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Original Research Article

Assessment of Haematological Parameters among Petrol Pump Workers in Bhubaneswar

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ABSTRACT

Background and objectives: Petrochemical workers are exposed to many noxious substances present in their work places. The most dangerous effects are due to benzene which is mostly found in petrochemical vapors. It is a well known carcinogen with relative hematotoxicity. So in our study we have assessed the hematological parameters (i.e. absolute eosinophil count, hemoglobin concentration, platelet count) of petrol pump workers in and around Bhubaneswar.

Methods: This study was conducted in the department of Physiology Hi-Tech medical college and hospital Bhubaneswar in 2016. Study group contains fifty petrol pump workers between age group of 20-50 years. Fifty healthy male nonsmokers housekeeping staff of Hi-Tech Medical College and Hospital matching socially and economically with study group were selected as controls. Absolute eosinophil count was done by using Pilots solution, Hemoglobin concentration estimation by Sahli's method and direct platelet count was done using Rees Eker's fluid.

Result: When we compare AEC in subjects who are exposed to more than 10 years with that of controls, there is decrease in count which is statistically significant. In control group when duration of exposure is between 11-15 years mean Hb concentration is 13.88 with a SD of 0.457, when duration of exposure is >15 years mean ± SD of Hb concentration is 12.64 ± 0.58 and both of these findings are statistically significant. There was no significant difference in the platelet count of study and control group.

Conclusion: In our study when the duration of exposure is more than 11 yrs the absolute eosinophil count was significantly decreased ($p<0.005$). When the duration of exposure is more than 15 years there occurs statistically decrease in hemoglobin count in study group.

In conclusions those exposed to prolong benzene exposure may develop bone marrow depression as evidenced by decrease in hemoglobin concentration and absolute eosinophil counts. So the parameters like hemoglobin concentration, absolute eosinophil count may be useful in detection of early hematological changes among exposed workers.

Key Words: Absolute Eosinophil Count, Hemoglobin, Platelet Count, Petrol chemical Workers.

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INTRODUCTION

It is a well-known fact that petrochemical workers are exposed to many noxious substances present in their work places. The most dangerous effects are due to benzene which is mostly found in petrochemical vapors.[1] Benzene (C_6H_6) is a clear, colorless, non-corrosive, volatile highly inflammable liquid. Its low boiling point and high vapor pressure causes rapid evaporation under ordinary atmospheric conditions.[2] The resulting vapors are nearly three times heavier than air and present in the atmosphere nearby. Inhalation of vapor is the principal route of exposure to benzene. It is a well known carcinogen with relative hematotoxicity.[3] High prevalence of cancer, chromosomal damage and specific hematologic malignancies associated with benzene which are acute myeloid leukemia, aplastic anaemia, myelodysplatic syndrome.[4]

The seriousness of poisoning caused by benzene depends on the amount, route, and length of exposure. Communities surrounding petroleum refineries have important health risks due to the probability of being exposed to elevated levels of benzene and other toxic chemicals.[5] Benzene causes instance oxidative stress, DNA damage, disruption of all cycle, programmed cell death.[6-7] It may interfere with cellular, humoral and innate immunity.[8]

A major effect of long term benzene exposure is on the blood. Several studies found no significant association between hematological profile and benzene exposure.

There is scarce information about hematological effects of exposure to benzene.[9] So in our study we have assessed the hematological parameters (i.e. absolute eosinophil count, hemoglobin concentration, platelet count) of petrol pump workers in and around Bhubaneswar.

Thus the objective of this study is to find out the effect of benzene exposure on haematological parameters like absolute eosinophil count, haemoglobin concentration, and platelet count.

MATERIALS AND METHODS

This study was conducted in the department of Physiology Hi-Tech medical college and hospital Bhubaneswar in 2016. Fifty petrol pump workers between age group of 20-50 years were included in the study group. They were healthy and had been working for more than 1 year. Subjects who were smokers, alcoholics, had a history of previous or present illness, had worked for <1 year duration were excluded from the study. Fifty healthy male nonsmokers housekeeping staff of Hi-Tech Medical College and Hospital matching socially and economically with study group were selected as controls. Study group was divided into four groups according to years of exposure. First group consisting of 18 subjects have exposure for 1-5 years, second group consisting of 15 subjects have exposure for 6-10 years, third group consisting of 12 subjects have exposure for 11-15 years and fourth group consisting of 5 subjects have exposure of more than 15 years. All participants completed individual informed consent forms**.** A brief physical and general examination was carried out and relevant data regarding age, sex, height, weight were collected. The study was approved by ethical committee of the institution. 3ml of venous blood were collected in EDTA tube from medial cubital vein, taking all aseptic precautions.

Laboratory analysis

Blood sample were analyzed at the dept. of Physiology. Absolute eosinophil count was done by using Pilots solution, Hemoglobin concentration estimation by Sahli's method and direct platelet count was done using Rees Eker's fluid.

Statistical analysis

Data were analyzed by Microsoft excel. Continuous data were presented as mean ± Standard Deviation. The mean values of two groups were compared by unpaired T-test. It was taken as statistically significant when P value was <0.05.

Table1: Anthropometric distributions among study and control group.

Traits	Study group (n=50)	Control group (n=50)	P value
Age (years)	28.8 ± 5.27	27.22 ± 4.18	<0.05*
Height(cm)	166.94 ± 4.4	169.86 ± 4.71	<0.05*
Weight (kg)	66.48 ± 3.55	70.3 ± 5.38	<0.05*

*significant

Table 2: Absolute eosinophil counts in study and control group.

Parameter	Years of exposure	Number of subjects	Count/cmm of blood in study group	Count in controls	P value
Absolute eosinophil count	1-5	18	253 ± 39.65	241.66 ± 35.35	>0.05
	6-10	15	233.33 ± 24.39	241.66 ± 35.35	>0.05
	11-15	12	162.5 ± 37.68	241.66 ± 35.35	<0.05*
	>15	05	105 ± 27.38	241.66 ± 35.35	<0.05*

*significant

Table 3: Hemoglobin concentration (gm/dl) in study and control group.

Parameter	Years of exposure	Number of subjects	Hemoglobin in study group	Hemoglobin in controls	P value
Hemoglobin concentration	1-5	18	15.73±0.38	15.01±0.53	<0.05*
	6-10	15	14.84±0.39	15.01±0.53	>0.05
	11-15	12	13.88±0.45	15.01±0.53	<0.05*
	>15	05	12.64±0.58	15.01±0.53	<0.05*

*significant

Table 4: Platelet count/cmm of blood in study and control group.

Parameter	Years of exposure	Number of subjects	Count in study group	Count in controls	P value
Platelet count	1-5	18	3.25±0.45	3.30±0.29	>0.05
	6-10	15	3.14±0.3	3.30±0.29	>0.05
	11-15	12	3.05±0.18	3.30±0.29	>0.05
	>15	05	3.08±0.10	3.30±0.29	>0.05

RESULTS

Data of anthropometric distribution among study group and control group were statistically significant (Table-1) (p<0.05).Comparison of absolute eosinophil count in subject and control group is depicted in table-2. When we compare AEC in subjects who are exposed to more than 10 years with that of controls, the changes were statistically significant. No statistically significant result is found when duration of exposure is < 10 years. Hemoglobin

concentration is compared between study and control group (Table-3). When years of exposure are between 1-5 years, Hemoglobin concentration in study subjects is 15.73 ± 0.38 compared to 15.01 ± 0.53 in controls which are statistically significant. When years of exposure are between 6-10yrs in study group, Hemoglobin concentration is 14.84 ± 0.39 which is not statistically significant. In study group when duration of exposure is between 11-15 years mean Hemoglobin concentration is 13.88 with a standard deviation of 0.457, when duration of exposure is >15 years mean ± SD of Hemoglobin concentration is 12.64 ± 0.58 and both of these findings are statistically significant. There was no significant difference in the platelet count of study and control group (Table-4).

DISSCUSSION

Benzene exposure to humans is associated with multiple toxicities affecting the hematological, hepatic, immunologic and chromosomal functions and increased risk of carcinogenesis.[10-11] But, the exact mechanism of toxic effect of benzene is still unknown. So this present study was conducted among nonsmoker petrol pump workers with the objective of determination of fact that the noxious chemicals particularly the benzene present in the vicinity may cause untoward changes in blood parameters. The agency for toxic substances and disease registry (ATSDR) has many cases of proven toxicity and advised many cases of benzene exposure for the vulnerable group.[12]

In the present study absolute eosinophil count, hemoglobin concentration, platelet count was measured in study and control group. Absolute eosinophil count in study subjects who were having benzene exposure for 1-5 years is 253 ± 39.65 in comparison to control group having mean absolute count 241.66 ± 35.35 which is not statistically significant. When duration of exposure is between 6-10 yrs the absolute eosinophil count is 233.33 ± 24.39 which is lower than control group but not statistically significant. However when the duration of exposure is more than 11 yrs the absolute eosinophil count was significantly decreased ($p<0.005$).[13-18] The lower no of eosinophil in those with duration of exposure more than 11 yrs may be due to suppression of bone marrow by the effect of benzene as reported by many studies.[19-20] Lower eosinophil count in those with duration of exposure is more is also found by T.Tunsaringkarn et.al.[13] Our study also shows same result as the previous study.

Long term exposure to petrochemical fumes like benzene and toxic gases like carbon monoxide in petrol filling workers had adverse effects on blood parameters thyroid and respiratory functions was reported by Naziaujma et.al. In 2008.[14] In their study hemoglobin concentration was increased. In our study we have found statistically significant increase in hemoglobin count in study subjects with duration of exposure 1-5 yrs. It may be due to tissue hypoxia due to more exposure of carbon monoxide in and around petrol filling stations. Hemoglobin concentration in study group gradually decreases in subjects with exposure of more than 5 yrs. There occurs statistically significant decrease in hemoglobin count when the duration of exposure is more than 10 yrs. By WHO criteria anaemia is defined as hemoglobin concentration lower than 13 gm/dl in men.[21] In our study when the duration of exposure is more than 15 yrs there occurs statistically decrease in haemoglobin count 12.64 ± 0.58. Like our study decrease in hemoglobin count is observed when duration of exposure is increased is found in a study by T.Tunsaringkarn et.al .

There was no statistical difference of platelet count between study and control group. Platelet count was within normal range and no significant differences with those controls were found in a study from Iraq[22] which is consistent with our findings. In contrast to our findings platelet count were significantly increased in benzene exposed subjects in study done by D'Andrea MA.[23]

In conclusions those exposed to prolong benzene exposure may develop bone marrow depression as evidenced by decrease in hemoglobin concentration and absolute eosinophil counts. It seems that platelets are not sensitive indicators of benzene induced hematotoxicity. So the parameters like hemoglobin concentration, absolute eosinophil count may be useful in detection of early hematological changes among workers exposed to petrochemical vapors like benzene. Further they should be advised to wear masks and goggles to get protection from exposure to benzene.

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