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Research Article

Cardio Metabolic Risk Factors Among Different Ethnic Women from Tripura, A North Eastern State of India: Relationship with Socio Demographic Patterns

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ABSTRACT

Introduction: This cross-sectional study assessed the risk factors of cardiovascular disease (CVD) in Tripuri and Riang women from Tripura and explored the associations between these factors with socio demographic status. Methods: Height, weight, waist circumference, hip circumference, waist height ratio and waist hip ratio, blood pressure, fasting plasma glucose, and serum lipids (HDL-cholesterol and triglycerides) were recorded. Cardio metabolic risk of the subject was evaluated according to consensus statement for Asian Indians. A socio demographic assessment was computed based on physical activity, education, main occupation and income. The association between socio- demographic pattern and cardio metabolic risk was determined by logistic regression models. Results: By applying 95% confidence interval in logistic regression models in both Tripuri and Riang women it has been found that urbanity, sedentary working , high education and high income groups are susceptible to cardio metabolic risk. Increased fasting blood glucose, elevated blood pressures, and high triglycerides and low HDL-C were observed in subjects having profound cardio metabolic risk. In both the groups the risk increased steadily with advancement of age. Conclusion: Our study show that cardio-metabolic risk factors in both the groups of indigenous population from Tripura are associated with various socio demographic factors. Lifestyle interventions with emphasis on physical activity appear appropriate to reduce the burden of cardio metabolic risk in studied population.

Keywords: Cardio metabolic risk, Tripuri, Riang, socio economic status, life style.

INTRODUCTION

The burden of cardiovascular disease (CVD) has enhanced over the last two decades in nearly all developing countries, particularly in urban areas[1,2]. It has emerged as a major public-health challenge worldwide owing to rapid urbanization, surplus energy intake, increasing obesity, and sedentary life habits. It eventually results in an enhanced possibility of type 2 diabetes mellitus (T2DM) and simultaneously contributes in the risk of developing cardiovascular disease (CVD) in population According to World Health Organization (WHO) estimate by the year 2020, cardio metabolic disorders will be one of the major reasons of disability and death in India[3]. Cardiovascular disease once considered to be the disease effecting only the affluent class have now been identified to effect people from all sections of the society[4].

The association between socio - demographic status and cardio metabolic risk factors has been rarely investigated both in developed and developing countries[5-7]. Levels of education, income and life style pattern are the indicators of socio - demographic status measurement, may have effects on the prevalence of cardio metabolic risk. In North India, higher socio - demographic status and sedentary occupation were found to be associated with cardio metabolic risk[8]. All of these studies suggested that socio - demographic status may affect the cardiovascular health especially in India, which was facing a great social and economic transition in the last decade.

Therefore, it is important to assess cardio metabolic risk profile of different population groups including the ethnic population of the country. Tripura, the third smallest state of North east India, is unique for its cultural heritage, lifestyle and population which is consisted of both indigenous ethnic and a mixed non ethnic population. Tripuris and Riangs the major tribal communities of the state. They originally migrated to this region and were introduced as an aboriginal tribe of Tripura. To our knowledge, there is so far, no data regarding cardio metabolic risk and socio - demographic status among Tripuri and Riang tribal women residing in Tripura. Therefore, the present study was conducted to investigate the association between individual socio - demographic status and cardio metabolic risk factors in both ethnic Tripuri and Riang women of Tripura.

MATERIALS AND METHODS

The Tripuri subjects for this cross sectional study was recruited during the health camp organized by Prajapita Brahma Kumaries Ishwariya Vishwavidyalay in February 2014 and February 2015. Whereas, the Riang subjects

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Table 1: Socio - Demographic Characteristics of Metabolic Risk Factors in Tripuri and Riang study population:

	Tripuri Subjects			Riang Subjects		
Variables	Subjects with MetS (n =97)	Subjects without MetS (n =259)	Total (%) (n =356)	Subjects with MetS (n =65)	Subjects without MetS (n =191)	Total (%) (n =256)
Age (years)(Mean ± SD)	49.35±10.49	41.78±11.75	43.84±11.89	47.69±10.90	41.02±11.42	42.71±11.63
Locality						
Urban	65(67.01)	125(48.26)	190(53.37)	42(64.61)	83(43.45)	125(48.82)
Rural	32(32.98)	134(51.73)	166(46.62)	23(35.38)	108(56.54)	131(51.17)
Education						
Illiterate	8(8.24)	50(19.30)	58(16.29)	5(7.69)	20(10.47)	25(9.76)
Elementary	15(15.46)	84(32.43)	99(27.80)	8(12.31)	30(15.70)	38(14.84)
High School	28(28.86)	65(25.09)	93(26.12)	22(33.84)	74(38.74)	96(37.5)
College	46(47.42)	60(23.16)	106(29.77)	30(46.15)	67(35.07)	97(37.89)
Socioeconomic class	4(4.12)	22(8.49)	26(7.30)	4(6.15)	20(10.47)	24(9.37)
< 10,000	6(6.18)	25(9.65)	31(8.70)	12(18.46)	45(23.56)	57(22.26)
<20,000	31(31.95)	85(32.81)	116(32.58)	21(32.31)	65(34.03)	86(33.59)
< 30,000	56(57.73)	127(49.03)	183(51.40)	28(43.07)	61(31.93)	89(34.76)
>30,000						
Occupation						
Sedentary	65(67.01)	98(37.83)	163(45.78)	35(53.84)	90(47.12)	125(48.82)
Moderate	32(32.98)	161(62.16)	193(54.21)	30(46.15)	101(52.87)	131(51.17)
Heavy	0	0	0	0	0	0
General Obesity BMI ≥23 kg/m2	42(43.29)	86(33.20)	128(35.95)	34(52.31)	49(25.65)	83(32.42)
Central Obesity (WC females ≥80 cm)	70(72.16)	54(20.84)	124(34.83)	45(69.23)	39(20.41)	84(32.81)
Increased Blood pressure	67(69.07)	76(29.34)	143(40.16)	51(78.46)	55(28.79)	106(41.40)
SBP(≥130mmHg)	67(69.07)	55(21.23)	122(34.26)	51(78.46)	48(25.13)	99(38.67)
DBP(≥85mmHg)						
Increased FBS (≥100mg/dl)	65(67.01)	45(17.37)	110(30.89)	36(55.38)	29(15.18)	65(25.39)
Increased TG (≥150mg/dl)	60(61.85)	44(16.98)	104(29.21)	38(58.46)	33(17.27)	71(27.73)
Decreased HDL-C(<50mg/dl)	60(61.85)	41(15.83)	101(28.37)	42(64.61)	37(19.37)	79(30.86)

Numbers in parenthesis indicate percentages.

MetS = Metabolic syndrome; BMI – Body mass index, WC- Waist circumference, SBP- Systolic blood pressure, DBP-Diastolic blood pressure, FBS-Fasting blood sugar, TG-Triglyceride, HDL-C – High density lipoprotein-Cholesterol.

were recruited from the Riang community dominated villages of South Tripura.

Three hundred and fifty six (356) Tripuri subjects were recruited randomly from a mixed population of young and old women ranging from 25-65 years. One hundred and ninety (190) among them were premenopausal (age 25-45 years) and one hundred and sixty six (166) were post menopausal (age 45-65 years). On the other hand, Two hundred and fifty six (256) Riang subjects were recruited of which one hundred and fifty (150) of the subjects were premenopausal (age 25-45 years) and one hundred and six (106) were post menopausal (age 45-65 years) Riang women. The participation to the study was voluntary basis and informed consent was obtained from each participating subject after explaining the study protocol and purpose of the study to the subjects in language they understand. Ethical clearance for the study was obtained from Institutional Human Ethical Committee of Tripura University. The calculated sample size for the study was calculated taking 30% prevalence with 95% of confidence interval and absolute precision of 5%[9].

Socioeconomic status and dietary history of the subjects were evaluated through questionnaire prepared for the purpose[10]. The marital status, history of menstrual cycle and number of children of each subject was recorded. History of any disease past or present medication was recorded to exclude the subjects having any cardio metabolic disorder from the study. Subjects having clinically confirmed pregnancy, diabetes, hypertension, polycystic ovary and any other cardiovascular disorders

Table 2: Multiple logistic regression analysis of correlates of Metabolic risk factors in Tripuri subjects by applying Socio demographic status.

Variables	Subjects with MetS (n = %)	Metabolic Syndrome odds ratio (95% CI)	P value
Age (years)			
25-45(n=190)	36(18.94)	2.4852(1.5365 -4.0197)	0.0002
46-65(n=166)	61(36.74)	Reference	
Locality			
Urban(n=190)	65(34.21)	2.1775(1.3361 -3.5488)	0.0018
Rural(n=166)	32(19.27)	Reference	
Education			
Illiterate (n=58)	8(13.79)	Reference	0.0003
Elementary(n=99)	15(15.15)	4.7917(2.0699-11.0925)	< 0.0001
High School(n=93)	28(30.10)	4.2933(2.1961-8.3932)	0.0540
College (n=106)	46(43.39)	1.7798(0.9901-3.1991)	
Socioeconomic class		Reference	
< 10,000(n=26)	4(15.38)	2.4252(0.7986 -7.3648)	0.1180
<20,000(n=31)	6(19.35)	1.8373(0.7142 -4.7263)	0.2070
< 30,000(n=116)	31(26.72)	1.2090(0.7205 -2.0289)	0.4723
>30,000(n=183)	56(30.60)		
Occupation			
Sedentary(n=163)	65(39.87)	3.3371(2.0400 -5.4589)	< 0.0001
Moderate (n=193)	32(16.58)	Reference	

Numbers in parenthesis indicate percentages.

Table 3: Multiple logistic regression analysis of correlates of Metabolic risk factors in Riang subjects by applying Socio demographic status.

Variables	Subjects with MetS (n = %)	Metabolic Syndrome odds ratio (95% CI)	P value
Age (years)			
25-45(n=150)	27(18)	2.5458 (1.4319-4.5260)	0.0015
46-65(n=106)	38(35.85)	Reference	
Locality			
Urban(n=125)	42(33.6)	2.3761(1.3259-4.2583)	0.0036
Rural(n=131)	23(17.56)	Reference	
Education			
Illiterate (n=25)	5(20)	Reference	
Elementary(n=38)	8(21.05)	1.7910(0.6141-5.2237)	0.2859
High School(n=96)	22(22.91)	1.6791(0.6889-4.0924)	0.2542
College (n=97)	30(30.93)	1.5061(0.7927-2.8615)	0.2111
Socioeconomic class		Reference	
< 10,000(n=24)	4(16.66)	2.2951(0.7173 - 7.3434)	0.1615
<20,000(n=57)	12(21.05)	1.7213(0.7904 - 3.7484)	0.1714
< 30,000(n=86)	21(24.41)	1.4208(0.7307 - 2.7626)	0.3006
>30,000(n=89)	28(31.46)		
Occupation			
Sedentary(n=125)	35(28)	1.3093(0.7446 - 2.3022)	0.3494
Moderate (n=131)	30(22.90)	Reference	

Numbers in parenthesis indicate percentages.

were excluded from the study. A questionnaire was formulated for the purpose. The age of the subject was recorded as mentioned by the subject.

About 10 ml non heparinised venous blood samples were collected after an overnight fast for biochemical analysis. The Blood Glucose level was estimated by using Digilab auto colorimeter. Serum total cholesterol, HDL cholesterol and triglyceride were estimated by using commercially available kit in a full auto analyzer (Erba - EM 200).

All anthropometric parameters were recorded following standard procedure[11]. Weight of the subject was measured by using weighing machine (Libra R, UK) with subject standing erect on the machine without shoes and in normal clothing. Height was measured using a stediometer (Bio+Plus (R). S. NO-51392) with subject standing erect without any footwear. Waist circumference was measured by positioning the measuring tap between coastal margin and iliac crest of the subject. Body mass index (BMI) was

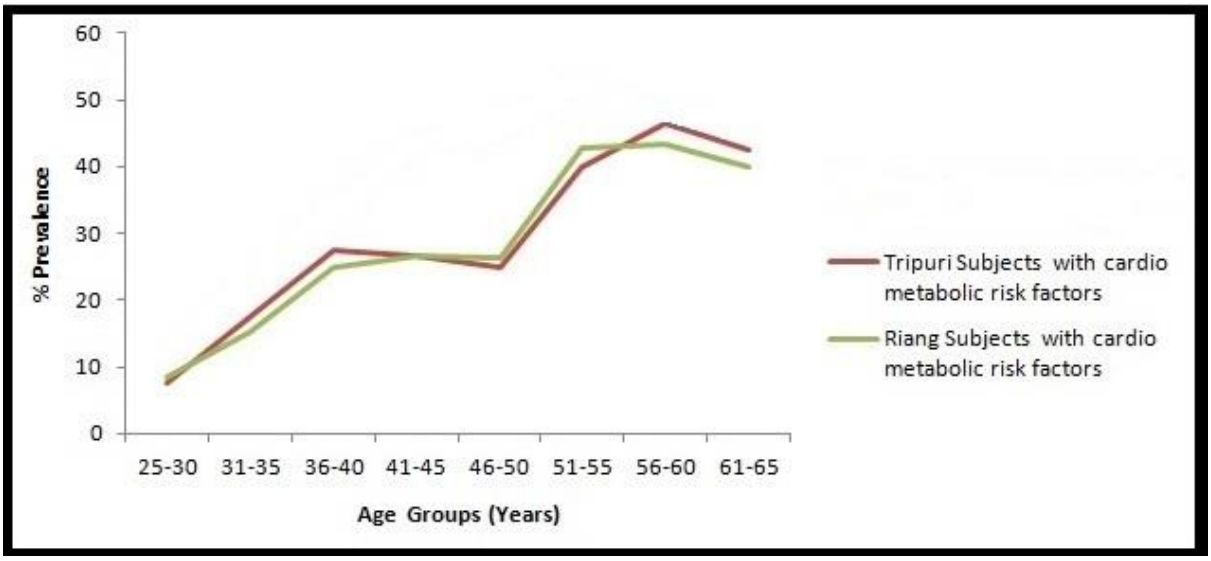

Figure 1: Age specific prevalence of Cardio metabolic risk factors among Tripuri and Riang women.

calculated using the standard expression: BMI = weight(kg)/ height^2 (m).

Blood pressure of the subject was recorded in supine position by using aneroid sphygmomanometer (Brand/ Model- Doctor Japan: Life line**)**. Both systolic and diastolic pressures were recorded. Mean and pulse pressure were calculated. ECG of the subject was recorded by a ECG Machine (Make-BPL, Model-Cardiart 9108 Sl.No-DURB3C1004).

Cardio metabolic risk of the subject was evaluated according to consensus statement for diagnosis of general obesity, abdominal obesity and metabolic syndrome for Asian Indians according to Joint Interim Statement of the International Diabetes Federation Task Force on Epidemiology and Prevention; National Heart, Lung, and Blood Institute; American Heart Association; World Heart Federation; International Atherosclerosis Society; and International Association for the Study of Obesity.[12] As per their consensus statements, women having three or more out of following five cardiovascular risk factors were identified as having cardio metabolic syndrome. The risk factors are:

Increased waist circumference ≥ 80 cm.
Hypertriglyceredimia ≥ 150 mg/dl (1.7 mmol/l)
Low HDL < 50 mg/dl (1.3 mmol/l)
Elevated blood pressure ≥130/85 mmHg
Elevated blood sugar ≥ 100 mg/dl (6.1 mmol/L)

The statistical analyses was performed using the PC version of SPSS statistical software (SPSS 20, IBM, Armonk, New york, USA). A *P* value (significance) of *<0.05* is deemed statistically significant. A significance of *.000* should be read as *P < .0001* (very highly significant) as the software can detect significance up to 3 decimal points only. Multiple logistic regression analysis was selected as the dependent variable has the binary outcome. The independent variables are a mixture of continuous and categorical variables. The dependent variable were metabolic risk factors and without metabolic risk factors. Multiple logistic regression analysis was performed on all the independent variables and the outcome was tabulated. It was used as a screening in selection of variables for further analysis.

RESULT

Table 1 demonstrated the socio-demographic characteristics of metabolic risk factors in Tripuri and Riang study population. According to socioeconomic strata urbanity, sedentary working, high education and high income groups has been considered susceptible to cardio metabolic risk. By applying clinical features prevalence of increased fasting blood glucose, elevated blood pressures, and high triglycerides were significantly higher but prevalence of HDL-C cholesterol were significantly lower in subjects having metabolic risk factors than subjects without the risk factors.

The odds ratio (OR) and 95% confidence interval (CI) of cardio metabolic risk and each component of the risk factors according to socioeconomic status of Tripuri subjects are presented in Table 2 In an unadjusted model the prevalence of cardio metabolic risk was 2.48 times more likely (CI: 1.5365 - 4.0197) in post-menopausal women than pre-menopausal women (P 0.0002). According to socioeconomic strata urbanity (CI: 1.33-3.54, p 0.0018), sedentary working (CI: 2.0400-5.4589, p 0.0001), high education (CI: 0.9901-3.1991, p 0.0540) and high income groups (CI: 0.7205 – 2.0289,p 0.4723) has been considered to be susceptible to cardio metabolic risk.

The odds ratio (OR) and 95% confidence interval (CI) of cardio metabolic risk and each component of the risk factors according to socioeconomic status of Riang subjects are presented in Table 3. In an unadjusted model the prevalence of cardio metabolic risk was 2.54 times more likely (CI: 1.4319-4.5260) in post-menopausal women than pre-menopausal women (p 0.0015). According to socioeconomic strata urbanity (CI: 1.3259-4.2583, p 0.0036), sedentary working (CI: 0.7446 - 2.3022, p 0.3494), high education (CI: 0.7927-2.8615 , p 0.2111) and high income groups (CI: 0.7307 - 2.7626, p 0.3006) has been considered to be susceptible to cardio metabolic risk.

Figure 1 illustrated age specific prevalence of cardio metabolic risk factors in Tripuri and Riang subjects. The relationship between age and prevalence of cardio metabolic risk in subjects revealed that the risk increases steadily with advancement of age.

DISCUSSION

The study has the aim to evaluate cardio metabolic risk profile of women from different ethnic communities of Tripura i.e; Tripuri and Riang and to correlate the cardio metabolic risk profile with their socio demographic characteristics.

As in other study, central obesity marked by increased waist circumference (≥ 80cm) was found to be the most prevalent cardio metabolic risk factor in Tripuri women, followed by altered lipid profile marked mainly by reduced HDL-C. However, high level of blood pressure seems to be the most prevalent cardio metabolic risk factor among the Riang population, which is followed by central obesity, altered lipid profile and hyperglycemia. The Riang population also showed a low level of HDL-C among post menopausal women which is in agreement with different studies around the world[13]. Kreisberg et. al. showed that reduction in the HDL-C level after menopause could be one of the coronary heart disease risk factor among post menopausal women[14]. Consistent with other studies fasting blood sugar in our study showed a higher value in post menopausal women[15].

Atherogenic dyslipidemia is common in South Asians with lower HDL and high level of LDL compared to Caucasians[16]. High rate of obesity is reported for the indigenous populations from studies conducted in different parts of the world including Australia, New Zealand and US[17]. Obesity and related cardio metabolic risk has clearly emerged as a public health problem effecting almost all population including indigenous groups. Bordoloi and Kapoor observed a positive correlation of waist circumference and waist height ratio with blood pressure indicating regional obesity to be the risk factor for cardiovascular health in Kolita, a biologically isolated caste population of the state of Assam[18]. Loknath et al. organized a cross sectional study on cardio metabolic risk among Kodava population of Mysore district of Karnataka and observed that female subjects and middle aged subjects with increased waist circumference were more susceptible to metabolic syndrome and increased cardiovascular risk[19].

Socio - demographic analysis of the study subjects revealed that urban subjects were having increased cardio metabolic risk prevalence than the rural subjects. Sarkar et al. in their study, have not found any rural urban difference in the prevalence of cardio metabolic syndrome among a population of Bhutia tribes, however, in case of Toto tribes the prevalence in rural community was found to be low[11]. The prevalence, in our study, was also found to be high among educated group with higher monthly income and in people with sedentary life style. These findings are in agreement with studies on different population across the world which indicated that socio-demographic characteristics plays a vital role in prevalence of cardio metabolic risk irrespective of origin or ethnicity of the population. Phipps et al. recently evaluated cardio metabolic risk factors for seven indigenous communities in Malaysia and reported variable prevalence of obesity, diabetes, cholesterol and hypertension which might be linked to their socioeconomic status, lifestyle changes and even genetic predispositions[20]. Studies found that income was positively associated with the consumption of snacks and excessive fried food and Socio economic status played a vital role in the early stage of eating behavior transition in China[21].

Education has been found to be associated with cardio metabolic risk in many studies[22]. The significance that education is a strong predictor of health lies in that education may affect life-style behaviors, psychosocial attitude, accessibility to health services, and economically advantageous surroundings[23].

Factors protecting premenopausal women against cardio metabolic risk in both the ethnic groups in our study might be explained by the effect of endogenous estrogen against atherosclerosis in premenopausal women[24]. Evidence suggest that estrogenic signaling contributes in the development of cardio metabolic risk. Change in the levels of estrogen or its receptors may cause cardio metabolic risk. Postmenopausal women having naturally reduced estrogen levels, are three fold more susceptible to cardio metabolic risk than premenopausal women[25]. The hormone replacement therapy based on estrogen/progestin in postmenopausal women has been reported to decrease visceral adipose tissue, insulin levels and fasting blood glucose[26]. In normal premenopausal female, 17β-estradiol (E2), that is the principal circulating estrogen, is formed in ovaries by aromatization of androstenedione to estrone (E1) and that converts E1 to E2. In healthy menstruating females E2 act as a circulating hormone that mainly function on remote target organs. However, in postmenopausal women, ovaries cease to produce E2 and in adult men, having normally decreased levels of circulating E2, E2 then produced in extra gonadal organs like in muscle, bone, breast, adipose tissue and brain, where it functions as a paracrine or intracrine factor[27].

The cardio metabolic risk in both the groups i.e; Tripuri and Riang women increased steadily with age with highest prevalence seen in women 51 to 60 years of age. Similar to our findings, Kanjilal et. al. in their study to determine the prevalence of cardio metabolic risk among Asian Indians observed that 50-59 years age group having the highest subjects with cardio metabolic risk[28]. In another study, Ervin observed that men and women of age group ranging from 40–59 years were three fold more susceptible to have metabolic syndrome compared to the age group ranging from 20–39 years. Among men with the age group of ≥60 years, this likelihood was 4 fold greater, and in women of the similar age group, the likelihood was increased by 6 fold[29].

CONCLUSION

In conclusion, our study revealed that women from indigenous Tripuri and Riang communities from a small state of India are almost at the similar level of risk for

cardio metabolic diseases like other population of India owing to a rapid change in lifestyle pattern and narrowing of urban and rural gap, therefore, similar efforts must be taken by the policy makers to mitigate the increasing cardio metabolic risk in the population. The cardio metabolic risk in both the groups of indigenous population from Tripura depend on various socio demographic factors like urbanity, high income and sedentary life style. Our data also highlights the relevance of lifestyle pattern when designing public health actions against cardio metabolic risk. Multiple-behaviour intervention programme would be appropriate, with main emphasis on physical activity.

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