

Prevalence of Malnutrition and Hypertension among Khasi Mothers of Sohra, Meghalaya.

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ABSTRACT

Malnutrition is one of the major problems faced by developing countries. It refers to the deficiency or excess of one or more nutrients in one's body. Overweight and obesity is often associated with many chronic non-communicable diseases including cardiovascular diseases. The present study was conducted to find the prevalence of malnutrition and hypertension among the Khasi mothers of Sohra area, Meghalaya. A total of 695 non-pregnant mothers of reproductive age 15-49 years were included in this study. Subjects were divided into four age groups viz., ≤ 24 , 25-34, 36-44 and ≥ 45 years respectively. The finding shows that mean systolic and diastolic pressure increases with increasing age group and highest among menopausal mothers. According to WHO cut-off value for both International and Asian population, a significant association was seen between BMI categories and blood pressure (Chi-square =33.12 and 28.09, $p > 0.001$ respectively). Mean blood pressure was found to be highest among overweight/obese and lowest among the underweight category. A significant positive correlation is also seen among BMI, systolic, diastolic blood pressure and age. Increasing urbanization and globalization, improvement in economic condition, changing lifestyle along with nutrition transition may be the factors that play important roles for increase prevalence in overweight and/or obesity in the current population.

KEYWORDS

BMI, blood pressure, malnutrition, reproductive age, lifestyle, Khasi Mothers.

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I. INTRODUCTION

The World Health Organisation (WHO) has defined health as a state of complete physical, mental and social well-being and not a mere absence of disease or infirmity. Thus, individual reflection on various dimensional aspects in one's life is of great importance. Health being multifaceted and complex, awareness is much needed to ward off any chances of one being afflicted from such infirmities.

Nutritional status may be defined as a health condition of an individual or a population that is influenced by the intake and utilization of nutrients. Malnutrition is the deficiency or excess of one or more nutrients, that is, it refers to both under-nutrition and over-nutrition (1). Malnutrition is one of the major problems that developing countries are facing. There is not only a high prevalence of undernutrition but an increasing number of overweight and obese individuals is seen in the past years due to an improvement in economic condition, increasing urbanization and globalization (2,3). Though considerable genetic components are influential, diseases such as hypertension is closely related to one's nutritional status, with overweight and obesity being one of its main associations. Obesity in all ages and hypertension in adults either remains at high levels or are increasing (4). Maternal nutritional status is detrimental to their child's health which are in turn affiliated with the health status of the family as a whole especially in a developing country like India.

The Khasis are a tribal population that are racially and linguistically an off-shoot of the Mon-Khmer branch of the Austro- Asiatic stock and follow the matrilineal system where inheritance and lineage is traced through the women. The staple food is rice which is commonly taken with some type of meat and vegetables on the side. Although majority of the people practise an agrarian culture, many engage in businesses and work in the public and government sector.

OBJECTIVE

The main objective of this present study is to find the prevalence of malnutrition and hypertension across different age groups and correlated factors between Body Mass Index (BMI), blood pressure (BP) and age among the Khasi mothers of Sohra, Meghalaya.

II. MATERIALS AND METHODS

The present study was conducted among 695 non-pregnant Khasi mothers of reproductive age of Sohra area, under the East Khasi Hills District, Meghalaya, Northeast India. Sohra sits on a plateau on the southern part of the Khasi hills facing Bangladesh. According to Indian census 2011, Sohra holds a mixed population of 14,816 people with the dominant tribe being the Khasis. Cross-sectional data was collected from 14 villages within Sohra area.

Subjects were divided into four different age groups *viz.*, ≤ 24 , 25-34, 36-44 and ≥ 45 years respectively. Anthropometric data such as height, weight was measured for assessment of BMI. BMI was calculated using the formula $\text{weight (in kg)}/\text{height (in m}^2\text{)}$. Non pregnant mothers with BMI $< 18.5 \text{ kg/m}^2$, 18.5 to 22.9 kg/m^2 and $\geq 23 \text{ kg/m}^2$ is classified as underweight, normal weight and overweight/obese (5). Data on blood pressure was collected, using a standard mercury sphygmomanometer and a stethoscope (6). Normal BP is defined if blood pressure is less than 120/80 mmHg, prehypertension as 120-139/80-89 mmHg, stage I hypertension as 140-159/90-99 mmHg, and stage II hypertension as $\geq 160/100$ mmHg as recommended by the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure in its seventh report (7).

Statistical analyses

Data was calculated manually and analysed using MS-excel software (Microsoft Company, 2014 version), and IBM developed software SPSS version 20. For statistical analyses, t-test, Chi-square, and correlation were used.

III. RESULTS

Table 1 shows the distribution of height, weight, and BMI across the different age groups. The highest mean height (143.86 cm) is found among the 25-34 years age group, while the minimum mean height (142.71 cm) is found among the age group ≤ 24 years. It also shows the maximum and minimum mean weight among the age group 35-44 years and ≤ 24 years at 45.80 kg and 42.61 kg respectively. Mean BMI displays that the maximum mean (22.34 kg/m^2) is among the oldest age group ≥ 45 years and minimum mean BMI (20.85 kg/m^2) is among the youngest age group ≥ 24 years. A statistically significant test between different age groups shows that the significant level (3.206^* , $p < 0.05$) is slightly lower in mean weight category of the age group (25–34 years) than that mean BMI (2.833^{**} , $p < 0.01$) of the same age group.

Table 1: Basic Data on Height, Weight and BMI in Different Age Groups

Age-group	N (695)	Weight (in kg)			Height (in cm)			BMI		
		Mean	SD	t-value	Mean	SD	t-value	Mean	SD	t-value
≤ 24	110	42.61	7.83	-	142.71	5.97	-	20.85	3.29	-
25-34	342	45.35	7.69	-3.206*	143.86	5.35	-1.798	21.87	3.21	-2.833**
35-44	196	45.80	8.12	-0.627	143.77	4.80	0.210	22.12	3.52	-0.817
≥ 45	47	45.65	8.16	0.109	142.73	4.90	1.310	22.34	3.55	-0.380

Note: Significant level $*p < 0.05$, $**p < 0.01$.

Table 2 show the mean distribution of BP in different age groups. Highest mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) is seen in the oldest age group ≥ 45 years (117.51 mmHg and 76.98 mmHg respectively) while lowest mean SBP (108.83 mmHg) and DBP (67.65) is seen in the youngest age group ≤ 24 years. Statistical tests show t-test is significant at $**p < 0.01$ for age group 35-44 years (-3.102), also at $*p < 0.05$ for age groups 25-34 years (-2.189) and 35-44 years (-2.419) respectively.

Table 2: Blood pressure in Different Age Groups

Age-group	N (695)	Systolic Blood Pressure			Diastolic Blood Pressure		
		Mean	SD	t-value	Mean	SD	t-value
≤ 24	110	108.83	13.15	-	67.65	11.88	-
25-34	342	110.87	13.35	-1.409	70.45	11.12	-2.189*
35-44	196	114.08	17.14	-2.419*	73.77	12.35	-3.102**
≥ 45	47	117.51	17.43	-1.215	76.98	12.74	-1.562

Note: Significant level $*p < 0.05$, $**p < 0.01$

Tables 3(a) and 3(b) displays the distribution of BMI against BP. A considerable increasing trend is seen in SBP and DBP against increasing BMI value. Underweight category constitutes 92 (13.24%) with mean

SBP at 107.27 mmHg and mean DBP at 68.38 mmHg. The prevalence of overweight and/or obese category is 206 (29.64%) and mean SBP and DBP values is found to be 117.06 and 75.45 mmHg respectively in table 3(a) of Asia-Pacific cut off values. In Table 3(b) of the international cut-off values, Overweight and/or Obese category is 107 (15.39%) with mean SBP at 119.89 mmHg and mean DBP at 78.27 mmHg.

Table 3(a): Blood Pressure against BMI categories (Asia-Pacific cut-off)

BMI	N (695)	%	Systolic Blood Pressure		Diastolic Blood Pressure	
			Mean	SD	Mean	SD
Normal	397	57.12	110.29	12.8	69.97	11.29
Underweight	92	13.24	107.27	17.29	68.38	11.76
Overweight and/or Obese	206	29.64	117.06	16.24	75.45	12.32

Table 3(b): Blood Pressure against BMI categories (International cut-off)

BMI	N (695)	%	Systolic Blood Pressure		Diastolic Blood Pressure	
			Mean	SD	Mean	SD
Normal	496	71.37	111.03	13.06	70.46	11.21
Underweight	92	13.24	107.27	17.29	68.38	11.76
Overweight and/or Obese	107	15.39	119.89	17.88	78.27	13.03

Table 4 shows the distribution of subjects in different categories of BP. In case of SBP, normal constitutes about 71.65 percent followed by prehypertension at 22.59 percent. Hypertension stages I and II constitute about 3.45 percent and about 2.30 percent, respectively. In case of DBP, 76.11 percent of the subject falls under normal category followed by prehypertension at 15.68 percent. Hypertension stages I and II constitute 5.75 percent and 2.45 percent, respectively.

Table 5 displays the correlation matrix between factors like BMI, SBP, DBP, and age. The correlation status is found to be significant at $p < 0.01$ level. Significant positive association is seen between all variables. The relationship of BMI with SBP (0.281**) and DBP (0.275**) shows a similar strength. The relationship of SBP and DBP (0.745**) is found to be much stronger than other variables.

Table 4: Distribution of subjects in different categories of Blood Pressure

Categories	Systolic Blood Pressure (mmHg)		Diastolic Blood Pressure (mmHg)	
	N (695)	%	N (695)	%
Normal	498	71.65	529	76.11
Prehypertensive	157	22.59	109	15.68
Hypertension Stage 1	24	3.45	40	5.75
Hypertension Stage 2	16	2.30	17	2.45

Table 5: Correlation matrix between BMI, SBP, DBP and Age.

Variables	BMI	SBP	DBP	Age
BMI	1.000	0.281**	0.275**	0.123**
SBP	0.281**	1.000	0.745**	0.164**
DBP	0.275**	0.745**	1.000	0.227**
Age	0.123**	0.164**	0.227**	1.000

**Correlation is significant at the 0.01 level (2-tailed)

IV. DISCUSSION AND CONCLUSION

Genetics influences the prevalence of malnutrition and its related diseases to some extent, however the majority cause is mostly due to dietary habits. The lack or excess of consumption of nutritious food could lead to an imbalance in one's body composition with due course of time. The prevalence of overweight and/or obesity diseases could be seen among the Khasi mothers of Sohra.

Sohra is one of the popular tourist sites for its beautiful cascading waterfalls and caves. Though the Khasis mainly practise in agrarian culture, however many of the Khasis settling in Sohra engage themselves in small businesses which is inculcated by tourism. They mostly have medium to short stature. Minimum mean body weight and BMI is found among the youngest age group. The highest mean body weight is found among the middle age group followed by the oldest age group having moderate mean body weight. Highest mean BMI is found among the older mothers. Body weight increases till middle age which may be due to fat accumulation with age and decrease in energy expenditure due to lesser physical activity. Decline in body weight in later stages of life may be due to reduced protein intake as well as decline in mass of muscle fibres and partly also due to decline in bone density due to gradual mineral loss (8). Loss of collagen between spinal vertebrae can lead to shrinkage in height with increasing age (9).

The present findings show an increasing trend along with increasing BMI categories which imply that there is an association between BMI and BP. Similar trend is also seen in other populations where there is a gradient relationship between BMI and increased risk of hypertension (10,11, 12). The present study also shows coexistence of underweight and overweight categories in the population. This co-existence of malnutrition is commonly termed as “the double burden of malnutrition”. Some studies have estimated that overweight exceeds underweight in many developing countries including India, especially in urban areas (13). The present study also shows that there is a strong positive correlation between BMI, BP and age. The strongest correlation is seen among SBP and DBP compared to the association between BMI and age. The study also shows the prevalence of higher BP along higher BMI values. As some studies have shown that overnutrition significantly leads to hypertension

(14). A sedentary lifestyle is also one of the causal factors leading to overnutrition. Not only is globalization, in terms of better facilities when it comes to nutritional intake, an influence to this trend of malnutrition, but lack of a more physically active lifestyle could be another factor to increasing BMI which is directly influencing BP in the study population. Therefore, with such trends of malnutrition rising among populations there is a need to re-examine and widen our awareness through health-related programs and raise issues to avoid further complication.

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