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Adverse Effect of Chronic Exposure of Fuel among Petrol Filling Workers in Benghazi-Libya

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ABSTRACT

Although petroleum products are the most important sources for energy but they may cause different side effects to human due to the risk of contamination of the environment. The individual most frequently exposed to contamination are those working in petroleum industries and petrol filling stations due to their long exposure to gasoline and inhalation of the fuel smell for a long time. The present study was undertaken to assess the extent of damage caused by the chronic inhalation of petrol fumes on hematopoietic of petrol filling worked in different stations throughout Benghazi. The study was carried out on 30 adult male as a study group and 15 as a control group. Hematological estimation was done at University Laboratory and Microsoft Excel was used as a statistical data program. Results obtained confirm that all blood parameter respected were within the normal range and this finding was differs from that obtained in other studies which found significant changes in the level of haemoglobin, white and red blood cells counts. Although no blood disorders were detected in the present study, full attention in medical surveillance of workers by performing further studies should carried out in different stations in different area in Libya.

Introduction

Most of organic solvents are chemicals with hazardous and toxic properties; they are considered as important part of the petrochemical industry and part of the great waste by-products of the chemical industry which may lead to environmental problems.

Although the most of their toxic potential is well known and there are safety rules for their use, but it has confirmed that the prolonged and high concentration exposures may lead to occupational adverse effects.

Several occupational solvents and atmospheric polluted air are absorbed by the respiratory tract or via epidermal contact into the human body. These absorbed solvents lead to primary respiratory symptoms and cause damage to the pulmonary and dermatological functions [1].

Petrol (gasoline) is a petroleum-derived liquid mixture, produced by distilling and refining process. It is a volatile and inflammable substance mainly used for internal combustion of machine [2]

Petroleum products can be used for various reasons at home, in addition to their use in manufacturing petroleum industries. The volatile nature of petrol products makes them readily available in the atmosphere once it is dispensed, especially at petrol filling stations and depots [3]. It was reported that people who work directly in petroleum industries and occupationally exposed to petrol products are more affected than others [4].

Since it was reported that several damaging effects seen following exposure to petrol were due to the chemicals present in the petrol mixture, such as benzene; therefore public health actions recommended to reduce the exposure of both workers and the general population to benzene through inhalation [5].

A common clinical result in benzene hematotoxicity is a decrease in numerous cellular elements of the circulating blood manifested as anemia, leukopenia, or thrombocytopenia in humans and animals and known as cytopenia. Benzene associated cytopenia vary and may involve a reduction in one of cellular elements of the blood historically (unicellular cytopenias) to all three of cellular elements (pancytopenia) [6].

Exposure to benzene can occur occupationally and domestically due to use of benzene-containing petroleum products, including motor fuels and solvents. Benzene is an aromatic hydrocarbon, which is a natural component of crude oil and petroleum products. The chemical and physical characteristics of benzene make them rapidly absorbed by inhalation route during occupational exposure to benzene [7].

There are several complications in certain systems that may occur due to long-term exposure to benzene. Benzene affects blood production (red and white blood cells) by affecting the bone marrow development, resulting in a life threatening disorders, for example; a plastic anemia has long been related to chronic exposure to high concentration of benzene [8].

It is known that the haematopoietic system is highly sensitive to the most of the air pollutants, which are reaching the blood very fast without being metabolized. The process of red blood cells proliferation can be obstructed by the solvents and air pollutants. These changes are reflected in the synthesis of heme and the life expectancy of red blood cells. Furthermore, it was confirmed that, toxic substances from air can cause a large damage to red blood cells producing aplastic anemia [1].

It is known that hazards in the gasoline-filling stations can be found in different forms, such as chemical, physical, biological and psychological. Because of the massive amount of hazards in such workplaces in addition to the lack of awareness given to health and safety by a lot of employers; the number of cases and the types of occupational diseases are increasing in both developing and industrialized countries. In addition it was reported that work-related accidents and diseases continue to consider as serious problems worldwide [9].

In spite of occupational diseases have been recognized in gasoline-filling workers, and affect them in different ways, such diseases are still problems in all parts of the world [10]. Therefore, the objective of the present study is to investigate whether exposure to Libyan petrol in petrol filling workers has adverse effect on their haematological parameters.

Method

The present study (descriptive cross section study) carried out at petrol filling stations in different areas in Benghazi city, involved only male individuals. Information has been collected from workers including age, smoking status, duration of employment and medical history. After consent, team of Laboratory of Benghazi University in Alhummaidah center, collected specimens of blood to investigate the complete blood counts which can be used as screens for early detection of gasoline blood disorders among the workers exposed to gasoline.

-Inclusion subjects:

- Age group more than of 18years old and less than 60years old.
- Healthy males.

- Exclusion subjects:

- Subject suffering from cardiovascular disorders.
- Subject with any kind of malignancies.
- Subjects with chronic renal or respiratory disease.

Smoker subjects supposed to be excluded but unfortunately, it was very difficult to find petrol filling workers that don't smoke, therefore, we have been forced to include them in our study.

Blood Collection:

Subjects were made to relax and comfortably seated. Venous blood sample (5ml) was collected aseptically by using heparinized disposable syringes from a peripheral vein on arm of each subject, to evaluate haemotological parameters. All tests were conducted between 8.0 am to 11.0 am, all subjects were fasted. The parameters recorded are:

1. Haemoglobin- in grams per decilitre (g/dl)
2. Red Blood Cell count- in millions per cubic millilitre ($x10^6$ µl).
3. White Blood Cell count - in thousands per cubic millilitre($x10^3$ µl).

Statistical Analysis

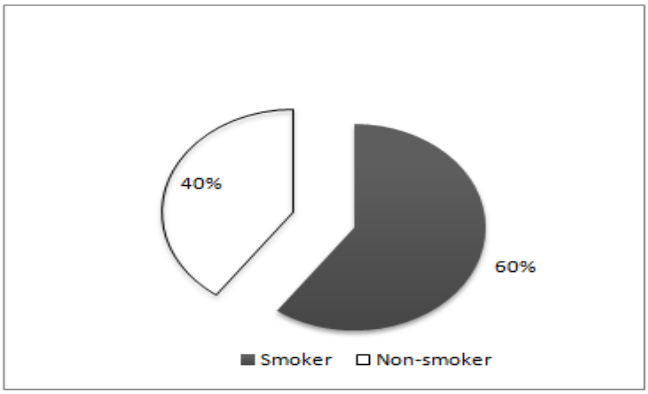
Analysis of the data was done by using descriptive statistics such as mean and standard deviation using Microsoft Excel.

Results and Discussion

The results obtained from the laboratory of University, were tabulated and means (± standard deviation) of the recorded parameters were calculated.

The age of petrol filling workers ranged between 60-18 years, the mean age was calculated as 37 ± 11 years old. AS seen in figure (1) most of workers (18) were smokers and the rest of them (12) were non-smokers.

Figure1: Percentage of smokers and non-smokers workers



The normal range of haemotological parameters are illustrated in table (1),

Comparing current results with normal ranges; it has found that; the mean of WBC and RBC counts were 6.37 (±1,59), 5.13 (±0.39) respectively and Hb level were 14.95 (±0.88).

As shown in figure (2); all the parameter measurements were within the normal ranges. The results represented as mean ± standard deviation.

Table1: normal ranges of Hb level WBC and RBC count

RBCx10^6/ µL	WBCx10/ µL	Hb in g/dl	
3.6-5.3	2.6-8.8	11.3-15.7	Normal range

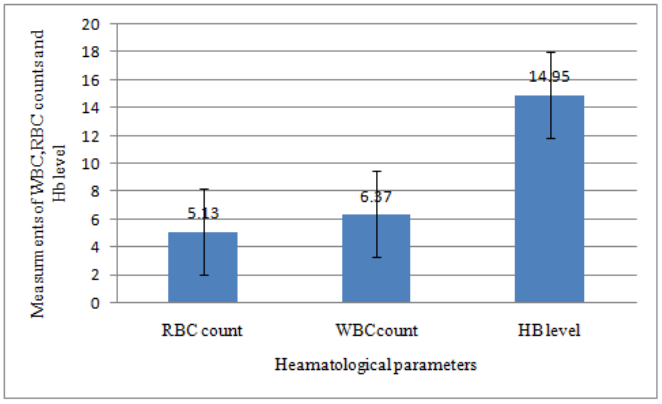


Figure 2: Measurements of Hb level, RBC and WBC counts.

Since it was difficult to find nonsmokers persons, comparison between both smokers and nonsmoker petrol filling workers was carried out to display the effect of smoking in the measurements of blood parameter. As shown in table (2) it seems that all respected parameter were almost similar in smokers and non-smokers workers. Thus it can say that smoking did not affect or cause any significant change in the blood parameter respected.

Table 2: Measurements of Hb level, RBC and WBC count in cigarette smokers and non-smokers petrol filling workers.

RBCx10^6/µL Mean ±SD	WBCx10^3/µL Mean± SD	Hb\dl blood Mean ±SD	NO.	Petrol filling workers
5.05 (±0.39)	6.42 (±1.69)	14.93(±0.78)	18	Smokers
5.26 (±0.38)	6.29 (±1.50)	15.01 (±1.06)	12	Non-smokers

As duration of exposure is consider as an important factor may lead to negative health effect thus, workers were divided to sub-group according to year of exposure. The first group included worker exposed less than 10 years and the second included workers whom exposed more than 10 years to petrol to assess the effect of exposure period on blood parameters.

Table 3: measurements of Hb, RBC count, WBC count levels in petrol filling workers in two different duration of exposure.

RBCx10^6/ µL Mean ±SD	WBCx10^3/ µL Mean ±SD	Hb/dlblood Mean ±SD	NO	Duration of exposure
5.14 (±0.38)	5.98 (±1.10)	15.08 (±1.13)	23	Less than 10 years
5.14 (±0.41)	7.21 (±1.51)	14.61 (±0.79)	7	More than 10 years

Finding demonstrated in table (3) indicated that, the measurement of Hb level and counts of RBC were within the normal range and were almost similar in both group. Although, the mean of WBC count of worker exposed for longer duration was higher than that of workers exposed to less than 10 years, but it is still within the normal range. Thus, it could be supposed that no correlation with exposure time was found in this study.

Although there were a number of studies conducted in this area in different countries of the world, and showed that exposed to petrol and its derivatives as benzene and gasoline leads to the lack of production of white blood cells and red blood cells. Our finding indicated that the exposure to petrol did not show any adverse effect in the blood parameter respected in all the workers included in this study.

It is known that; dangerous heavy metal such as lead is added in several countries to their petrol. Lead and its compounds are known as potentially toxic; and cause aberrant function to multiple human organs. It inhibits many enzymes, including pyruvate dehydrogenase, and enzymes of the heam synthetic pathway[11]. Accordingly we can explain our finding as that either the petrol used in Libyan petrol filling station does not contain any percentage of lead or we may our sample was small and it may need to increase the number of sample and repeat the blood analysis in different laboratories to confirm the results.

Conclusion and Recommendation:

-Although no blood disorders were detected in the present study, but blood diseases involvement in petrol-filling workers is still possible. Thus, efforts, and full attention in medical surveillance of workers should be given by performing further studies in different area in country to prove the safety of Libyan petrol using in Libyan petrol station.

-Furthermore, individuals at risk should be assessed periodically to prevent any expected damage.

-If the damage occurred people should change their work or they should use the provision of protective gear like specialised gowns to protect from trans-dermal absorption, and gas masks for effective prevention against inhalation the petroleum fumes.

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