

Nutritional Status Related to Blood Pressure (Hypertension) on a Group of Migrant population (Marwari) of Khordha District, Odisha

Dr. Saubhagini Mohapatra

Lecturer in City Women's College, Odisha, Bhubaneswar-751003, India

Abstract: *Blood pressure and nutritional status of Marwari populations of Khordha District, Odisha shows a moderate phenomenon. Marwaris are Migrants when migration plays an important role in the determining personal/individual's health. Marwaris are going through on transitional phase (both economic and life style point of view) comprising urban and semi-urban society. From the present study, the strong significant phenomenon is found on hypertension which poses the higher value of the systolic and diastolic blood pressure in relation with anthropometric variable (Height, weight, upper arm girth, calf girth, waist girth, hip girth, biacromial breadth, cristal breadth), Sum of six skinfold thickness, Three trunk skinfold thickness and various indices (body mass index and relative fat pattern index) and dietary pattern (calorie, fat, salt and other addictive habits). The main objective of this research isto study the blood pressure and nutritional status of Marwaris settled in Khordha district of Odisha and its concomitants as well as the next objective is to compare the nutritional status and life style habits between the two Marwari groups of two different States such as Odisha and West Bengal. There are 592 Marwari inhabitants (295 male and 297 females) are selected randomly selected for study from Khordha, Jatni and Bhubaneswar from the age group more than 15 to less than 100.*

Keywords: Blood pressure (BP), Systolic Blood pressure (SBP), Diastolic blood pressure (DBP), Sum of six skinfold thickness (Sf6), Three trunk skinfold thickness (TSF3), Body mass index (BMI), Relative fat pattern index (RFPI).

1. Introduction

Marwari is an umbrella term to classify both hindus and jains. The Marwaris originate from Eastern Rajsthan and the term was used as an ethnographic classification in the 1901 census. Marwaris are migrant communities are settled at Jatni, Khordha and Bhubaneswar, who have eventually taken on the Odisha culture to become a sizeable Odia community of their own. Nutritional status of a population is a very good indicator of overall health status of a population. Marwaris are the most prominent ethnic group among business communities in India with a population about 25-30 million (Timberg, 2014).

Odisha state in eastern India (formerly known as Orissa) has a population of 42.0 million (Government of India, 2011) from which Khordha district contains 2, 251, 673 million people approximately. From the total people Marwaris are business ethnic group approximately constitute 5.36%. Present population consists of ethnic Marwaris of Khordha district. It has been serendipitously observed that this community has prone to risk of hypertension and its relation with nutritional aspects.

Nutritional status has been found to be associated with many different morbidity conditions and in effect mortality as well (James et al., 1988; Ferro-Luzzi et al., 1992; Naidu and Rao, 1994; Park, 2003). Relationship of mortality and Body Mass Index (BMI) an indicator of Nutritional status is U- or J-shaped (Lee et al., 1993; Shetty and James, 1994; Allison et al., 2002) that is both the ends show higher mortality, and the least mortality is in between. Nutritional status and intake of nutrients have the greater hypertension value however obesity is the major factor of hypertension (Savica et al., 2010). Another study was made to establish the relationship with blood pressure for measuring the

assessment in a group of children and adolescents in the Hainan province, China show overweight and obesity were strongly associated with pre-hypertension and hypertension (Zhang et al., 2012). However, Nguyen et al. (2013) studied a review of nutritional factors in hypertension management, reveals recommendation of a diet containing rich in potassium magnesium, calcium, dietary fiber, and protein and has reduced fat (total and saturated) and cholesterol (<25%), red meat, sweet, and sugar containing beverage.

Hypertension affects approximately one billion individuals worldwide (JNC7, 2003). Hypertension has been shown to increase in traditional populations undergoing modernization and also among migrant populations from rural to urban habitats. Many different studies have shown that a number of factors are found to be responsible for higher incidence of hypertension (JNC7, 2003). The traditional rural population not following sedentary way of life don't generally show higher incidence of hypertension. Hypertension is achronic major health issue which influenced upon the migrant population. Present scenario describes the determinants of human hypertension also greatly related to physiological variables, anthropometric variables, socioeconomic factors, environmental factors, and nutritional aspects among migrants. Such migrant community known as Marwari shows the health risk behaviors and issues with determining variables.

Considering the seriousness and magnitude of the problem, the World Health Organization (WHO) recognizes obesity and hypertension as the global epidemic (WHO 2000). Despite factors, like age and lifestyle variables (Buchowski and Sun 1996; Jebb and Moore 1999; Maes et al., 1997; Bell et al., 2005; Mishra and Khurana 2008; Mokhtar et al., 2001; Proper et al., 2007), ethnicity does have a role in determining obesity and hypertensive disorders (Colin Bell

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et al., 2002). A study in the United States (US) shows that the incidence of obesity and hypertension are significantly higher among the Afro American adults than their Caucasian American counterpart (Barreira et al., 2012). Other studies from US showed that the Afro American group reports lower adipose tissue compared to the Hispanics and the Whites (Carrol et al., 2008); and a high percent body fat (PBF) along with low BMI among a group of Asian American women compared to other ethnic groups settled in US (Carpenter et al., 2013). Another cross cultural study shows that the Chinese and the South Asian communities have relatively greater visceral fat in abdomen than the Europeans (Lear et al., 2007). Again, the Indians living in Malaysia are found to have greater BMI than the Malays (Mohamud et al., 2011). On the other hand, another study from the same country shows that the prevalence of hypertension is commonly higher in the Malays than the Chinese and the Indians living in Singapore (Sabanayagam et al., 2013). Subsequently, there has been a rise in the metabolic disorders like hypertension, dyslipidaemia, insulin resistance among the population (Chukwuonye et al., 2013; Commodore-Mensah et al., 2014; He et al., 2014). Other studies show that Sum of skinfolds were measured by biceps, triceps, subscapular, suprailliac, abdominal and calf (Rice et al., 1992). Sum of three trunk skinfolds were measured by subscapular, suprailliac and abdominal (Rice et al., 1992). Triceps, subscapular, suprailliac, abdominal, thigh and medial calf skinfolds were measured among the athletes according to ISAK (International Society for Advancement of Kinanthropometry) (Garrido-Chamorro et al., 2012).

According to Oliver et al. (1975), the etiologic factors contributing to raise in the general level of blood pressure in a population the factors may be many but the important are salt intake and degree of obesity, physical activities and psychological stress. A series of epidemiological studies have shown the existences of link between alcohol use and hypertension. Wallace et al. (1981), McMahan (1987) reported that there was consistent positive association between blood pressure and alcohol intakes, especially moderate of heavy alcohol intake. Medeiros (1982) stated that caffeinated beverage consumption and blood pressure in Mississippi young adult do not show significant difference of blood pressure between smokers and nonsmokers.

Klatsky et al. (1986) have suggested a linear relationship between alcohol intake and blood pressure. Shaper et al. (1998) stated that the British Regional Heart study estimated that approximately 10% of hypertension could be attributed to moderate or heavy drinking of alcohol. McMahan (1987) reported that the consumption of their drink (approximate 30ml) of alcohol per day was associated with an increase of 3-4 mmHg in systolic blood pressure and 1-2 mmHg is diastolic blood pressure. That subject consuming five to six drinks (approximately 50-60ml) of alcohol per day had systolic blood pressure 5-6 mmHg greater and a different blood pressure 2-4 mmHg greater than non-drinkers. Wakabayashi et al. (1994) reported a positive association of alcohol intake with rise on blood pressure independence of body mass index and glucose intolerance. Kaufman et al. (1996) did not find relation between hypertension and alcohol consumption among West Africans. Larson and

Silvette (1975) studied on tobacco and reported that smokers had lower blood pressure than nonsmokers.

Nutritional status has been found to be associated with many different morbidity conditions and in effect mortality as well (James et al., 1988; Ferro-Luzzi et al., 1992; Naidu and Rao, 1994; Park, 2003). Relationship of mortality and Body Mass Index (BMI) an indicator of Nutritional status is U- or J-shaped (Lee et al., 1993; Shetty and James, 1994; Allison et al., 2002) that is both the ends show higher mortality, and the least mortality is in between. The disease conditions like cardiovascular and renal diseases, which are generally found to be associated with the higher values of BMI (overweight), were all found to be positively related to high blood pressure. Suter et al. (2002) studies the differing hypertension prevalence rates between certain population and age groups are partially due to differences in the intake of certain nutrients. Savica et al. (2010) study the incidence and severity of hypertension is affected by nutritional status and intake of many nutrients. Excessive energy intake and obesity are major causes of hypertension. Department of Foods, Nutrition and Dietetics (2011) shows the study was based on the determination of nutritional status, blood pressure levels and the associated risks for hypertension among Kenyatta University employees.

Hypertension is a major public health concern in India and in other parts of South Asia (Dodani et al., 2004; Sharma et al., 2006; Mahon et al., 2006). In India, several studies reveal that body composition and cardio respiratory symptoms differ significantly with respect to the ethnicity (Majumder et al., 1995; Das and Bose 2006; Mungreiphy et al., 2012). However Nirmala and Reddy (1993) reported that body mass index, sum of skin-folds and fat patterning are positively correlated with blood pressure among Reddy community of Andhra Pradesh and these measures explained 15% to 16% of variability. Majumdar et al. (1995) studied the genetic epidemiology of blood pressure in two Indian populations that is Marwari's of Calcutta and the Hindu middle-caste agriculturists of Digha. Gupta S. and Kapoor S. studied the sex differences in blood pressure level and its association with obesity indices: who is at greater risk (2007), Das M. and Bose K. also studied obesity and blood pressure among adult Marwaris of Howrah, West Bengal in India. Dash et al. (1999-2000) stated the variation of blood pressure according to BMI. The overall observation viewing in terms of these perspectives, the broad objective of the present research is to study the determinants of hypertension or high blood pressure and nutritional status in one of the Migrant population (Marwari) of Khordha District. As blood pressure is a multi-factorial trait is regulated by various mechanisms that involve a number of factors such as climate, diet, lifestyle, physical exercise, obesity, etc. In order to these subsequent aspects, Marwaris are more vulnerable to these factors basing on obesity and nutritional status, which in term to enhance hypertension. Furthermore an analysis is made to compare the present population with another population of different State.

2. Materials and Methods

The study was conducted among a group of Marwari populations residing in the Bhubaneswar city, Jatni and

Khordha town in Khordha district, Odisha. The numerical strength of Marwaris community is a large migrant community in this district since 200 years ago approximately. The members of Marwari community are found to be distributed in all parts of Khordha district such as Bhubaneswar, Jatani and Khordha. Hypertension is a non communicable disease which is most prevalent in India, as well as Odisha. Besides these criteria the hypertension is mostly accessible in Khordha district in comparing to other district.

The data were collected from Primary and Secondary sources on the blood pressure and nutritional status (Anthropometric variables and Dietary habits). The population under study belongs to the urban and semi-urban area also, which comprises 592 individuals (295 Male and 297 Female) are collected purposively (aged from more than 15 to less than or equal to 90). Blood pressure was measured with a mercury sphygmomanometer as suggested by Rose et al. (1980). Height, weight, upper arm girth, calf girth, waist girth, hip girth, biacromial breadth, crystal breadth were measured by anthropometre rod (of Martin) weighing machine, rod compass (of Martin) for each participant. Six skinfold measurements (biceps, triceps, sub-scapular, suprailliac, abdominal and calf), Sum of six skinfold thickness, Three trunk skinfold thickness and various indices (body mass index and relative fat pattern index) were obtained from each subject. Skinfold thickness was measured according to the methods of Weiner and Lourie (1981) using large skinfold caliper.

- 1) Body mass Index (BMI) = Weight in kg / (Height in mt)²
- 2) Sum of six skin fold thickness (SF6) = (Biceps + Triceps + Subscapular + Suprailliac + Abdominal + Calf)
- 3) The sum of three trunk skin fold thickness (TSF3) = (Subscapular + Suprailliac + Abdominal)
- 4) Relative fat pattern index RFPI = Subscapular / (Suprailliac + Subscapular)

Blood pressure levels

Blood pressure [systolic blood pressure (SBP) and diastolic blood pressure (DBP)] levels were measured on left arm by auscultator method using a blood pressure monitor (Omron M2 Manual Inflation Blood Pressure Monitor, Japan).

Hypertension was defined as mean systolic blood pressure (SBP) 140 mm Hg, mean diastolic blood pressure (DBP) 90 mm Hg following the guideline of the seventh report of Joint National Committee (JNC VII) (Chobanian et al., 2003).

Nutrient value of food consumption

The nutritive values were estimated from the food composition tables, prepared by the Indian Council of Medical Research (ICMR) (Gopalan et al., 2007). Calorie need of an individual was taken as the basis of estimation of consumption unit. The consumption unit (cu) per household was calculated by the method suggested by Bhattacharya et al. (1981), Bhattacharya et al. (1994) and Mondal et al. (2005).

Statistical analysis

Statistical analysis for data obtained during present study was performed using various appropriate statistical tools and software. Age group-wise and sex-wise descriptive statistics such as mean and standard deviation (SD) for each variable was estimated for the selected anthropometric variables. Present data related with anthropometric, nutritional demographic factors were analyzed using MS Excel 2013, IBM SPSS-20.0 version (software package for social sciences).

3. Results and discussion

The adverse health effects of elevated BP have been recognized since the early part of 19th century and population level studies in India had been conducted as early as the late 1940s. High blood pressure or hypertension kills nearly 1.5 million people every year in South-East Asia. Present population comprises the total number of 592 individuals from which 295 males and 297 females mostly suffered pre-hypertensive and hypertensive cases. Systolic and diastolic blood pressure shows in an increasing trend among male rather than female. Other anthropometry and nutritional factors have no positive relationship with hypertension but, intake of salt is inversely related with blood pressure.

Table 1: Variation of Blood pressure (SBP and DBP) in relation to age and sex among Marwaris

Age Group (Years)	Male					Female				
	N (%)	Mean SBP (mmHg)	SD	Mean DBP (mmHg)	SD	N (%)	Mean SBP (mmHg)	SD	Mean DBP (mmHg)	SD
16-25	18 (6.10)	130.28	7.03	88.0	4.78	30 (10.10)	122.3	9.17	81.43	5.87
26-35	80 (27.12)	134.11	14.88	87.58	7.71	80 (26.94)	128.68	15.20	84.21	8.49
36-45	110 (37.29)	134.85	14.26	87.43	7.66	98 (33.0)	127.56	11.01	83.50	7.04
46-55	48 (16.27)	135.71	14.78	88.92	7.84	47 (15.82)	128.55	18.07	82.60	7.69
56-65	27 (9.15)	131.81	17.31	86.48	7.93	28 (9.43)	131.29	17.58	86.46	9.87
66-75	9 (3.05)	131.11	15.16	88.33	7.07	9 (3.03)	122.22	9.72	81.67	5.59
>75	3 (1.01)	143.33	22.55	92.67	4.62	5 (1.68)	125	10.0	82.00	5.70
TOTAL	295 (100)	134.45	15.13	88.48	6.80	297 (100)	140.8	12.96	83.12	7.17

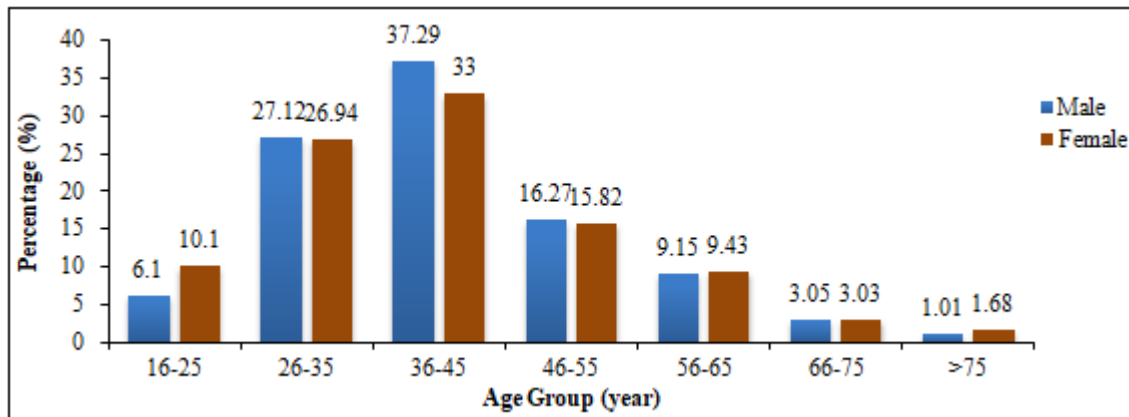


Figure 1: Age and sex wise distribution of Marawaris of Khordha district

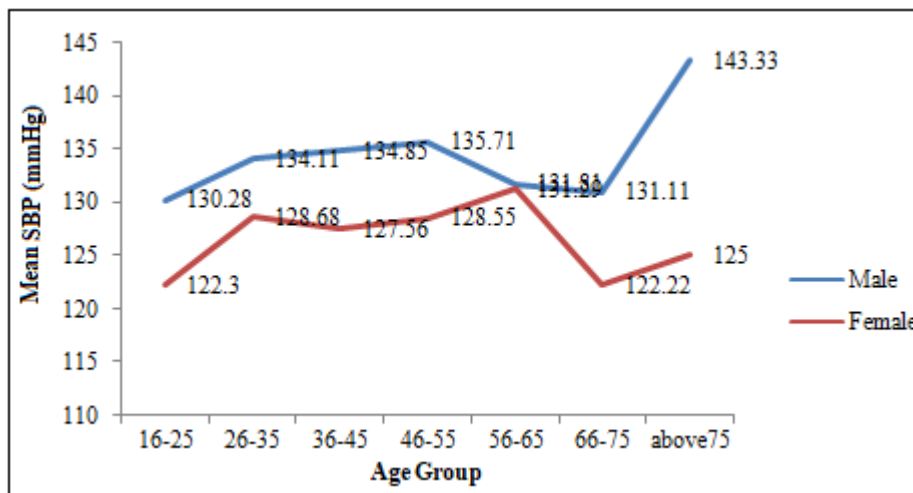


Figure 2: Age and sex wise distribution of mean Systolic Blood Pressure (SBP) of Marawaris of Khordha district

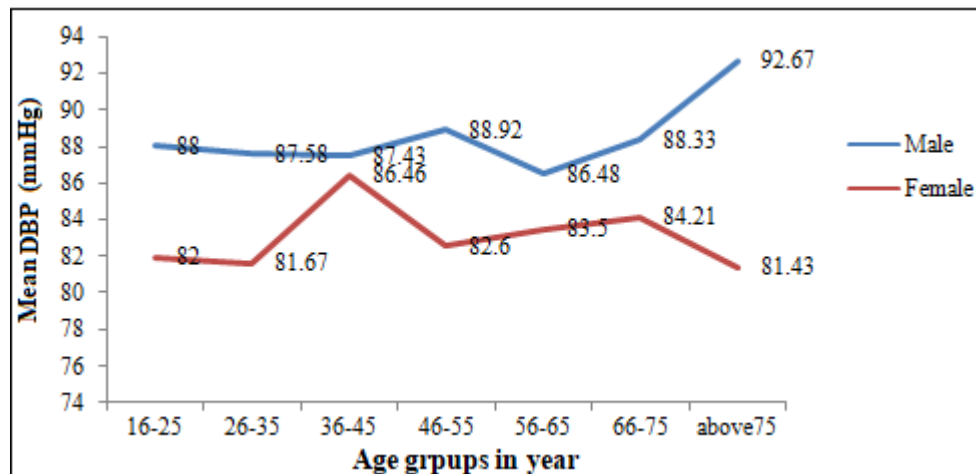


Figure 3: Age and sex wise distribution of mean Diastolic Blood Pressure (DBP) of Marawaris

In the present study among Marwaris of Khordha district in Odisha it was observed that the increase in blood pressure with age as well as the difference between both the sexes were also found (table-1 and figure 1, 2 and 3). A substantial proportion (49.8% of male and 50.2% of female) possesses higher value for the systolic and diastolic blood pressure. Male people are higher at the age group 36-45, but at this age they are prone to accesses pre-hypertension. This mean value is higher at the age group 75 above. Most female subjects are found at the age 36-45 are belonging to pre-hypertension. Blood pressure value is lower at 65-75 among

female. Most females are suffered with pre-hypertension condition at the age 55-65. The mean value of diastolic pressure is highest within the age group 46-55. But the highest mean value of systolic pressure tends within the age group 56-65 in case of female and the mean value of diastolic pressure is higher within the age group 66-75. From this result it is observed that the mean values of blood pressure of same age group of male and female are different since the biological and environmental factors influencing blood pressure differ considerably sex-wise.

Table 2: Blood pressure (SBP and DBP) variation shows according to the relation with Body Mass Index (BMI) among ethnic Marwari Community of Khordha district

BMI (kg/m ²)	Male					Female				
	N (%)	Mean SBP (mmHg)	SD	Mean DBP (mmHg)	SD	N (%)	Mean SBP (mmHg)	SD	Mean DBP (mmHg)	SD
18.5-24.9	50 (16.95)	126.71	15.54	80.2	7.62	87 (29.28)	126.17	10.19	79.47	6.5
25 - 29.9	223 (75.59)	134.29	14.69	87.48	7.63	159 (53.53)	126.83	13.43	83.66	7.87
≥30	22 (7.45)	134.22	10.92	89.5	6.02	51 (17.17)	129.23	15.7	84.66	7.21
Total	295 (100)	134.11	13.71	88.36	7.09	297 (100)	128.06	14.46	83.65	7.61

Present findings show that highest individuals (male, 75.59% and female, 53.53%) are found whose BMI is 25-29.9. The mean SBP did not show increment with the increase in BMI for males. But for the females, the mean SBP is the highest in the highest BMI category. The mean DBP values also showed increment with the increase in BMI value.

In the reviews, a study was conducted by Kusuma Y.S. and Das P.K. (2008) shows the hypertension in Odisha, India, a cross-sectional study among some tribal, rural and urban populations (BMI is the important factor of their study). According to the NHFS-4 (2015-16), the nutritional status of

adults (age 15-49 years) consists of the women whose Body Mass Index (BMI) is below normal (BMI<18.5kg/m²) show 12.1 percent urban population, 19.2 percent rural population and 15.4 percent population belongs to total population but women who are overweight or obese (BMI≥25.0kg/m²) belongs to 34.0 percent urban population, 25.7 percent rural population and 30.2 percent total population. However the men whose BMI is below normal (BMI<18.5kg/m²) show 7.8 percent urban population, 12.7 percent rural population and 9.8 percent population belongs to total population but men who are overweight or obese (BMI≥25.0kg/m²) belongs to 32.4 percent urban population, 19.7 percent rural population and 27.1 percent total population.

Table 3: Distribution of blood pressure (SBP and DBP) related to calories intake per day among Ethnic Marwari's of Khordha district

Calories (in KCal)	Male					Female				
	N (%)	Mean SBP (mmHg)	SD	Mean DBP (mmHg)	SD	N (%)	Mean SBP (mmHg)	SD	Mean DBP (mmHg)	SD
500-1000	0	0	0	0	0	5 (1.68)	126.2	11.62	88.6	6.69
1000-1500	0	0	0	0	0	26 (8.75)	130.96	16.06	85.42	7.6
1500-2000	0	0	0	0	0	130 (43.77)	129.81	12.88	85.48	7.89
2000-2500	132 (44.74)	133.39	14.92	86.82	7.64	136 (45.79)	131.3	16.13	85.11	8.18
2500-3000	151 (51.18)	129.65	14.31	85.15	8.1	0	0	0	0	0
3000-3500	12 (4.06)	128.5	14.85	85.16	6.27	0	0	0	0	0
Total	295 (100)	130.51	14.69	85.71	7.73	297 (100)	129.56	14.17	86.15	7.59

The highest male subjects (44.74%) are found among Marwaris when they consume 2500 - 3000 Kilocalories (Kcal.) intake per day. But the mean systolic blood pressure is high at the calories 2000-2500 Kcal. intake per day in case of male. Highest female subjects (45.79%) are found in the calorie consumption 2000-2500 (Kcal.)per day. The mean systolic blood pressure is high in 2000-2500(Kcal)

consumption per day. The mean diastolic blood pressure is highest at the 500-1000 Kilocalories consumption per day. The mean SBP did not show increment with the increase in calorie intake of males. But for the females, the mean SBP is the highest in the highest BMI category. Likewise SBP the mean DBP values did not show increment with the increase in calorie intake of male and females.

Table 4: Distribution of Blood pressure (SBP and DBP) related to Fat intake per day among ethnic Marwaris of Khordha

Fat (gm)	Male					Female				
	N (%)	Mean SBP (mmHg)	SD	Mean DBP (mmHg)	SD	N (%)	Mean SBP (mmHg)	SD	Mean DBP (mmHg)	SD
0-20	0	0	0	0	0	12 (4.04)	133.33	15.85	84.75	5.75
20-40	0	0	0	0	0	83 (27.94)	134.56	13.94	87.55	7.76
40-60	21 (7.11)	128.14	10.82	86.38	9.12	142 (47.81)	133.14	10.82	86.38	9.12
60-80	260 (88.13)	131.2	15.23	85.95	8.31	45 (15.15)	136.61	13.91	85.62	8.45
80-100	12 (4.06)	123.75	10.25	83.5	6.08	15 (5.05)	131.19	17.48	85.79	8.84
100-120	2 (0.67)	127	16.97	82.5	3.53	0	0	0	0	0
Total	295 (100)	127.52	13.31	84.58	6.76	297 (100)	132.34	13.53	86.22	7.54

When blood pressure is related to consumption of fat, it was observed that the highest males (88.13%) are found in the fat intake 60-80 gm per, like that highest females (47.81%) are found in the fat intake 40-60 gm. The mean systolic blood pressure is found highest at 60-80 gm fat consumption per day but the mean blood pressure is highest at 40-60 gm fat

consumption per day in case of male. The mean systolic blood pressure is high in the fat range 40-60 gm and the mean diastolic blood pressure is high in the fat range 20-40 gm. The mean SBP and DBP did not show increment with the increase in case of fat intake of males and females.

Table 5: Salt intake per day and blood pressure (SBP and DBP) distribution among Ethnic Marwaris of Khordha district

Salt (gm)	Male					Female				
	N (%)	Mean SBP (mmHg)	SD	Mean DBP (mmHg)	SD	N (%)	Mean SBP (mmHg)	SD	Mean DBP (mmHg)	S.D.
2-4	139 (47.11)	124.8	2.37	84.35	0.82	174 (58.58)	119.75	3.2	79.88	1.53
5-7	151 (51.18)	144.02	1.42	93.71	0.27	115 (38.72)	132.96	2.71	86.97	1.28
> 7	5 (1.69)	156.25	10.6	94.37	4.44	8 (2.69)	156.42	16.56	90.07	4.02
Total	295 (100)	141.69	4.79	90.81	1.84	297 (100)	136.37	7.49	85.64	2.27

Highest males (51.18%) are taking 5gm to 7 gm salt but highest females (58.58%) are taking 2gm to 4gm salt. Most prevalence of hypertension is depending upon more intake of salt. The mean systolic and diastolic pressure is found to be highest in the salt increases up to more than 7 gm in case of both sexes. The mean SBP and DBP show the incassation with the increase of salt intake of males and females.

Table 6: Anthropometric and physiological variables of the Marwari participants (n=592) of Khordha district, Odisha

Anthropometric variables	Male (n=295)	Female (n=297)	P value
	Mean±SD	Mean±SD	
Height	166.4±10.7	149.8±15.8	0.308
Weight	71.6±3.8	60.2±2.9	0.001
Biacromial breadth	32.9±4.43	30.98±4.36	0.001
Cristal breadth	32.11±4.43	30.98±4.35	0.001
Calf girth	24.83±12.1	23.16±2.7	0.035
Waist girth	39.06±3.90	37.87±3.72	0.048
Hip girth	37.62±4.16	36.48±4.10	0.980
Upper arm girth	15.85±1.89	14.72±9.08	0.445
Anthropometric Indices			
BMI	30.64±3.27	27.59±7.1	0.001
RFPI	35.76± 8.62	39.49± 9.15	0.002

Skinfold thickness			
SF6	79.85±6.32	85.92±8.41	0.013
TSF3	50.24± 6.12	55.71± 5.80	0.001
Physiological variable			
SBP	132.52±14.36	125.81±13.85	0.001
DBP	87.30±7.50	83.18±7.62	0.001

Above table shows the anthropometric and physiological values of Marwaris of Khordha district, Odisha. The distributions of the Height, Weight, Biacromial breadth, Cristal breadth, Calf girth, Waist girth, Hip girth, Upper arm girth and, indices and skinfold thickness, SBP and DBP are followed by males and females and compared. From the above studies of anthropometric measurements in relation with systolic and diastolic blood pressure weight and BMI has the positive relationship with blood pressure, likewise biacromial and cristal breadth has the association with blood pressure. It is also evident from the above studies calf girth and waist girth has little positive relationship with blood pressure. Skinfold thickness such as Sum of Six Skinfold Thickness (SF6) and Sum of Three Trunk Skinfold thicknesses (TSF3) has the positive relationship with blood pressure, but Relative Fat Pattern Index (RFPI) has little positive relationship with blood pressure.

Table 7: Calorie intake, alcohol consumption and smoking habits among Marwaris of West Bengal (Ghosh, 2016; unpublished article) and Marwaris of Odisha (present study)

Habits	Male		Female	
	Odisha Marwaris (n=295) n(%)	West Bengal Marwaris (n=29) n(%)	Odisha Marwaris (n=297) n(%)	West Bengal Marwaris (n=41) n(%)
Total calorie intake (mean±sd)	2555.4±345.7	2105±562.8	1784.6±234.1	1574.49±389.5
Alcohol consumption	5(1.69)	9(31.0)	-	-
Cigarette smoking	22(7.45)	8(27.6)	-	-

Above table shows the caloric intake of Marwaris of Odisha and West Bengal. From this comparison it shows people take more calories in Odisha than West Bengal. However alcohol consumption is very less among Marwaris in Odisha

than West Bengal when cigarette smoking is more than alcohol consumption. However females have no other addiction habits except consuming betel.

Table 8: Anthropometric and physiological characteristics among Marwaris of West Bengal (Ghosh et al., 2016; unpublished article) and Odisha (present study)

Anthropometric variables	Male		Female	
	Odisha Marwaris (n=297) n(%)	West Bengal Marwaris (n=29) n(%)	Odisha Marwaris (n=297) n(%)	West Bengal Marwaris (n=41) n(%)
BMI (mean±sd)	30.64±3.27	29.99±2.15	27.59±7.1	27.49±0.62
Physiological variables				
SBP (mean±sd)	132.52±14.36	126.48±2.61	125.81±13.85	125.46±2.33
DBP (mean±sd)	87.30±7.50	83.18±7.62	87.71±1.15	85.05±1.71

Above table 25 shows Marwari people of Khordha district of Odisha and Marwari people of Kolkata, West Bengal. From this comparison it is observed that males Odish have greater BMI in comparison to the males of West Bengal however

females of Odisha shows the BMI value is much similar with the females of West Bengal. But the mean SBP and DBP value is significantly higher in case of Odisha male than the males of West Bengal. In case of female SBP value

is similar among these two groups whereas DBP value is higher among the Marwaris of Odisha than West Bengal.

4. Conclusions

Multifactorial disorders, such as: hypertension, heart disease, kidney disease, diabetes and cancer can be as complex as their name suggests. Hypertension is one of them which is rapidly increasing worldwide. This disease is partially explained by genetics, and it is known to run in families (Watkins and Farrall, 2006). High blood pressure or hypertension kills nearly 1.5 million people every year in South-East Asia. Studies also made that the incidence of blood pressure is also increasing in both rural and urban area in Odisha (Kshatriya, 2016 and Mohapatra, 2015). Their sedentary life style and rich food consumption sometimes lead to high blood pressure. It will be concluded that members of Marwari community affected with blood pressure also depend upon nutritional status. This in turn perhaps gets translated in their lifestyle behavior and finally scripts related to cardiovascular health outcome.

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