

ORIGINAL ARTICLE

A Comparative Study of Lipid Profile and Haematological Parameters in Women Beedi Rollers and Non Beedi Rollers in Rural Population of Solapur, Maharashtra

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Abstract:

Background: Beedi industry is one of the most important unorganized agro industries which occupies important place in the national economy. Women beedi rollers start their profession at a very early stage of life and are exposed to tobacco dust for approximately 4–10 hr. each day. Monitoring of blood parameters may help to evaluate the exposure and risk. **Aim and Objectives:** The study was undertaken to know the effects of tobacco dust on lipid profile and various haematological parameters in women beedi rollers from the rural population of South Solapur, Maharashtra. **Material and Methods:** The study was conducted on 100 subjects out of which, 50 were non beedi roller women and 50 were women beedi rollers selected from Ashwini Rural Medical College, Hospital and Research Centre, Kumbhari, Solapur, Maharashtra. **Results:** A highly significant increase in total cholesterol, Low Density Lipoprotein (LDL)-cholesterol and triglyceride levels with a concomitant decrease in High Density Lipoprotein (HDL)-cholesterol level in women beedi rollers was observed as compared with non beedi roller women ($p < 0.001$). Atherogenic index of plasma was also significantly higher in women beedi rollers when compared with non beedi roller women ($p < 0.001$). Haematological parameters like hemoglobin, RBC count, WBC count and platelet count were also found to be decreased in women beedi rollers as compared with non beedi roller women ($p < 0.001$). **Conclusion:** An altered lipid profile, increased atherogenic index and lower haematological parameters in women beedi rollers

could contribute towards the development of systemic illness such as cardiovascular disease in them.

Keywords: Lipid Profile, Women Beedi Rollers, Haematological Parameters

Introduction:

A beedi is a thin South Asian cigarette made of 0.2-0.3 g of tobacco flake wrapped in a tendu (*Diospyros melanoxylon*) leaf and secured with colored thread at both ends. It is very popular because it is very cheap form of tobacco but at the same time, it carries greater health risks as it delivers more nicotine, carbon monoxide and tar than conventional cigarettes [1].

Beedi industry is one of the most important unorganized agro industries occupying important place in the national Economy [2]. Beedi rolling is a manual process and a popular small-scale industry in Solapur District, Maharashtra. It is a strenuous, labour intensive task because each beedi is rolled individually. The untaught women labours roll out the beedis and help their family income. Women represent a very high percentage of labour force in this industry. The reason behind this could be that this work is generally done from home which is possible for women and they can simultaneously look after their children. Srinivasulu reported that 90% of beedi workers are women [3].

Beedi rollers are exposed to unburnt tobacco dust through cutaneous and naso-pharyngeal route [4-6]. Bagwe *et al.* reported that extracts of processed unburnt beedi tobacco contain nitrosamines precursors to potent mutagens and the aqueous beedi tobacco extract was found to exhibit moderate mouse skin tumour promoting activity [7]. Govekar and Bhisey found a marked increase in urinary thioether excretion in beedi industry workers [8]. Further studies revealed increased micronucleated buccal epithelial cell frequency in these workers [9].

Women beedi rollers who start their profession at a very early stage of life are exposed to tobacco dust for approximately 4-10 hours each day. Monitoring of blood parameters may help to evaluate the exposure and risk. Hence, the study was undertaken to know the effects of tobacco dust on lipid profile and various haematological parameters in women beedi rollers from the rural population of South Solapur, Maharashtra.

Material and Methods:

The present study was undertaken in the Department of Biochemistry, Ashwini Rural Medical College, Hospital and Research Centre, Kumbhari, Solapur, Maharashtra from January 2017 to June 2017. The study was approved by Institutional Ethics Committee. The study was conducted on 100 subjects out of which, 50 were non beedi roller women and 50 were women beedi rollers selected from volunteers and patients attending the hospital Outpatient Department (OPD).

Selection criteria:

Definition:

- i) Non beedi roller women: those who had never been in this profession.
- ii) Women beedi rollers: those who were in this profession at least for five years.

The beedi rollers and non beedi rollers were comparable in age as well as socioeconomic status.

The inclusion and exclusion criteria are as follows:

Inclusion criteria:

1. Non beedi roller women:

- a. Age: 28-60 years
- b. None of them was suffering from any chronic disease/s.
- c. None of them have the habit of tobacco chewing or smoking.
- d. Were without any medication.

2. Women beedi rollers:

- a. Age: 28-60 years
- b. Had been in this profession for at least 5 years.
- c. Not having the habit of tobacco smoking/chewing.

Exclusion criteria:

1. Subjects who required antibiotic or anti-inflammatory drug therapy
2. Having history of alcoholism and/or diseases which increases lipid profile like diabetes mellitus, hypertension, etc.

A detail history was taken. All the participants were well informed about the experimentation and their written consent was obtained. Four ml fasting venous blood was collected from the subjects under aseptic condition. Out of that 2 ml was collected in sterile EDTA bulb and rest of the blood was allowed to clot. Serum and plasma were separated by centrifugation at 2000 rpm for 1-2 minute at room temperature. All the samples were analyzed on the same day of collection. The tests for lipid profile were carried out by an enzymatic method on fully automated analyzer of Erba Transasia (EM 360) and haematological parameters were done on Erba Transasia blood cell counter (Sysmex KX 21).

Statistical analysis:

Data were subjected to statistical analyses. Descriptive statistics such as mean and SD were used. Comparison of parameters between non beedi roller women and women beedi rollers was done by using Unpaired *t*-test for normally distributed variables and Mann-Whitney Test for non-normally distributed variables. A *p* value less than 0.05 were considered as significant.

Results:

Table 1 depicts a significant increase ($p < 0.001$) in serum Total Cholesterol (TC), Low Density Lipoprotein (LDL)-cholesterol and Triglycerides

(TG) followed by a significant decrease ($p < 0.001$) in High Density Lipoprotein (HDL)-cholesterol in women beedi rollers than non beedi roller women. Table 2 depicts increased Atherogenic index of Plasma ($p < 0.001$) in women beedi rollers than non beedi roller women.

Table 3 shows significantly decreased haemoglobin levels, decreased Red Blood Cell (RBC) count, White Blood Cell (WBC) count and platelet count in women beedi rollers than non beedi roller women ($p < 0.001$).

Table 1: Shows levels of Total Cholesterol (TC), Low Density Lipoprotein (LDL)-cholesterol, High Density Lipoprotein (HDL)-cholesterol, Triglycerides (TG) in Non Beedi Roller Women and Women Beedi Rollers

| Parameter (mg/dl) | Non beedi roller women (n=50) Mean \pm SD | Women beedi rollers (n=50) Mean \pm SD | Mean difference | 95% CI of difference | <i>t</i> -value | <i>P</i> -value |
|-------------------|--|---|-----------------|----------------------|-----------------|-----------------|
| TC | 161.36 \pm 16.91 | 180.74 \pm 20.78 | 19.38 | 11.85-26.91 | 5.11 | $P < 0.001$ |
| LDL-c | 107.8 \pm 11.79 | 154.9 \pm 15.23 | 47.10 | 41.69-52.51 | 17.29 | $P < 0.001$ |
| HDL-c | 47.44 \pm 2.86 | 40.4 \pm 6.30 | 7.04 | 5.09-8.98 | 7.19 | $P < 0.001$ |
| TG | 113.20 \pm 10.19 | 166.36 \pm 21.11 | 53.24 | 46.67-58.82 | 16.09 | $P < 0.001$ |

t-value-Unpaired *t*-test, *P* value is significant at 0.05 level

Table 2: Shows Atherogenic Index of Plasma (AIP) in Non Beedi Roller Women and Women Beedi Rollers.

| AIP | Non beedi roller women (n=50) Mean \pm SD | Women beedi rollers (n=50) Mean \pm SD | Mean difference | 95% CI of difference | U-value | <i>P</i> value |
|-------------|--|---|-----------------|----------------------|---------|----------------|
| TC/HDL-c | 3.36 \pm 0.48 | 4.6 \pm 0.97 | 1.24 | 0.94-1.54 | 2175 | $P < 0.001$ |
| LDL-c/ HDL- | 2.16 \pm 0.37 | 4.0 \pm 0.81 | 1.84 | 1.59-2.09 | 2448 | $P < 0.001$ |

U value-Mann-Whitney test, *P* value is significant at 0.05 level

Table 3: Shows Complete Blood Count (Haemoglobin, RBC Count, WBC Count and Platelet Count) in non beedi roller women and women beedi rollers

| Parameter | Non beedi roller women (n=50) Mean \pm SD | Women beedi rollers (n=50) Mean \pm SD | Mean difference | 95% CI of difference | U-value | P value |
|--------------------------------|--|---|-----------------|----------------------|---------|-------------|
| Haemoglobin (gm%) | 11.57 \pm 0.93 | 9.21 \pm 1.37 | 2.36 | 1.89-2.83 | 2293 | $P < 0.001$ |
| RBC Count (million/cu mm) | 5.04 \pm 0.69 | 3.69 \pm 0.22 | 1.35 | 1.15-1.55 | 2491 | $P < 0.001$ |
| WBC Count (no. per cu mm) | 10542.52 \pm 384.02 | 7108.82 \pm 217.18 | 3433.7 | 3309-355.5 | 2500 | $P < 0.001$ |
| Platelet Count (lac per cu mm) | 2.93 \pm 0.15 | 2.11 \pm 0.21 | 0.83 | 0.75-0.89 | 2500 | $P < 0.001$ |

U-value-Mann Whitney Test, RBC-Red Blood Cell, WBC-White Blood Cell, P value is significant at 0.05 level

Discussion:

In the present study, women beedi rollers were compared with non-beedi roller women with regard to lipid profile and basic routine hematological parameters. Increase in plasma total cholesterol, triglycerides, LDL-cholesterol and decrease in HDL-cholesterol was observed in women beedi rollers when compared with non beedi roller women population ($p < 0.001$).

Atherogenic index of plasma was also elevated in women beedi rollers than non beedi roller women ($p < 0.001$). The reason for increased cholesterol in women beedi rollers could be due to continuous exposure of these women to tobacco dust. As the method of beedi rolling is a manual process it releases great amounts of coarse particles and dust into the surrounding work area. Beedi rollers are exposed to tobacco dust through their skin as well as by inhalation of the harmful particles as they do not wear any protective clothing, gloves or masks. During rolling of beedi, nicotine of tobacco powder comes into direct skin contact of these

women and further absorbed into the blood stream [10].

Inhalation of high nicotine by women beedi rollers stimulate catecholamine secretion that results in increased concentration of plasma free fatty acids, this further results in increased secretion of hepatic free fatty acids and hepatic triglycerides. Triglyceride has been well recognized as an independent risk factor for the development of coronary heart diseases [11-13].

Present study documents increased ($p < 0.001$) Atherogenic index of plasma (Table 2) in women beedi rollers when compared with non beedi roller women. Nicotine increases the circulatory pool of atherogenic LDL via accelerated transfer of lipids from HDL and impaired clearance of LDL from plasma compartment and therefore increases the deposition of LDL cholesterol in the arterial wall. In addition, it increases the oxidative modification of LDL. Several studies have shown that the ratio of total cholesterol/ HDL cholesterol is a better

predictor of future coronary heart disease than total cholesterol, LDL cholesterol, HDL cholesterol or triglycerides alone [14-17]. TC/HDL-c ratio estimates the net effect of two way traffic of cholesterol in and out of tissues.

Women beedi rollers showed decreased haemoglobin as compared to non beedi roller women group ($p < 0.001$). The results of present study are in accordance with Sable [18]. The platelet count was also declined in women beedi rollers when compared ($p < 0.001$) with non beedi roller women. The findings of present study are in agreement with the reports of Metin *et al.* [19] and Adeniyi and Ghazal [20].

Present study revealed significantly lower erythrocyte count in women beedi rollers when they are compared with non beedi roller women group ($p < 0.001$). The result is substantiated by the earlier report [20] wherein significantly reduced RBC count was found.

In the present study women beedi rollers exhibited decrease in the total leucocyte count ($p < 0.001$) when compared with non beedi roller women. The results of the present study are in consistent with Valenca *et al.* [21]. This decrease in WBC count may be due to continuous exposure to tobacco dust.

The analysis of haematological parameters of the blood of women beedi rollers reflect the inflammatory responses and increased risk of

developing cardiovascular disorders.

In the present study, highly significant increase in total cholesterol, LDL-cholesterol and triglyceride levels with a concomitant decrease in HDL-cholesterol level in women beedi rollers was observed as compared with non beedi roller women group. Atherogenic index of plasma was also significantly higher in women beedi rollers when compared with non beedi roller women. The haematological parameters like haemoglobin levels, RBC count, WBC count and platelet count were also found to be lower in women beedi rollers as compared with non beedi roller women group.

An altered lipid profile, increased atherogenic index of plasma and lower haematological parameters in women beedi rollers could contribute towards the development of systemic illness such as cardiovascular disease.

Conclusion:

Although beedi manufacturing provides employment to millions of women; but at the same time these women are at an extremely high risk of developing systemic illness due to high content of nicotine present in beedi tobacco. Large scale interventions and preventing measures are necessary to diminish tobacco exposure and generate alertness of the disease to minimize the deleterious effect of tobacco in beedi rollers.

References

1. Yasmin S, Afroz B, Hyat B, D'Souza D. Occupational Health Hazards in Women Beedi Rollers in Bihar, India. *Bull Environ Contam Toxicol* 2010; 85(1): 87-91.
2. Chavan SK. A Study of Female Bidi Workers in Solapur City. *ISRJ* 2011; 1(5).
3. Srinivasulu K. Impact of liberalization on beedi workers. *Econ Polit Wkly* 1997; 32(11):515-17.
4. Mahimkar MB, Bhisey RA. Occupational exposure to tobacco increases chromosomal aberrations in tobacco processors. *Mutat Res* 1995; 334: 139-44.
5. Bagwe AN, Bhisey RA. Mutagenicity of processed beedi tobacco: possible relevance to beedi workers. *Mutat Res* 1991; 261(2): 93-99.
6. Swami S, Suryakar AN, Katkam RV. Absorption of nicotine induces oxidative stress among beedi workers. *Toxicol Lett* 1995; 18(2): 259-65.

7. Bagwe AN, Bhisey RA, Govekar RB. Toxic effects of exposure to tobacco among beedi rollers. *Toxicol Lett* 1992; 22(6): 1205-06.
8. Govekar RB, Bhisey RA. Elevated urinary thioether excretion among bidi rollers exposed occupationally to processed tobacco. *Int Arch Occup Environ Health* 1992; 64(2):101-04.
9. Govekar RB, Bhisey RA. Mutagenic activity in urine samples from female tobacco habitués. *Cancer Lett* 1993; 69(2):75-80.
10. Joshi KP, Robins M, Venu P, Mallikarjunaih KM. An epidemiological study of occupational health hazards among bidi workers of Amarchinta, Andhra Pradesh. *J Acad Indus* 2013; 1(9): 561-64.
11. Libby P. Inflammation and cardiovascular disease mechanisms. *Am J Clin Nutr* 2006; 83(2): 456S-60S.
12. Venkatesan A, Hemalatha A, Bobby Z, Selvaraj N, Sathiyapriya V. Effect of smoking on lipid profile and lipid peroxidation in normal subjects. *Indian J Physiol Pharmacol* 2006; 50(3): 273-78.
13. Reddy KS, Gupta PC (eds). Report on tobacco control in India. New Delhi: Ministry of Health and Family Welfare, Government of India; 2004.
14. Padmavathi P, Damodara Reddy V, Narendra M, Varadacharyulu N. Bidis--hand-rolled, Indian cigarettes: Induced biochemical changes in plasma and red cell membranes of human male volunteers. *Clin Biochem* 2009; 42(10-11): 1041-45.
15. Mensink RP, Zock PL, Kester AD, Katan MB. Effects of dietary fatty acids and carbohydrates on the ratio of serum total to HDL cholesterol and on serum lipids and apolipoproteins: a meta-analysis of 60 controlled trials. *Am J Clin Nutr* 2003; 77(5): 1146-55.
16. Kitamura A, Iso H, Naito Y, Iida M, Konishi M, Folsom AR, et al. High-density lipoprotein cholesterol and premature coronary heart disease in urban Japanese men. *Circulation* 1994; 89(6): 2533-39.
17. Plump AS, Scott CJ, Breslow JL. Human apolipoprotein A-I gene expression increases high density lipoprotein and suppresses atherosclerosis in the apolipoprotein E-deficient mouse. *Proc Natl Acad Sci USA* 1994; 91(20): 9607-11.
18. Sable RV, Kowli SS, Chowdhary PH. Working condition and health hazards in beedi rollers residing in the urban slums of Mumbai. *Indian J Occup Environ Med* 2012; 16(2): 72-4.
19. Kılınc M, Okur E, Yıldırım , nanç F, Belge Kuruta E. The investigation of the effect of Maraf powder (smokeless tobacco) on hematological parameters. *Ann Clin Biochem* 2004; 21(3):131-6.
20. Adeniyi PAO, Ghazal OK, Oyewopo AO. Haematological effects of aqueous extract of tobacco (*Nicotiana tabacum*) leaves in young Wistar rats. University of Ilorin (Nigeria) Publications.
21. Valenca SS, Gouveia L, Pimenta WA, Porto LC. Effect of oral nicotine on rat liver stereology. *Int J Morphol* 2008; 26(4): 1013-22.

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