Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2015; 3(8D):3054-3056 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublisher.com

Research Article

Hematological changes among Sudanese petroleum workers with a broad range of benzene exposure

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Abstract: To evaluate the hematological changes among workers with continuous exposure to benzene. This is a population-based-cross-sectional study was carried out to investigate the potential risk of exposure to benzene in Elobid city, Sudan, among Petrol Station workers. Short questionnaire was administered on the randomly chosen subjects to elicit demographic features of workers were recorded information on their exposure. And forty blood samples were collected and performed complete blood cell (CBC) and reticulocytes count for each participant. The data was entered and analyzed by SPSS prograrmme (version 16) and compared with international studies. In Result show that CBC parameters as follows : RBCs (Mean = 3.4±.6) (.00), Hb (Mean = 13.7±.5) (P value =.0.748), HCT(Mean = 41.9)(P value =.00), MCV(Mean = 77.9)(P value =.00), MCH(Mean =25.7)(P value =.00),MCHC(Mean = 32.7) P value =.00), RWD-SD (Mean = 0.325) (.00), platelets count (Mean = 276.6),(P value=.045), TWBCs(Mean = 7.3±.6)(P value = .097), Retics count (Mean = 0.32) (.00). In conclusions, those exposed to benzene may develop bone marrow depression, as evidenced by drop in Reticulocytes, Hct and red cell indices in all workers WBC and platelets count were not sensitive indicators of benzene-induced hematotoxicity.
Keywords: Hematologic Parameters; Sudanese workers; Benzene; Exposure.

INTRODUCTION:

Benzene is a hydrocarbon used as a solvent is found in the air from missions, from burning coal and oil gasoline service, station and motor vehicle [1]. Benzene is well-known carcinogen with relative hematotoxicity [2, 3]. Benzene affects blood production by affecting the bone marrow. In Korean industries, an excessive risk of hematopoietic diseases because of relatively high past exposure to benzene has been reported [4]. The most characteristic effect resulting from intermediate and chronic benzene exposure is arrested development of blood cells. Also it causes a life threatening disorder caused a plastic anemia in human and [5]. A common clinical finding in benzene hematotoxicity is cytopenia, which is a decrease in various cellular elements of the circulating blood manifested as anemia, leukopenia, or thrombocytopenia in humans and in animals. Benzene associated cytopenias vary and may involve a reduction in one (unicellular cytopenias) to all three (pancytopenia) cellular elements of the blood Historically, a complete blood count (CBC) has been recognized as an easy and readily available screening tool for assessing the hematotoxicity of benzene [6]. Following inhalation, benzene vapour is rapidly absorbed into the blood and distributed throughout the body [7, 8]. Benzene is considered to be one of the possible causes of morbidities among automobile workshop mechanics as well as in automobile painters [9]. Numerous earlier studies of benzene exposed workers demonstrated that chronic exposure to benzene air concentrations of 10 ppm or more resulted in adverse hematological effects, which increased in severity with increasing benzene exposure levels [10].

MATERIAL AND METHOD:

After the consent was obtained by participants divided in two vacationer tubes, 2.5 mL of whole blood in K2 ethylene diamine tetra acetic acid. Sysmex KX-21 (hematology analyzer) was used for complete blood counts. Red blood cell count (RBCs) hemoglobin (Hb), Hematocrit (Hct), Mean Corpuscular Volume (MCV), Mean cell hemoglobin (MCH), Mean cell hemoglobin concentration (MCHC), RWD-SD ,White blood cell count (WBC), Platelets count (PLTs and Reticulocyte counted manually form thin blood film

stained by new methylene blue. All the result compare with normal value of Sudanese people (as control).

Data analysis

Data were statistically described in terms of mean ± standard deviation (± SD), median and range, or frequencies (number of cases) and percentages when appropriate. Odds Ratio (OR) and the 95% confidence interval (95%CI) were calculated for the presence of mutation between cases and controls and analyzed by SPSS programme (version 16) (The test considered significant when P.value <0.05) .

RESULTS:

Table 1 shows the distribution of hematological parameters among exposure to benzene workers. We found that there were significant differences between the cases and control value of (PCV, MCV, MCH and MCHC).There was no difference between TWBCs and control value 92.5% of sample showed and 7.5% has high level. Also there was no difference between mean of hemoglobin and Red blood cells count. Retics count was found to be reduced 92.5%. Platelets were normal in all workers.

Table 1: hematological parameters in benzene workers:

PARAMETER	MEAN	P.VALUE	NORMAL VALUES
RBCS	3.4	0.00	3.2
HEMOGLOBIN (g/dl)	13.7	0.748	13.75
HEMATOCRIT (%)	41.9	0.000	45.5
MCV (FL)	77.9	0.000	90
MCH (Pg)	25.7	0.000	30.5
MCHC (g/dl)	32.7	0.000	43
RDW-SD	0.325	0.000	1.5
WBC ($\times 10^9$/L)	7.05	0.923	7.000
PLATELETS ($\times 10^3$/L)	276.6	0.045	300
RETICS COUNT (%)	0.32	0.000	1.5

DISCUSSION

Several studies conducted among worker exposure to benzene and found no significant association between hematological profile and benzene exposure [11, 12]. And also there were several previous research studies carried out were on composite fumes evaporating from kerosene, petrol and diesel and such studies were carried out on experimental animals. Hydrocarbons like benzene, metals like lead and volatile nitrates have all been shown to produce harmful effects on the bone marrow, spleen, and lymph nodes [13].In this study we found no significant difference between mean values of the hemoglobin, red blood cell count, White blood cell count and platelets count among exposure workers to benzene this finding was agree with other study conducted by Ali among iraqian people in Baghdad city Also was inconsistent with other study [14]. Also our finding supported by some previous studies done among exposure workers to benzene [15, 16, 17]. Also we found the significantly lower PCV values compared with controls (P < 05). These findings agree with several studies done by Dede and Kagbo [18], Ovuru and Ekweozor [19]. Our result of red cell indices (PCV, Hb, MCH and MCV) agree with result conducted by Okoro. *et al.;* concluded that the petroleum fumes cause a reduction in hematological indices which worsens with prolonged exposure [20]. Finally we found low reticulocytes count among those workers (92.5%.) with significant P.value <0.05) this me be agree with study done by Tunsaringkarn, et.,al and concluded that Exposure to benzene would cause bone marrow depression presenting as drop in hemoglobin, Hematocrit and eosinophil counts [15]. There were many limitations in this study included a lack of detailed exposure history include time of exposure and time in day per hours in the studied workers the other limitation of this study the low sample size of this study would have reduced the study power.

CONCLUSION:

In conclusions, those exposed to benzene may develop bone marrow depression, as evidenced by drop in Reticulocytes, Hct and red cell indices in all workers WBC and platelets count were not sensitive indicators of benzene-induced hematotoxicity. Also our study leads us to conclude that the hematological indices may be useful in detection early hematological changes among workers exposed to benzene.

ACKNOWLEDGMENTS

We are grateful thank all the volunteers who agreed to participate in this study.

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