

Haematological parameters of rice mill workers in Thiruvarur District: A Case study

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R. Pavithra and T. Ananthi*

PG and Research Department of Biochemistry, S.T.E.T Women's College, Sundarakkottai, Mannargudi

Abstract

Rice is the staple food for most of the population especially in south India. It is the largest source of the food grains consumed with calorific value. Rice milling is the oldest and the largest agroprocessing industry of the country. A large amount of dust is generated, especially during the milling processes, and the labourers involved are exposed, which causes health problems including lung diseases and breathing problems. Perusal of literature proved that study on such aspects are scanty. Hence it was planned to evaluate the haematological parameters associated with occupational exposure to rice husk dust. In this study a group of 75 exposed labourers working in the rice mill, and another group of 30 healthy workers in villages of Thiruvarur district were randomly selected with age group of 25-35, 35-45 and 45-55 years. They were interviewed using standardised questionnaire and haematological parameters were evaluated. The role of rice husk dust exposure for a longer duration declined majority of haematological parameters (Haemoglobin, RBC, MCV, MCH, MCHC and Platelets) in rice mill workers. It is concluded that the rice husk dust causes adverse effect on haematological parameters in rice mill workers. The findings suggest that there is the urgent need of care for the rice mill workers to prevent occupational health hazards.

Key words: Rice husk, Haematological parameters, Rice mills

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INTRODUCTION

Rice (*Oryza sativa* L.) has been the staple food for more than half of the humanity in the world (Razavi and Farahmandfar, 2008) or two-third of the World's population. India is the second largest producer of rice in the world next to China. In India paddy occupies the first place both in area and production. West Bengal is the leading producer of paddy in the country. It accounts for 16.39% of the total production, and the other leading states are Uttar Pradesh (13.38%), Andhra Pradesh (12.24%), Punjab (9.47%), Orissa (7.68%) and Tamil Nadu (7.38%) and the remaining states account for 33.45% of the production. India is also one of the leading exporters of rice to the world market. There is significant proportion of the population working in this sector. The Rice milling is the process that helps in removal of hulls and bran from paddy grains to produce polished rice. A large amount of dust is generated, especially during the milling activities. Rice mill workers are potentially exposed to organic and inorganic dusts and synthetic chemicals that may have adverse effects on respiratory health. There have been many reports on health effects

of grain dust exposure. Grain dust has a long history of association with disease, and its adverse effects on various organs such as eyes, nose, skin, and lung and on haematological parameters have been described (Hurst and Dosman, 1990) However, few studies have been reported on the effect of rice husk dust exposure. Rice husk is known to have high silica content. This biogenic silica may cause effect on haematological parameters (Standards and Industrial Research Institute of Malaysia, 1983). Therefore, the purpose of the present study is to assess, evaluate and predict the risk of haematological abnormalities of rice mill workers and the results are discussed in this article.

MATERIALS AND METHODS

The study population consisted of all workers employed at the time of the study (November to March 2018) in five rice mills in the Thiruvarur District. Altogether there were 100 male subjects who had been exposed dust in rice mills for more than 5 years. As controls, 50 workers employed as farmers in an agricultural work station in the same District were selected. The controls were of the same sex and ethnic group and from a similar agricultural work background without exposure to rice husk dust.

Each subject and control was interviewed by a standard questionnaire. This also contained questions

*Corresponding Author :
email: elangani576@gmail.com

pertaining to symptoms of eye irritation (defined as any complaints of itchiness, grittiness, soreness, lachrymation, redness or photophobia of the eyes) and nose irritation or irritation of skin with or without rashes.

Collection of Blood

Blood samples were collected from the different age group of rice mill workers (25-35, 35-50, 50-60). For haematological parameters 2ml of intravenous blood was collected in vial Ethylene Diamine Tetra Acetic Acid (EDTA) tubes and analysed it in Hematocare V2.0 (Automated reporting system) blood cell counter machine.

Statistical Analysis

All statistical values are expressed as mean \pm standard deviation

RESULTS AND DISCUSSION

Rice is the staple food for most of the population in India. It is the largest consumed food source with high calorific value. Rice milling is the oldest and largest agro processing industry of the country. The main product of the rice milling industry is rice, it also produce a substantial amount of by products such as husk, bran and broken rice. Therefore a large amount of dust is generated during the milling activities. It has been well established that the occupational exposure of rice husk dust produce adverse health effect on haematological parameters. Hence this study was carried out among rice mill workers of Thiruvapur District to determine the impact of the exposure to rice mill pollutants on haematological parameters.

Physical parameters

There was no significant difference between the mean age, height, weight and BMI of rice mill workers and also the clinical symptoms of which the rice millers and controls complained as shown in **Table 1**. A greater proportion of rice millers complained of irritant cough, eye irritation, nose irritation, skin rashes and tightness of chest than with the control.

Table 2 shows the mean and standard deviation of haematological parameters in rice mill workers. The rice mill workers showed significantly higher Eosinophils (8.31 ± 0.37), ESR (2.53 ± 18.06), TLC (22.32 ± 0.56) respectively as compared to control, whereas significantly decreased Haemoglobin (9.86 ± 0.20), platelets (1.2 ± 0.13), MCH (21.93 ± 1.44), MCV (85.66 ± 0.166), MCHC (23.2 ± 1.55) and RBC (1.66 ± 0.39) than the control group. This study clearly indicates that there was greater proportion of anaemia, leucocytosis and eosinophils were found in rice mill workers.

Table.1. Physiological characteristics and personal habits of control and Rice Mill workers

Parameters	Control (Mean \pm S.D)	Rice mill workers (Mean \pm S.D)
Age (years)	47.5 \pm 9.35	47.0 \pm 11.08
Height (cm)	158.1 \pm 6.013	154.3 \pm 9.33
Weight (kg)	55.6 \pm 4.966	58.8 \pm 5.911
BMI(Kg/m ²)	22.43 \pm 0.14	21.75 \pm 0.11
Smokers (%)	10	28
Tobacco chewers (%)	9	19
Alcohol consumers (%)	4	18
Breathing problems (%)	6	17

Table.2. Haematological parameters in rice mill workers

Haematological parameters	Control	Rice mill workers
Eosinophils (%)	5.7 \pm 0.54	8.31 \pm 0.37
ESR (mm)	2.53 \pm 18.06	5.87 \pm 19.4
TLC ($\times 10^3 / \text{mm}^3$)	8.46 \pm 1.70	22.32 \pm 0.56
Basophils (%)	1.34 \pm 0.28	1.4 \pm 0.15
MCV (fc)	87.8 \pm 2.62	85.66 \pm 0.16
MCH (pg)	28.86 \pm 1.65	21.93 \pm 1.44
MCHC (g/dl)	32.03 \pm 1.65	23.21 \pm 1.55
Platelets count (Lakhs/cu.m)	3.2 \pm 0.3	1.2 \pm 0.13
Haemoglobin (g/dl)	14.4 \pm 1.15	9.86 \pm 0.20
RBC ($\times 10^6 / \text{mm}^3$)	5.40 \pm 0.51	1.66 \pm 0.39

Values are expressed as Mean \pm S.D.

Rice mill dust contains husk and may contain a large number of contaminants including silica, fungi and their metabolites (aflatoxin), bacterial endotoxins, insects. Therefore, the workers who work for more than 8 h daily in this type of mill are at high risk of inhaling the spores or fragments of mycelium containing aflatoxin (Hurst and Dosman, 1990). Aflatoxins are well known as potent hepatotoxin and hepatocarcinogen have been established that they find their way through respiratory route (Dillon and Bassi, 2011).

Workers exposed to husk dust during milling, transfer operations, mixing processes and develop respiratory diseases (Yach *et al.*, 1985; Massin *et al.*, 1995). The relationship between dust exposure levels and the

respiratory health status of workers in grain and flour mills, and a dose–response relationship between dust exposure levels and chronic respiratory symptoms have been demonstrated which suggested that exposure to grain and flour dust could lead to chronic bronchitis. Gimenez *et al.* (1995) reported that exposure to flour dust may induce chronic respiratory manifestations as well as low pulmonary function values among mill workers. In addition, studies of (Musal, 2000) demonstrated that grain dust exposure is a common cause of respiratory symptoms and it has been shown that there was showed obstructive changes in pulmonary function.

CONCLUSION

It is concluded that the impairment of haematological parameters clearly indicates that the harmful effect linked with rice husk dust and safety of the rice mill workers. Hence it has been suggested that there is the urgent need of preventive measures. It is also suggested that the rice mill workers have to adopt technical preventive measures, such as well-ventilated work areas and wearing appropriate respiratory protective devices. These measures would help to prevent lung damage, which often, over time, contributes to morbidity and mortality.

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