

Stress and Nutritional Status of Individuals in Uttarakhand, Northern India: Differential Effect of Gender

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ARTICLE INFO	ABSTRACT
<p>Article type: Original Article</p>	<p>Background: Uttarakhand, Northern India is facing challenges in the issues concerning public health. Hence, researches identifying the stressors and nutritional factors influencing health are encouraged. This study attempts to assess the stress levels and nutritional status. Gender differences are also measured in the same.</p>
<p>Article history: Received: Aug 05 2013 Accepted: Oct 28 2013 e-published: Dec 31 2013</p>	<p>Methods: Stress and nutritional status related information was gathered (Nov, 2012-June, 2013) from 118 individuals residing in Uttarakhand state. Stress level was assessed using Personal Stress Score Inventory. Anthropometric details and dietary intake (3 day food recall method) were collected. Nutrient intake were calculated and compared with recommended dietary allowance (RDA) for Indians. T-test and Chi-square (χ^2) were performed to measure the gender difference in studied variables.</p>
<p>Keywords: Stress, Nutritional status, Gender difference, India</p>	<p>Results: 66.6% of females and 85.4% of males reported moderate stress (31-79). Males were seen to be more stressed than females, though no significant difference was seen. A significant difference in BMI (Body mass Index) was seen between males (24.1 kg/m²) and females (21.5 kg/m²). The study sample was found to be deficient in iron and zinc when compared with RDA. Females suffering from various level of stress had significantly lower levels of energy, protein, zinc than males.</p>
<p>*Corresponding Author: Anju T. Bisht Tel: +91 941 216 3610; e-mail: dr.anjuthathola@rediffmail.com</p>	<p>Conclusion: Majority of subjects were suffering from moderate level of stress. The anthropometric status of subjects was good, though females showed significantly lower intake of nutrients compared to men. Poor intake of iron and zinc points towards a possibility of hidden hunger. Hence, psychological and nutritional counseling may be required.</p>

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Introduction

The Uttarakhand region comprising of Garhwal and Kumaun region, situated in Northern India was carved out from Uttar Pradesh in the form of a separate state in 2000 and have 92.57% of hilly region and 63% of forest cover¹. After the formation of the new state, sudden, intense developmen-

tal activities got triggered at a considerable rate in the state. Thus, the state and more specifically, its people experienced the transition phase and its impact on them. On the other hand, in the past 13 years not much has been achieved in the development and management of the health care system.

Presently, concern regarding the stress experienced, nutritional and health conditions have emerged realizing the wide range of sections of population which are influenced by the transitional changes and paucity of research investigations targeting the people affected, revealing their problems and exploring the etiological possibilities of the prevailing problems of the people of Uttarakhand.

Stress has been considered to have grave effects on nutritional status. Higher stress is associated with less healthy eating behavior, higher body weight and thus poor nutritional status². In a study done on four purposively selected areas of Uttarakhand and 125 dual career women revealed the detrimental effects of stress on various psycho-physiological dimensions, like, blood pressure, pulse pressure, heart rate, respiration rate, temperature fluctuations, aptitude test and letter cancellation test more on the women working in the banks/Life Insurance Corporation³. The affects of stress in reference to the gender comparison in the state are not available and due to lack of research on this aspect there is unavailability of adequate information.

Regarding the nutritional status, a study conducted to assess the nutritional intake of a sample of 136 women in seven villages of Kumaun region of Uttarakhand revealed 42.64% women suffering from chronic energy malnutrition of various grades⁴. The assessment of nutritional status in 223 rural women from three villages in Uttarakhand revealed high proportion of subjects suffering from malnutrition⁵. The studies have specifically reported the nutritional status of women in villages and not of the men. In developing Uttarakhand not only women in villages but also women who are in the areas in which there are availability of facilities, together, represent the women section and the nutritional condition of the men, whom the transition has similarly influenced, needs to be explored.

There is a paucity of research investigations revealing the above mentioned dimensions in Uttarakhand. Hence, the present

study was conducted with the aims to firstly, assess the level of stress and nutritional status in the study sample, second, to compare the level of stress in males and females and third to measure the gender difference in nutritional status of individuals of Uttarakhand, Northern India.

Materials and Methods

The present study was an exploratory research, in which five areas, namely, Pithoragarh, Pauri, Nainital, Dehradun and Udham Singh Nagar of Uttarakhand were randomly selected. The data collection was done from Nov, 2012- June 2013. Individuals of the selected area were contacted. The inclusion criteria were that the age of subjects should be between 22-55 years, should not be suffering from any physical impairment, should not be pregnant and lactating and should be willing to participate in the study. The purpose of the study was explained to the contacted subjects and 125 individuals volunteered to provide the data. Out of 125 samples, seven samples were rejected due to incomplete information. Thus the final sample consisted of 118 (63 females and 55 males) on which following tools were employed for the purpose of obtaining data regarding level of stress and nutritional status:

- i. Level of stress: For assessing the level of stress Personal stress source inventory⁶ was administered which consists of 35 items and each item had three possible answer options, namely, seldom, sometimes and frequently. The scores describing level of stress are, namely, mild (0-30), moderate (31-79) and high (80 and above). As more subjects falling in moderate category of stress were reporting physiological symptoms like asthma, diabetes, hypertension etc. compared to those in the mild category, hence, for adequate explanation of the obtained scores in the moderate category the authors have defined the scores ranging from 31-55 and 56-79 by using the terms moder-

ately low and moderately high, respectively. The test-retest reliability of the tool is 0.79 and 0.68 concurrent validity.

ii. Nutritional status: For exploring the nutritional status a self-made questionnaire in which anthropometric details like height, weight were collected for the individuals of Uttarakhand and Body Mass Index (BMI) was calculated as weight (kg)/ height (m²). For evaluating nutritional status a 3 day food recall method⁷ was deployed. The daily intake of nutrients was calculated according to food composition table for Indian foods⁸ and compared with the recommended dietary allowances (RDA) for Indians⁹. Statistical Analysis: Mean ±SD of scores and percentage is used to describe the results. Chi square (χ^2) was employed to assess the difference in the level of stress between males and females. For the analysis of gender differences in BMI and daily nutrient intake *t*-test was employed.

Results

Out of 118 participants, 63 were female with the mean age of 31.3 and 55 were male in the age range of 32.8.

Stress: The mean level of stress for men and women of Uttarakhand under study is presented in Table 1. The mean overall level of stress for both male and female fell in the moderate category of stress according to PSSI scale. It was observed that mean overall stress was 43.58 for males and 40.4 for females.

Further explaining level of stress as mild (1-30), moderately low (31-55), moderately high (56-79) and severe (80 and above), it was elucidated that none of the subject reported severe stress. 33.3 percent of females showed mild stress, 41.3 percent moderately low stress and 25.4 percent moderately high stress whereas, among males 14.5 percent suffered from mild stress, 67.3 percent from moderately low stress and 18.2 percent from moderately higher level of stress. It can be seen from the data that males suffered from higher degree of stress. χ^2 analysis result showed a significant difference in level of stress between the male and female subjects (Table 1).

Nutritional status: The mean BMI for both men and women fell in the normal range, with the mean BMI (kg/m²) of 24.1 for men and 21.5 women. T-test was applied to see the difference in BMI due to gender and it was revealed that males had significantly higher BMI than females ($P=0.0001$).

Table 1: Stress distribution by gender

	Female		Male			
Category	n	%	Mean Stress	n	%	Mean Stress
Mild Stress	21	33.3	22.67±5.72	8	14.5	21.63±6.78
Moderately Low Stress	26	41.3	40.77±7.43	37	67.3	43.27±5.7
Moderately High Stress	16	25.4	63.06±6.32	10	18.2	62.3±5.52
Overall Stress	63	100	40.4±16.7	55	100	43.58±13

$\chi^2 = 8.64, df=2, P \leq 0.05$

The nutritional status in terms of BMI was also calculated for subjects showing mild, moderately low and moderately high level of stress and it was found that mean BMI of women and men in the mild category was 21.0 and 24.2 kg/m², respectively, though the difference was not significantly pronounced. A significant difference in BMI between males (24.0

kg/m²) and females (21.4 kg/m²) suffering from moderately low stress was observed ($P=0.003$). The group suffering from moderately high stress showed BMI of 22.3 for females and 24.1 for males (Table 2).

On comparing the dietary intake of the study sample with the RDA it was seen that study sample were deficient in iron and zinc. Rest of the nutrients were either in accord-

ance to RDA or higher than the recommended levels (Table 3). Female subjects had significantly ($P<0.05$) lower nutrient intake than male subjects except for niacin. The nutrient intake was also calculated for the subjects lying in different level of perceived stress and it was elucidated from the data that a decrease in nutrient intake with an increase in stress for females occurred whereas, males showed an increase in nutri-

ent intake with increase in level of stress. Intake of all the nutrients was higher than the RDA except for iron and zinc for the subjects in all the three categories of stress. Data revealed that in all the three categories of stress, females had significantly lower levels of energy, protein, zinc than males. The intake of iron and calcium was significantly higher ($P<0.05$) for males than females in moderate stress category (Table 3).

Table 2: Comparison of BMI levels between males and female subjects

Category	BMI Mean±SD		P-value
	Females	Males	
Mild stress	21.0±4.0	24.2±4.0	0.06
Moderately low stress	21.4±3.53	24.0±3.1	0.003*
Moderately high stress	22.3±2.33	24.1±3.4	0.122
Overall stress	21.5±3.44	24.1±3.26	0.0001*

*Significant

Table 3: Nutritional status of subjects according to degree of stress and in comparison to Recommended Dietary Allowance (RDA)

Category	Gender	Nutrients intake per day Mean(±SD)						
		Energy* (Kcal)	Protein* (g)	Zinc* (mg)	Calcium* (mg)	Iron* (mg)	Niacin* (mg)	Vit C* (mg)
Over all stress	Female	1877(445)	60(15.2)	8.2(2.4)	659(228)	23.7(26.3)	16.6(6.4)	105(54)
	Male	2477(621)	90.9(33.8)	11.5(3.2)	781(236)	29(8.7)	21.6(6.4)	106(40)
	S/NS	S	S	S	S	NS	S	NS
Mild stress	Female	1990(385)	63(12.7)	8.5(2.1)	693(199)	29.8(44.6)	16.2(4.4)	120(66)
	Male	2515(443)	92(14.8)	11.5(3.2)	730(241)	29.4(10.3)	22.1(8.0)	98 (26)
	S/NS	S	S	S	NS	NS	S	NS
Moderately low stress	Female	1801(417)	59(14.4)	7.8(2.2)	645(225)	20(5.75)	15.8(4.7)	106(47)
	Male	2355(459)	85(28.5)	11.08(3.1)	790(217)	27(7.5)	20.3(5.7)	99(28)
	S/NS	S	S	S	S	S	S	NS
Moderately high stress	Female	1853(551)	59(19.4)	8.7(3.1)	590(202)	22(9.6)	19(10)	84(41)
	Male	2623(569)	952(8.9)	12.6 (3.4)	738(216)	34.6(8.8)	25.6(6.8)	126(60)
	S/NS	S	S	S	S	S	NS	S
RDA	Female	1875	50	15.5	400	30	12	40
	Male	2425	60	15.5	400	28	16	40

S/NS- Significant/Non significant ($P<0.05$)

The information regarding presence of any other disease or ailment in the subjects was also obtained and it was revealed that 22.2 percent female reported physiological problems like diabetes, hypertension, hormonal imbalance, anemia, aches etc. whereas 7.2 percent males reported physiological problem. Out of those who reported physiological trouble a high proportion suffered from higher degree of stress. 76.6% of females and 75% of males reporting physio-

logical problem suffered from moderate level of stress and rest from mild degree of stress.

Discussion

Majority of subjects (75.4%) reported moderate level of stress (mean=48.230) and 24.6% reported mild stress (mean=22.4). Almost similar level of stress was observed in a

study conducted in remote and inaccessible part of western India where 88.4% reported moderate stress¹⁰. Vimla and Madhavi¹¹ showed 15% and 55% of women subjects reported mild and moderate stress, respectively. The male subjects suffered from higher levels of stress compared to female subjects¹² which are in consistent with our study where males were more stressed than female. This may be due to the reason that in Indian society men are considered as prime bread earner and caretaker of whole family and therefore, the responsibility may increase their stress level. Due to the paucity of the adequate required researches undertaken examining the stress and health status in Uttarakhand, hence, it limits the comparative aspect of our study within this particular region. The anthropometric status of the subjects under study was better than the subjects in Western India¹³. According to NFHS-3 Uttarakhand report¹⁴ higher percent of men (64%) had healthy weight for height compared to their female counterparts (57%) which is true for our study too, where males had significantly higher BMI than females. Males are at higher risk of developing obesity than females¹⁵. The intake of all the nutrients except zinc and iron were either in accordance or higher than the RDA, which indicates possibility of hidden hunger in the subjects. In their study Gupta et al.¹⁶ also reported a low intake of iron and zinc and higher intake of calcium than RDA in young Indian adults. The energy and protein intake were in close proximity to RDA, though the entire nutrient intake were lower for females than males as observed in the current study too. In general, the intake of nutrients decreased as the level of stress increased to moderately lower level from mild level but as the stress level further increased to moderately higher levels the nutrients intake increased probably due to high consumption of food in the stressed state by the subjects. Higher stress could contribute to obesity risk, particularly in women^{2,17}. Besides, inadequate intake of micronutrients may lead to stress and vice versa¹⁸.

Conclusion

A majority of the subjects of Uttarakhand, Northern India were moderately stressed though none of the subject was found to be severely stressed. The BMI, indicative of nutritional status reflected a healthy population, with males more vulnerable to develop obesity. The nutrient intake was in accordance to the RDA except for micronutrients like zinc and iron which calls up for the need of nutrition education in the area. With the increase in stress level the nutrient intake also increased, probably due to more food consumption. This creates a need of combined psychological and nutrition counseling in the study area. However, further analytical study with a large sample size, representative of Uttarakhand population is required to reach a conclusive association between stress and nutritional status. Also, there is a need to study socio-demographical variables which may affect the stress and health status in a community. On the other hand the strength of this study is that this is a pioneer study dealing with physiological as well as psychological health of the people of this particular region and open up new avenues for the researchers.

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Competing interests

The authors declare that there is no conflict of interest.

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