



ASSESSMENT OF THE WORK-RELATED HEALTH STATUS OF IRON INDUSTRY WORKERS IN KULATHUR AT DINDIGUL DISTRICT

A. Pandia Rajan^[a,b] and M. S. Dheena Dayalan^[b]

Keywords: health hazards, foundry industry, hemoglobin count, total leukocyte count (TLC), differential leukocyte count (DLC).

Ecological contamination is a distressing issue at the present. It deals with every aspect of our life including birth to death. The problem is not from a pinpoint source; rather it is a wide problem which contains many more aspects beyond our imagination in air, water, land etc. Many types of health hazard are in our surroundings and they gradually exposed to us. Occupational exposure to harmful substance is a very important human health hazard. Industrial empowerment worsens the problem. Check on polluting industries in Dindigul District at Kulathur. A person cannot avoid this type of health hazard. Foundry industry is strongly set at Kulathur and as such polluting the area and affect the life of nearby living persons and workers. Iron is the world's most commonly used metal and can usually be found with other elements in the form of steel. The frequently recorded health disorders between iron and steel industry workers includes: respiratory and skin problems as well as noise-related hearing impairment. An assessment has been done for the occupational hazard at iron foundry through haemoglobin concentration and total erythrocyte count. A decrement in total erythrocyte count (TLC) different Leukocyte count (DLC) and haemoglobin concentration (Hb conc.) has been found in foundry workers which is alarming to take rehabilitate steps.

Corresponding Authors

Tel: +91-9380939942

E-Mail: dr.msdcchem@gmail.com

[a] Bharthiyar Univ., P. G. and Research, Department of Chemistry, G. T. N Arts College, Dindigul, India.

[b] P. G. and Research, Department of Chemistry, G. T. N Arts College, Dindigul, India

INTRODUCTION

Iron is the world's most commonly used metal and can usually be found with other elements in the form of steel.¹ Steel is not a single product, but more than 3,500 different products that have many different physical and chemical properties, 75 percent of which have been developed in the last 20 years.²

Foundry workers are exposed to a unique collection of environmental challenges including noise, heat, vibration, organic and inorganic chemical dusts, residue, aerosols, gases, acids and other pollutants. However, professionals in the field of occupational health have focused more on the adverse health effects resulting from exposure to physical factors. The physical loads, organizational factors, individual characteristics and psychosocial factors have been found to be related to various musculoskeletal symptoms, which consist of a multi-factorial mechanism of the work-related illness. Operations in the iron and steel industry may expose workers to wide range of hazards or workplace activities that could cause incidents, injuries, death, ill health or diseases.³

Pollutants emitted from foundry work cause so much damage to blood, which carries very innocently the harmful chemicals and gases to the various organs. These substances have been shown to produce harmful effects on the blood, bone marrow, spleen and lymph nodes, since blood cells.

Toxic chemicals in the air are also stimulating the immune system to activate leukocytes and macrophages that can create tissue damage, especially to the cells living the blood vessels. Blood is an important factor for maintenance of better health.

The frequently recorded health disorders between iron and steel industry workers includes: respiratory (66 %), skin problems (31 %) ^{4,5} and noise-related hearing impairment.⁶ Occupational dermatosis is any alteration in the skin, mucosa, and annexes, which is direct or indirectly caused, conditioned, maintained or aggravated by agents present in the occupational activity or work environment.⁷ Therefore, present investigation has been made on the assessment of some haematological parameters in foundry workers at Kulathur in Dindigul District.

MATERIALS AND METHODS

There are about 10 permanent workers employed in the Iron industries. Out of this, 5 industrial workers who have been working for more than 20 years were selected for blood analysis.

The following were the "Criteria" followed for the inclusion for blood analysis.

- Those who were directly employed in rubber manufacturing operations.
- Those who have been working in the industrial units for more than ten years and above.
- Male workers in the age group of 40-60 years.

Table 1. The collected values of blood parameters of the foundry workers as given below

Blood Parameters		Standard value	Blood samples from the iron industry workers				
			S1	S2	S3	S4	S5
Age groups, years		40-60	47	55	43	50	44
Total leukocyte count, TLC, no. of cells mm ⁻³		4000-10000	8600	7400	9400	9900	10100
Differential leukocyte count, %	P	40-60	63	59	55	69	70
	L	20-40	31	40	40	30	25
	E	up to 6	3	2	5	1	5
	M	2-10	2	3	1	4	2
	B	up to 2	2	1	2	1	1
Erythro sedimentation rate (ESR), mm h ⁻¹		5-20	25/50	15/30	10/20	10/20	10/20
Hemoglobin, g dL ⁻¹		14-16	10.8	12.5	10.9	13.0	12.5
Total serum protein, g dL ⁻¹			6.5	7.4	6.9	7.1	7.1
Albumin, g dL ⁻¹			4.1	4.0	4.4	4.5	4.0
Globulin, g dL ⁻¹			2.4	3.4	2.5	2.6	3.1
Albumin/globulin ratio			1.7	1.2	1.8	1.7	1.3

Samples: S1, woman, 47 old, S2- man, 55 years old, S3 – women, 43 years old, S4 – man, 50 years old, S5 – man, 44 years old. L: Lymphocytes B: Basophiles, E: Eosinophiles, P: Polymorphous, M: Monocytes

RESULTS AND DISCUSSIONS

In order to assess the health hazards associated with chemicals used in the Foundry industry Blood samples were collected from the persons in iron industry in order to diagnosis diseases like lungs disorder, gastro intestinal tract infection. Hexavalent chromium causes dermatitis, allergic skin reaction and skin veneration. The results obtained for the blood samples of the Iron workers Table 1.

Polymorphs

The polymorphs counts of the five samples are varied from 64 to 70 % but the normal value are 40-60 %. Here there is an increase of polymorphs from 64-70 % the indicating infection of the lungs to workers.

Lymphocytes

The Lymphocytes counts of selected samples are varied from 28 to 40 % and the normal values range from 28 to 40 % and the normal values range from 20 to 40 % indicating infective disease

Eosinophyles

The Eosinophile counts of the selected samples varied from 2 to 6 % but the normal values up to 6 % The result of the various blood samples of the foundry workers with age group of 40-46 are presented and discussed. From the Table 1 the following results obtained for various blood samples are discussed.

Total leukocyte count

The TC values for selected five samples varied from 8500 to 9800 cells mm⁻³. Whereas the normal values range from 4000 to 10000 cells mm⁻³. There results come under normal values.

Differential leukocyte count (DLC)

Differential count includes the percentage of polymorphs, lymphocytes, eosinophiles, monocytes and basophils.

Hemoglobin (Hb)

The Hb values of the given samples are varied from 7 to 10g/dL. But the normal values range from 14 to 16 g/dL. The deviation is due to Anaemia of the Foundry workers.

Total protein

The normal values of control samples is 6 to 8 g/L but the observed values for five samples are in the range of 6.8 to 7 g /L indicating the normal values of the workers.

These results are not within the standard limit. The deviation is due to allergic and asthma condition of the workers.

Monocytes

The monocytes of the selected samples are varied from 1 to 2 % and the normal values are 2 to 10 % and there is a decrease in monocytes due to tuberculosis infection.

Erythro sedimentation rate (ESR)

The ESR values of the five samples are varied from 15 mm for 1 h to 60 mm for 1 h but the normal values in 5 to 20 mm for 1 h. The deviation indicates the presence of tuberculosis among foundry workers.

Albumin

The normal albumin values range from 3.2 to 5 g dL⁻¹ but the observed values for five samples range from 3.4 g dL⁻¹ to 4.5 g dL⁻¹. The values are within the normal limit.

Globulin

The normal globulin values range from 2.3 to 3.6 g dL⁻¹ but the experimental values for the five samples from 2.4 to 3.5 g dL⁻¹ indicating the values are within the normal limit.

Albumin/globulin (A/G) ratio

The normal value of A/G ratio is 1 to 1.38. But the observed values are 0.9 to 1.8 indicating there is a deviation from the normal values indicating malnutrition of the foundry workers.

CONCLUSION

Working in iron and steel industry may be associated with higher prevalence of chest manifestations hearing impairment and other occupational diseases. The nature of the toxic chemicals handled within the iron industry itself is not good for the health of the workers bare handling of chemicals like metal dusts, acids, bases and other inorganic chemicals. Dust during various processes and chemical dust inhaled by the workers leading to bronchitis.

Workers are also exposed to various types of skin disease lung diseases, nausea, respiratory tract diseases, skin allergies and dermatitis. Iron industry toxic chemicals can attack mucous membrane of nose, throat, liver and kidney. They also cause asthma bladder cancer and tumors as per the ESI report concentrated gases from pits are poisonous and cause respiratory tract problems and damage to lung diseases. The study reveals that the following findings which will be very much useful for the abatement methods for the iron industry workers.

REFERENCES

- ¹Chatterjee, A., *J. Iron Steel Inst.*, **1995**, 188, 100-4.
- ²Wilson, A., *Am. Metal Market Energy Spec.*, **2001**, 109, 11.
- ³International Labor Office (ILO).: "*Occupational Safety and Health in the Iron and Steel Industry*", **1983**, International Labor Organization, Geneva.
- ⁴American Thoracic Society, *Am. Rev. Respiratory Disease*, **1987**, 136, 1285-98.
- ⁵Achutan, C. D. and Nemhauser, J., *Health Hazard Evaluation Report*, 2003-0175-3033 COL-FIN Specialty Steel Fallston, Pennsylvania " **2007**, p. 3-9.
- ⁶Bies, D. A. and Hansen, C. H., *J. Iron Steel Inst.*, **1996**, 190, 1907-1913.
- ⁷Diepgen, T. L., Coenrads, P. J., *The epidemiology of occupational contact dermatitis*. In: Kanerva, L., Elsner, P., Wahlberg, J. E., Maibach, H. I., Ed. *Handbook of Occupational Dermatology*, Springer-Verlag, Heidelberg, **2000**, p. 1.

Received: 04.04.2015.

Accepted: 20.07.2015.