohol enhances the effects of the medication, particularly in the central nervous system [17-24]. Many medications can interact with alcohol, leading to increased risk of illness, injury, or death. Generally most of them consume alcohol moderately or heavily, and also take medications. They may consume alcohol while medication in the stomach or take medication while there alcohol in the stomach. Most of the medications may have potential to interact with alcohol. In this case, medication-alcohol interaction occurs, these interactions may alter the drug metabolism or alcohol metabolism and cause serious adverse effects in the body [25-33].

DRUG METABOLISM

The primary site for drug metabolism is liver. In liver the enzymes act on the drug, then metabolic break down occurs. [34-38]The drug metabolism produces drug metabolites which are more active, even more than the parent compound. This active metabolite is called prodrug, especially if designed to deliver the active moiety more effectively.

MECHANISM OF ALCOHOL METABOLISM

The primary site for alcohol metabolism is liver. The alcohol circulating in the blood stream if once reaches to the liver, there the enzymes act on the alcohol [39-43].The most important enzymes which act are ADH and cytochrome P450. Oxidation reaction takes place, then ADH converts alcohol into acetaldehyde, this acetaldehyde causes may adverse effects which is highly toxic. Aldehyde dehydrogenase acts further on this acetaldehyde and broken down further. Cytochrome P450 actually is a system consisting of two enzymes, one is cytochrome P450 reductase and the other is CYP2E1. These enzymes acts [44,45].

Alcohol-Medication Interactions

ADH coverts the alcohol to acetaldehyde, then Aldehyde dehydrogenase acts on this acetetaldehyde and break s further. Some medications inhibit aldehyde dehydrogenase when coadministered with alcohol which leads to accumulation of acetaldehyde. This acetaldehyde which is highly toxic cause many toxic affects like nausea, vomiting, facial flushing, tachycardia and hypotension, which leads to disulfiram-like reactions and is called as acetaldehyde syndrome [46-49].

Mechanisms of Alcohol-drug Interactions

The drug reaches to the site of action through blood stream, in the same way alcohol also reacjed through blood stream. Alcohol can influence the effectiveness of a drug by altering its availability. These are the mechanisms of alcohol- drug interactions [50-53].

- The alcohol interferes with the normal metabolism of the drug, the breakdown and excretion of the drugs are delayed. Both the alcohol and drug compete for breakdown by cytochrome P450.
- The alcohol intake enhances the activity drug metabolising enzymes and they remain same even in the absence of alcohol. When it is not present for compete for the enzymes (cytochrome) there by increases the metabolism rate of the drug and finally rate if excretion increases [54-58].

- The enzymes activated by chronic alcohol intake transform some drugs into toxic chemicals that can damage the liver or other organs [59-65].
- Fourth, alcohol can magnify the inhibitory effects of sedative and narcotic drugs at their sites of action in the brain [65-71].
- Sometimes the medication also affect the metabolism of alcohol, thus altering its potential for intoxication and caused adverse effects which adds to the complexity of these interactions

SOME SPECIFIC INTERACTIONS

Antihistamines

These drugs are used in the management of allergies and cold. These drugs may cause drowsiness and sedation. When alcohol combines with antihistamines enhance the sedating effects of these agents [71-75].

Barbiturates

Barbiturates are sedative or sleep-inducing and these are the agents used for anesthesia. When they are consumed in the combination with alcohol activates some of the same molecules in the brain as does alcohol does and finally results in drug alcohol interaction and the alcohol increases medication's sedative side effects. [76]

Antibiotics

If antibiotics are taken in combination with alcohol, they interact and mostly it decrease the availability of most of the antibiotics, finally the effectiveness of the medication gets reduced [77-82].

Antidepressants

Antidepressants when taken along with the alcohol, the pharmacokinetic and pharmacodynamics interactions occurs. Antidepressants have sedation effects, this effect is increase by alcohol, alcohol consumption increases the availability of some antidepressant drugs, potentially increasing their sedative effects, finally impairing mental illness [83-86].

Antidiabetic medications

Alcohol consumption increase the availability of the antidiabetic drugs and these medications increases the risk of lower than-normal blood sugar levels which results in hypoglycaemia [87-91].

Cardiovascular medications

These are the drugs used in the treatment of disorders of heart and circulatory system. When cardiovascular medications taken combining with the alcohol, this alcohol interacts with these drugs to cause dizziness or fainting upon standing up [92-96].

Antipsychotic medications

These are the drugs are used to diminish psychotic symptoms such as delusions and hallucinations. Alcohol intake increases the sedative effect of these drugs, resulting in impaired coordination and potentially fatal breathing difficulties. The combination of chronic alcohol ingestion and antipsychotic drugs may result in liver damage [96-100].

CONCLUSION

Alcohol affects the drug metabolism and activities of the medication. Alcohol- medication pharmacokinetic interaction occurs and the alcohol interferes with the desired therapeutic actions of a medication. The alcohol sometimes enhance the medication effect and sometime decrease the effect of medication. We can't make assumption of quantity of the alcohol to be taken while taking medication, so it is good and safe to avoid alcohol consumption while taking medication.

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