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TO STUDY CORRELATION BETWEEN HEMOGLOBIN LEVELS AND THE USE OF BIOMASS FUEL (WOOD) FOR COOKING BY FEMALES IN RURAL AREAS OF LUCKNOW DISTRICT

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ABSTRACT

Hemoglobin is the protein molecule present in red blood cells that carries O_2 from the lungs to the body tissues and returns CO_2 from the tissues back to the lungs.

The red blood cells have the ability to concentrate hemoglobin in the cell fluid up to about 34 grams in each 100 ml of cells. Anemia refers to a reduced oxygen carrying capacity of blood either due to reduced red blood cell count or decreased hemoglobin concentration. Anemia in women apart from many other causes is possibly due to the result of systemic inflammation which is probably because of the smoke of biomass fuels.

To study correlation between hemoglobin levels and use of biomass fuel (wood) for cooking by females in rural areas of Lucknow district.

The examination was done on the 44 females between 18 to 55 years of age and cooking food using biomass fuels for at least 5 years. Women who were pregnant, having history of bleeding disorders like hemophilia and Thalassaemia, history of tobacco intake, history of medications like steroids and history of hemorrhoids were excluded from the study. Examination of the blood sample for hemoglobin estimation was collected in the rural health training center (RHTC) of Era's Lucknow medical college and Hospital and hemoglobin estimation was done in the hospital lab services (HLS) Era's Lucknow medical college and hospital, which use fully analyzing method SYSMEX XS 8001for hemoglobin estimation .

The correlation between biomass fuel (wood) smoke and hemoglobin levels was strongly positive and statistically highly significant (p= 0.004).

The decrease in hemoglobin levels due to exposure to indoor air pollution resulting from the burning of biomass fuels in smoky fires for cooking have important implications for diagnosis of anemia.

KEYWORDS: Hemoglobin, Biomass fuel, Anemia, Indoor air Pollution.

INTRODUCTION

Hemoglobin is the protein molecule present in red blood cells that carries O_2 from the lungs to the body tissues and returns CO_2 from the tissues back to the lungs. The hemoglobin in the cells is an excellent acid base buffer. So the RBCs are responsible for most of the acid base buffering power of the whole body (1).

Haemoglobin combines with O2 readily and reversibly to form Oxyhaemoglobin. Combination of Haemoglobin with Carbon dioxide forms Carbaminohaemoglobin, with acid forms acid hematin and with CO forms carboxyhaemoglobin (2).

Anaemia refers to a reduced oxygen carrying capacity of blood either due to reduced red blood cell count or decreased haemoglobin concentration. The physiological anaemia can be compounded by nutritional problems including iron, folic acid and vitamin B12 deficiencies.

Wood, straw, crop residues and dung are widely used as household fuel resource in underdeveloped and developing countries (3).

Indoor air concentration associated with biomass smoke were six-fold greater in rural vs urban household. Burning biomass fuels indoor for cooking is associated with high concentrations of particulate matter and Carbon monoxide (4).

According to W.H.O., half of world's population still uses polluting fuels such as biomass fuel (coal, charcoal, wood, dung and crop residues) which emits high CO levels that which binds with haemoglobin to form carboxyhaemoglobin and reduce the level of haemoglobin in blood causing anaemia, stunting of

growth in children, reduced birth weight& respiratory disease (5).

In the developing countries, exposure to biomass fuel emissions is probably one of the most important occupational health hazards for women (6).

MATERIAL AND METHOD

This was a cross-sectional study was conducted on 44 women in rural areas (using data from rural health training center (R.H.T.C.) of Era's Lucknow medical college & hospital) for estimation of Haemoglobin level at Hospital Lab Services (HLS) who were using wood as fuel (biomass fuel) for cooking.

Inclusion Criteria

- Female subjects between 18 to 55 years of age.
- Cooking food using biomass fuels for at least 5 years.

Exclusion Criteria

- Pregnant women.
- Bleeding disorders like Hemophilia, Thallassaemia
- H/o tobacco intake.
- H/o medications (steroids)
- H/o haemorrhoid

Study Centre

Department of Physiology in collaboration with department of Community Medicine and Hospital Lab. Services (HLS), Era's Lucknow medical college & hospital.

METHODOLOGY

All the subjects who were fulfill the inclusion criteria and not falling into the domain of exclusion criteria were invited to enroll in the study till the sample size requirements were fulfilled. All subjects were explained about the protocol of the study and a written informed consent was obtained. The subjects selected for the study were motivated to give blood sample and were explained the benefits of examination of their blood sample.

The device used for estimation of hemoglobin works on principle of fluorescence flow cytometry for high quality analyzing .Venus blood sample was collected with all aseptic precautions and stored in the EDTA vial for examination in hospital lab. Survey was done in the rural areas and families living in low socio-economical status. Selections of females were done, involving those who were using biomass fuels for cooking since five years or more (7-9).

Statistical Analysis

- Data was analysed using statistical package for social sciences (SPSS) Version 20.
- Chi- Square Test & Independent sample t test was used to find the association between the type of anaemia, and the type of Biomass fuel (wood) with haemoglobin levels .
- The confidence limit of study was 80% hence the level P<0.05 was considered as the cut off value or statistically significant.

RESULTS

This cross-sectional study was conducted on 44 women living in rural areas (using data from rural health training center (R.H.T.C.) of Era's Lucknow medical college & hospital) for estimation of Hemoglobin levels at Hospital Lab Services (HLS). We performed this study to find the association between hemoglobin levels and effect of biomass fuel's (wood) smoke amongst females in rural areas of Lucknow district who was using as the primary source of fuel for cooking.

		Hemoglobin level (g/dL)	N =44	p value
Hemoglobin levels(g/dL) (n=44)	Severe	<8	10 (22.7)	<0.01
	Moderate	8 –10.9	34 (77.3)	
	Mild	11–11.9	-	
	Normal	≥12	-	

Table 1: Correlation Between Hemoglobin Levels And Fuel Used (Wood) By Females For Cooking

P value <0.01 = Statistically Highly significant; P value <0.05 = Statistically significant

Table 1 shows the distribution of severity of anemia with hemoglobin levels . In severe anemia(10%) the level of hemoglobin was found to be <8.0 gm/dL whereas the level of hemoglobin in moderate anemia (34%) was found to be 8.0 to 10.9 g/dL. None of the women using wood as cooking fuel source suffered from mild anemia. The results were found to be highly statistically significant (p<0.01)

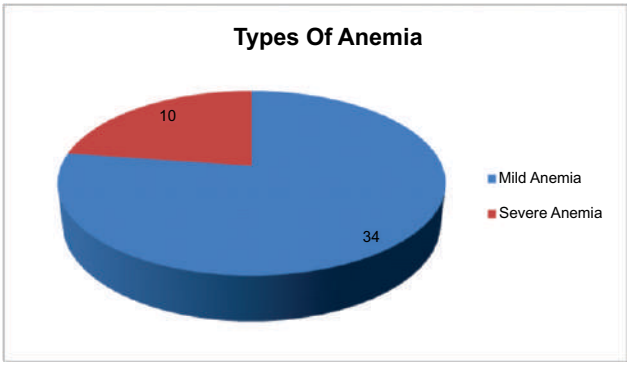

Fig 1: Distribution Of Females According To Severity Of Anemia

Anthropometric parameters	Mean±SD (n=44)	Range
Weight (in kg)	50.09±7.15	38-68
Height (in meter)	1.54±0.042	1.48-1.65
BMI(kg/m^2)	21.14±2.49	17.0-25

Table 2: Anthropometric Distribution Of Study Population

Table 2 shows the distribution of women using biomass fuel on the basis of their BMI in which the mean weight was found to be 50.09±7.15kg whereas the mean height was found to be 1.54±0.042 meters and mean BMI was found to be 21.14±2.49 kg/m^2

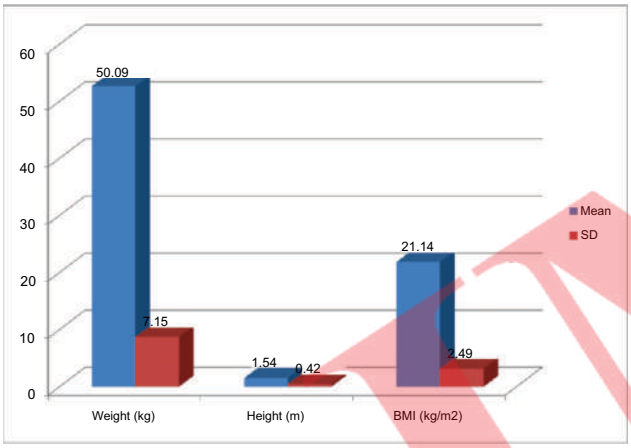

Fig 2: Anthropometric Distribution Of Study Population

DISCUSSION

Biomass smoke contains lots of pollutants substances that may be systemic inflammation, including carbon monoxide, transitional metals, ultrafine particle, particulate matter (10).

In the present study, we study the effect of biomass fuel on Hb. Level in 44 women who used wood as fuel (biomass fuel) for cooking food. After estimating the Hb. Level of women we analyses that there are 10 women whose Hb level estimated <8g/dL and 34 women whose Hb. Level 8 – 10.9g/dL. No women found whose Hb level >11. This shows that possibility of anemia may be due to use of wood as biomass fuel. Therefore smoke produced by biomass fuel i.e. wood was found to be strongly positively correlated with the hemoglobin levels in females and its impact on their hemoglobin levels was found to be highly statistically significant (P<0.01). This result was found to be in accordance with the study conducted by Charlotte M. page et al (2015) [3]who also found a strong positive correlation between use of biomass fuel and anemia which was statistically significant (p=.0001).

In the present study females using wood as biomass fuel were found to be moderate to severe anaemic. This result was found to be in accordance with the study conducted by D Behera, S Dash , SP Yadav 1991[4] who found carboxy hemoglobin in women exposed to different cooking fuels like biomass, kerosene and liquefied petroleum gas.

The decrease in hemoglobin levels due to exposure to indoor air pollution resulting from the burning of biomass fuels in smoky fires for cooking have important implications for diagnosis of anemia. Amongst the population most at risk for anemia, are women living in the poor rural areas of developing countries, were the use of biomass fuels for cooking is most prevalent.

CONCLUSION

Though, it is a small study, but on the basis of the conclusions drawn, further research work can be undertaken with a larger sample size to ascertain more confirmatory diagnostic criteria to assess the effect of biomass fuels smoke on the hemoglobin levels in females using it as source for cooking so that health status of women can be improved.

REFERENCES

1. Guyton AC, Hall JE. The text book of medical physiology. 13th ed. India: Elsevier Publication; 2016.
2. Jain A K Text book of Physiology.6th Edition. Avichal publishing Company; 2016.
3. Page C, Patel A, Hibberd P. Does Smoke from Biomass Fuel Contribute to Anemia in Pregnant Women in Nagpur, India? A Cross-Sectional Study. PLOS ONE [Internet]. [cited 2015 May 29]; 10(5):Available from: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0127890
4. Behera D, Dash S, Yadav S P. Carboxy-hemoglobin in women exposed to different cooking fuels thorax.1991; 46: 344-346.
5. Pollard SL,Williams D L,Breysse P M, Baron P A, Grajeda L M,Gilman R H, et al; A Cross –Sectional study of determinants of indoor environmental exposure in household with and without chronic exposure to biomass fuel smoke: E H Journal. 2014; 13(21):1-12.
6. Neufeld LM, Hass JD Ruel MT Graieda R, Naeher LP. Smoky indoor cooking fires are associated with elevated homeglobin concentration in iron deficent women. Pan Am J public Health. 2004 ; 15(2): 110-118.
7. Bora R, Sable C, Wolfson J, Boro, Roa R. Prevalence of anemia in pregnant women and its

effect on neonatal outcomes in Northeast India. J Maten Neonatal Med. 2013; 27(9):887-891.

8. Makhoul Z, tarend, Duncan B, Pandey P, Thomson C ,Winzerling J. Etal. Risk factors associated with anemia, iron deficiency and iron deficiency anemia in rural nepali pregnant women. Southeast Asian J Troop Med Public Heal. 2012; 43(3): 735-746.
9. Alvis N, Paternina A, Montes J, De la Hoz F. Prs39 Effect Of Biomass Smoke On Chronic Obstructive Pulmonary Disease In Rural Localities Of Colombia. Value in Health. 2011; 14(3): A144.
10. Dutta A, Ray MR, Banerjee A. Systemic inflammatory changes and increased oxidative stress in rural Indian women cooking with biomass fuels. Toxicol Appl Pharmacol. 2012; 261(3): 255–62

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