



RESEARCH ARTICLE

ASSESSMENT OF LIVER FUNCTION TESTS IN BENZEN STATION WORKERS IN  
KHARTOUM STATE- SUDAN

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ABSTRACT

**Background:** Human in contact with petroleum products always in regular life needs as they are parts of many materials on consumption needs, the more affected individuals are those in direct contact with these products are individuals in work positions make easy direct exposure, as workers in petrol stations, petrol products enter the body though breathing from air; swallow in water, food, or through touching. Most components can enter the blood stream rapidly when inhaled. Liver one of the organs exposure to patrol components can lead to its damage which can be manifested in different patterns.

**Objectives:** the aim of this study was to assess the liver function tests in benzene stations workers in Khartoum state- Sudan.

**Results:** The results of the study revealed significant difference in serum Aspartate Amino Transferase (AST) and Alanine Amino Transferase (ALT) in case group as compared with control group with mean of (30.3) IU/L, (22.3) IU/L and (24.3) IU/L, (17.6) IU/L with (*P. Value* 0.001, 0.01) respectively. On other biochemical parameter there was no significant variation between case and control group (*P. Value* >0.05).

**Conclusions:** There were no obvious effects on LFT in most of parameters, but LFT should be assessed with the time of work and an end point for such work should be kept in employment rules, to prevent irreversible damage in gas worker health status.

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INTRODUCTION

Human in contact with petroleum products always in regular life needs as they are parts of many materials on consumption needs, the more affected individuals are those in direct contact with these products are individuals in work positions make easy direct exposure, as workers in petrol stations, petrol products enter the body though breathing from air; swallow in water, food, or through touching. Most components can enter the blood stream rapidly when inhaled. When touch petrol compounds, the absorption is more slowly and to a lesser extent than when breathe or swallow them.

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Most of petrol compounds leave the body through urine or when exhale air containing the compounds (Norbert, 1989). Benzene is a major constituent of petroleum and occurs naturally in crude oil. It is also formed as a result of the incomplete combustion of fossil fuels such as petroleum products and coal (Rothman et al., 1996) is a common component of gasoline (Patel et al., 2004). As a volatile organic compound, benzene is one of the main contributors to air pollutants in the environment. It is found in the environment as a contaminant from both human activities and natural processes. Furthermore, benzene is an intrinsic component of tobacco smoke, and tobacco smokers have a higher body burden of benzene than nonsmokers (ATSDR, 2014) Human exposure to benzene has significant deleterious health effects. Exposure to benzene is associated with the risk of blood disorders, including leukemia, lymphoma, aplastic anemia,

pancytopenia and chromosomal aberrations (Smith, 2010; Khalade *et al.*, 2010; Marchetti *et al.*, 2012). In addition, exposure to benzene can cause a wide range of adverse effects on many organs and systems including liver (Dundarz *et al.*, 2003; Mandiracioglu *et al.*, 2011). Hydrocarbon, measure component of petroleum, is also known to be hepatotoxic (Sofer *et al.*, 2003). The hepatotoxicity results after hydrocarbon undergoes phase 1 metabolism, thereby inducing free radicals formation. These free radicals subsequently bond with hepatic macromolecules and ultimately cause lipid peroxidation. This metabolite creates a covalent bond with the hepatic macromolecules, thereby initiating lipid peroxidation. Liver function tests can be abnormal within 24 hours after ingestion and clinically apparent jaundice can occur within 48–96 hours (Halliday *et al.*, 2004). The aim of present study was to assess the serum biochemical parameters in benzene workers in Khartoum state.

## MATERIALS AND METHODS

### Study design

A case control study conducted at Khartoum states during the period October to November 2015. An eighty (80) subjects were involved in this case control study, a 50% (40) subjects were workers in benzene stations indifferent spots in Khartoum state, while the other 50% (40) subjects were non- benzene workers, as control

### Sampling

Venous blood should be collected from case and control subjects by clean venipuncture in heparinized anticoagulant tubes. Samples were centrifuged at (1500) rpm for no less than (10) minutes. Plasma removed from the tube using a plastic pipette and stored in plastic tube used to measure the biochemical liver profile.

### Ethical consideration

Ethical consideration was taken verbally. This study posed no physical risk to participants though an interview of (10) minutes, might have been convenient to some participants. It is a convenient study, thus neither the participants name nor his institution in use in any of the study materials and each participant was assigned a unique identification number. Collected data will be secured in a computer protected by password.

### Measurement of Biochemical parameters

The (80) plasma samples obtained from the subject was analyzed for liver function tests (LFT), total protein, albumin, AST, ALT, Alkaline Phosphatase (ALP) and Gamma Glut amyl Transferase ( $\gamma$ GT), in Omdurman Military Hospital research laboratory using full automated chemistry analyzer (Mindray BS200)

### Statistical analysis

All data was analyzed using statistical analysis soft ware (SPSS) version (16). Statistical analysis included description statistic of mean and standard deviation.

## RESULTS

**Table 1. Plasma Biochemical values in case versus Control group**

No	Parameter	Case group (Mean $\pm$ SD)	Control group (Mean $\pm$ SD)	P.value	Remark
1	Total protein (g/dl)	7.6 $\pm$ 0.53	7.4 $\pm$ 0.55	0.074	b
2	Albumin (g/dl)	4.1 $\pm$ 0.28	3.8 $\pm$ 0.51	0.023	a
3	AST (IU/L)	30.3 $\pm$ 10.6	24.3 $\pm$ 9.8	0.001	a
4	ALT (IU/L)	22.3 $\pm$ 11.9	17.6 $\pm$ 10.3	0.01	a
5	ALP (IU/L)	82.23 $\pm$ 29.56	92.00 $\pm$ 33.67	0.172	b
6	$\gamma$ GT (IU/L)	25.93 $\pm$ 44.61	25.82 $\pm$ 11.45	0.989	b

- Key: a = Significant  
b = not significant
- Result expressed as mean  $\pm$  SD
- Significant different consider as p.value  $\leq$  0.05

**Table 2. Correlation between parameters of LFTs versus duration work (years)**

Parameters	Correlation Coefficient (r)
Total protein (g/dl)	0.830
Albumin (g/dl)	0.134
AST (IU/L)	0.147
ALT (IU/L)	0.340
ALP (IU/L)	0.378
$\gamma$ GT (IU/L)	.0794

Correlation is significant at the 0.01 level

## DISCUSSION

Petroleum hydrocarbons and other related carbon containing compound are converted into free radicals or activated metabolites during their oxidation in cell especially mammalian liver and kidney cells. These activated metabolites react with some cellular component such as membrane lipid to produce peroxidation products which lead to membrane changes. They may react with enzyme and cause inactivation through protein oxidation and or DNA breakage of the strands. Enzymes are useful bio-markers used in assessing specific function and integrity of a cell, especially hepatocyte. An increase level in these enzyme activities in the plasma are linked to hepatocellular damage. This study was done to evaluate liver Function Tests among Sudanese benzene station workers, 40 subjects were tested for LFTs, to assess their liver status with time of exposure to patrol components, as total protein, Albumin, AST, ALT, ALP, and  $\gamma$ GT mean $\pm$  SD obtained as (7.64 $\pm$ 0.53), (4.1 $\pm$ 0.28), (30.3  $\pm$ 10.6), (22.3  $\pm$ 11.9), (82.23 $\pm$ 29.56), and (25.93 $\pm$ 44.61) respectively. And for other 40 subjects who were control group as (7.4 $\pm$ 0.55), (3.8 $\pm$ 0.51), (24.3 $\pm$  9.8), (17.6  $\pm$ 10.3), (92.00 $\pm$ 33.67), and (25.82 $\pm$ 11.45) respectively. Statistical analysis conducted using independent T- test comparing the two groups gave significant difference in AST, ALT& Albumin, (P.Value less than 0.05). Correlation statistic between parameters of LFTs and duration of exposure to petroleum derivatives was positive correlation for all parameters, as shown in (Table 2). This study in agreement with study conducted by Masoud Neghab *et al.* (2015) which revealed that their findings were shown early liver disorder, and in our study it may be beside the fact of type of patrol, which may be not full quality enough to be loaded in high

concentration of substances are truly toxic and narrow group was included. And the disagreement of this study with many research conducted revealing that, damage more than early, considered a severe as in (Mark A D'Andrea and G Kesava Reddy, 2014; Olufunsho Awodele *et al.*, 2014).

### Conclusion

There were no obvious effects on LFT in most of parameters, but LFT should be assessed with the time of work and an end point for such work should be kept in employment rules, to prevent irreversible damage in benzene worker health status.

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