

Correlates of Stress and Indicators of Nutritional Status of Women in an Electronic Industry

Sunanda Sharan and Shashikala Puttaraj

INTRODUCTION

Working women's population constitute a major section of industrialisation in developing countries (Mukhopadhyaya, 1989). There is an increased participation of women for gainful employment in production activities of industry. The rate of work participation, which was 14.22 percent in 1971, increased to 22.27 percent in 1991 (Joshi, 1997). The growth of women's employment particularly in electronics industry has shown a substantial growth (Papola, 1993) at 18.8 percent (Vittal, 1995), perhaps, because of the nature of jobs which makes it suitable for employing women (Vittal, 1995). Since Karnataka State occupies a premier position with over 20 percent of India's electronics output (Vittal, 1995; Anon, 1991), of which Bharath Electronics produces a major share of it. Occupation of women as salary earners in addition to demands of household work and marital life cause dual stress. Stress is implicated in the etiology of a wide range of physical and mental health problems (House, 1974; House and Mark, 1979; Kahn, 1981). The multiple roles of women are although stressful, the empirical relationship of multiple roles to health are reported to be positive rather than negative (Thoits, 1983; Vebrugge, 1983).

Studies on women's employment have shown more beneficial for women of low socio economic status (Bibbington et al., 1981; Warr, 1982) where husbands share responsibility (Kessler, 1982; Krause, 1985) and in women who have high job satisfaction.

Health related quality of life indicators usually encompass a person's ability to function effectively physically, emotionally and socially and to maintain a sense of well being (Stewart and Ware, 1992, Mosteller et al., 1989). The more traditional bio-medical health status measures capture the presence, absence and/or severity of disease or morality.

It is known that the multiple work burden borne by women imposes enormous costs in terms of calorie deficits (Batliwala, 1985; Jetley, 1987)

particularly in women of low socio economic status engaged in unorganised sectors like farming.

It is expected that stress could be an important correlate of BMI and WHR which are nutritional indicators particularly in women with multiple roles in addition to monotonous and sedentary nature of work. The present paper investigates a) the daily stress in the household, marital and occupation in an electronic industry. b) The correlation of quantum of perceived stress and BMI and WHR which are nutritional indicators.

METHODS AND SUBJECTS

Study Population: The study was performed in the Bharat Electronics Ltd. (BE) a public sector unit located at Jalahalli of Bangalore urban district of Karnataka, India from September, 1995 to September 1996. The objectives of the study were two fold: to investigate the presence and quantify the perceived stress in three different areas namely- Household, marital and occupational stress, to study the correlation of stress with BMI and WHR and possibly with obesity.

A group of 93 Executives (Ex-I) and 460 Non-executives (Nex-II) working in all the 12 different divisions of electronics industry were randomly selected. The selected women for the study had put in a minimum of 10 years and 20 years of service in the cadre of executive and non-executive job respectively.

Nutritional Assessment: For assessing the nutritional status - anthropometric measurements like height (cm), weight (kg), the anatomical sites for waist and hip measurements were taken at the level of umbilicus and maximum hip circumference respectively, while the subject was standing erect, relaxed and breathing normally (Dhurandhar and Kulkarni, 1993). Data was used for calculation of Body Mass Index [wt. (kg) / Ht² (cm)] (Anon., 1991) and waist hip ratio (WHR) (Besten et al., 1988).

Modified scales (Pearlin and Schoolar, 1973) were adopted to measure the occupational, household work and marital role stress as per-

ceived by women. Occupational stress scale consisted of 16 statements regarding work, workplace, colleagues, etc on a five point scale ranging from strongly disagree to strongly agree. The reliability coefficient of the scale was 0.86. Household work scale consisted of 12 statements on a five-point scale and the coefficient of the scale was 0.89. Similarly, marital scale consisted of 14 statements on both positive and negative on a five-point scale to be marked from strongly disagree to strongly agree. Each subject was assured of confidentiality of their answers and requested them to be truthful. Individual subject was then carefully read out the statement in case of Nex-II women. In case of Ex-I women scale was given to them for ticking in the appropriate column. Scales were scored with reference to the scoring key and the no. of scorable responses were totaled. The sample was classified into four quartile level scores and assigned as 1st quartile or low scorers, 2nd quartile or low medium scorers, 3rd or high medium scores and 4th quartile or high scorers. High score indicated a high stress. For the purpose of the study, only 1st quartile (low stress) and 4th quartile (high stress) were selected. Low and high stress scorers were correlated with BMI and WHR values.

RESULTS

Characteristics of the Study Population: The socio-economic characteristics of women are presented in Table 1. The two groups were significantly different in case of age, education and income status. Women in executive positions were found to be nearly a decade younger to those who were in non-executive position. Also educational status of the women Ex-I was found to be better and higher than the Nex-II. It was found that 85% of women in Ex-I had spent > 13-15 years in formal education as compared to 16% in case of Nex-II. However, 68% of Nex-II had also obtained formal education ranging from 1-10 years. As expected, the estimated mean monthly income from different sources and also per capita income was higher in Ex-I than Nex-II women, which was significantly different. The estimated percent contribution to the total family income from the self earnings of the selected women was found to be 45 and 52% in Ex-I and Nex-II respectively. A pre tested schedule was employed

Table 1: Socio-economic characteristics of selected women

Characteristics	Ex-I (n-93)	Nex-II (n-460)	χ^2
Mean Age (yrs.)	33.40 ^a ±97	44.7±6.6	
<i>Educational Status</i> (yrs. of education)			
1-10	3(3)	315(68)	239.57**
11-12	-	68(15)	
13-15	79(85)	73(16)	
>15	11(12)	4(1)	
Monthly Income (Rs.)	17,405 ^a ±	11,182 ^b ±	
Mean monthly per capita income (Rs.)	6,851	4,612	
<i>Economic Status</i>			
Low Income	28(30)	127(27)	0.45NS*
Middle Income	46(50)	243(53)	
High Income	19(20)	93(20)	

Any two means carrying different superscripts a b-differ significantly ($p \leq 0.05$)

*Significant at 5 percent level

**Significant at 1 percent level

NS Non-Significant

to elicit the information on socio economic status of women.

Classification of Women Based on Nutritional Indicators: Percentile classification of women by BMI and WHR criteria and mean of two indices is presented in Table 2. BMI indicated a pattern that majority of women in Ex-I (61%) were found to be in the normal range. While 21 percent Ex-I and 46 and 17% of Nex-II women were found to be either overweight or obese. Likewise, WHR indicated a higher proportion of women (Ex-I- 47%, Nex-II- 61%) were found to have lower body obesity (Gluteol Femoral obesity).

Stress Levels and Indicators of Nutritional Status: Occupational stress was found to be high in case of Ex-I women. The reverse pattern was observed in case of stress associated with household chores and marital life in Nex-II women. Mean \pm SD scores of low and high stress and their corresponding BMI and WHR levels and correlation values are shown in Table-3. It is interesting to note that BMI indicated an increasing trend with high stress scores, whereas WHR decreased in Ex-I women. In Ex-I women, the increase in BMI was correlated significantly with high stress scores due to occupation. Significantly decreased WHR was found to be negatively correlated with stress due to household chores in Ex-I women. In Nex-II BMI increased due to occupational and household chores, it

Table 2: Distribution and mean±SD indices of women

Indices range	Ex-I	Nex-II	χ^2
15-18.5	16(17.0)	6(1.0)	
18.5-25	57(61.0)	165(36.0)	
25-30	20(21.0)	211(46.0)	79.5
>30	-	78(17.0)	
Mean±SD	22.7 ^a ±3.0	26.3 ^b ±4.0	
WHR			
0.7	5(6.0)	18(4.0)	
0.71-0.80	44(47.0)	279(61.0)	
0.81-0.90	40(43.0)	151(33.0)	5.84NS
>0.91	4(4.0)	12(2.0)	
Mean ±SD	0.80±0.06	0.79±0.08	

Significant at 1 percent level

Any two means carrying different superscripts ab-differ significantly (p<0.05)

remained constant in case of marital stress. In addition, a trend of decreased WHR was found to be associated with high stress related to both occupation and household chores in Nex-II. The results of the study indicate that increased BMI (body weight) is positively correlated with high stress. The negative correlation of WHR and high stress reveal that lower body obesity may be associated with greater stress.

DISCUSSION

Results of the study indicate the presence of higher BMI levels in the Non Executive women population. Percentile classification of women confirmed that as high as 63% of them being overweight/ obese compared to 21% in Executive women. The highest percent of 61 (Ex-I) and 47 (Nex-II) of these women also found to have glu-

teol, femoral obesity. The distribution of socio-economic profile differed between these women. Age, educational level and economic factors appeared to be strongly associated with overweight/ obesity. Low socio-economic level of Nex-II women seems to be related to higher BMI levels. The women at greater risk of weight gain are those with low family income and less than a college education (Khan et. al., 1991).

The results of the study reveal that considerable role 'stress' was being experienced by these women could perhaps be influenced by situational and other variables. It is reported that when women are gainfully employed outside home continue to assume the primary responsibility of home making activities which may induce stress due to double role (Mukhopadhaya, 1989). However, it is also indicated that stress due to increased responsibilities depending on nature of occupation may be greater when compared to household stress (Denis et.al 1985). The findings of the study indicated these to be true in case of Ex-I women. Whereas stress related to marital and household aspects were found to be high in Nex-II. Stress due to dual role played by these women appeared to have found expression in their body size in terms of BMI and WHR. High scores of stress were found to be associated with increased BMI and lowered WHR. It has been postulated that WHR may be indicative of adoptive phenomena in the human body towards stress either physiological (nutritional deficiencies/imbalance) or environmental (occupation, house hold activity, marital /family relationship etc) (Sastry and

Table 3: Mean Scores of low and high stress and their corresponding mean BMI and WHR level

Type of Stress	Ex-I		Nex-II		Stress Score		Mean BMI		Mean WHR	
	n	n	Ex-I	Nex-II	Ex-I	Nex-II	Ex-I	Nex-II		
Household Stress										
Low (Q1)	21	99	22	31	22.7 ^a	25.9 ^a	0.83 ^a	0.80 ^a		
High (Q2)	13	90	47	55	23.5 ^b	26.3 ^a	0.78 ^b	0.79 ^a		
'r'					0.0593	0.0738	-0.305**	0.0311		
Occupational Stress										
Low (Q1)	19	100	36	23	21.4 ^a	25.8 ^a	0.80 ^a	0.80 ^a		
High (Q4)	11	84	54	43	24.20 ^b	26.6 ^a	0.76 ^a	0.78 ^a		
'r'					0.2632*	0.0951	-0.1396	0.0237		
Marital Life Stress										
Low (Q1)	5	123	23	29	22.3	26.2	0.80	0.79		
High (Q4)	15	90	45	55	23.0	26.0	0.79	0.79		
'r'					0.0162	0.0343	-0.1956	0.0603		

Any two means in columns carrying different superscripts a b-differ significantly (P<0.0543)

**Significant at 1 percent level

*Significant at 5 percent level

Pandey, 1990). Thus, WHR and stress scores appeared to be inversely related. low stress scores may result in high WHR. It may be attributed that individuals under stress indulge in over eating and more so, to break the monotony of skilled repetitive work in electronic industry. Further, lower body obesity due to stress may be in some way related to changes in hormonal imbalances, thus resulting in correlation of high stress with increased BMI and lowered WHR of gluteal femoral obesity. Corrective interventions for obesity should include nutrition education, measures to provide appropriate food service and orientation towards management of stress for women at work site may go a long way in maintaining the desirable body size.

KEY WORDS Working Women. Stress. Body Mass Index. Waist Hip Ratio.

ABSTRACT The present investigation explores the correlation of daily house-hold, occupational and marital stress to nutritional indicators of women employed in a mega electronic industry. A group of 553 women employed in Bharat Electronics (BEL) located at Jalahalli of Bangalore urban district working in all the 12 divisions of both I and II shift were randomly selected. Results of the study revealed normal body size in Ex-I and overweight and obesity in Nex-II women. Occupational stress was higher in Ex-I women and the reverse pattern of comparatively higher stress in house-hold activity and marital life in Nex-II women. Stress scores were classified as high and low quartiles and correlated to mean BMI and WHR of these women. It was interesting to note that while BMI increased significantly with high occupational stress and an increasing trend of BMI with high stress of house-hold and marital life in Ex-I women. While in case of Nex-II women, a trend of increase in BMI was associated with high stress due to house-hold and occupation and it remained unchanged in marital stress. Significantly decreased WHR of lower body obesity was found to be associated with high stress due to house-hold activity in Ex-I women and a trend of decreasing WHR was found to be associated with high stress related to both occupation and house-hold chores in Nex-II women. Findings revealed that stress may be associated with increased BMI and decreased WHR of over nutrition.

REFERENCES

- Anon.: *Karnataka Economic Survey*. Government of Karnataka (1990-91).
- Batliwala, S.: Women in poverty: The energy, health and nutrition syndrome. In: *Tyranny of the Household: Investigative Essay on Women's Work*. Devaki Jain and Nirmala Banerjee (Eds.) Shakti Boosm, New Delhi (1985).
- Bebbington, P., Hury, J., Tennant, C., Sturt, E. and Wing, J.K.: Epidemiology of mental disorders in Campbell. *Psychol. Med.*, **11**: 561-579 (1981).
- Besten, C., Vasant, G., Westrate, J.A. and Deurenberg, P.: Resting metabolic rate and diet induced thermogenesis in abdominal and gluteal, femoral, obese women before and after weight reduction. *Am. J. Clin. Nutr.*, **47**: 840 – 847 (1998).
- Denise, B., Kandel, Mark, Davies and Victoria, H. Ravies.: The stressfulness of daily social roles for women: marital, occupational and household roles. *J. Health Soc. Beha.*, **26**: 64 – 78 (1995).
- Dhurandhar, V.N. and Kulkarni, P.R.: Outpatient weight management in India: A comparison with the West. *Intl. J. Food. Sc. Nutr.*, **44**: 77-83 (1993).
- House, James S.: Occupational stress and coronary heart disease: A review and theoretical integration. *J. Health. Soc. Beha.*, **15**: 12-27 (1974).
- House, James S. and Mark, F. Jackman.: Occupational stress and health In: *Towards a New Definition of Health*. P Ahmed and G. Coelho (Eds.). Plenum, New York p. 135-138 (1979).
- Jetley, Surinder: Impact of male migration on rural females. *Eco. Pol. Weekly*. Oct (1987).
- Joshi, S.C.: Status of women in India. *NIPPCCD* **19**: 7-8 (1997).
- Kahn, Robert L.: *Work and Health*. Wiley, New York (1981).
- Kahn, H. S., William, Son D.F., Stevens, J.A.: Race and weight change in US women: The roles of socio-economic and marital status. *Am. J. Publ. Health*, **81**: 319 – 323.(1991).
- Kessler, R.C. and McRae, J. Jr.: The effect of wife's employment on the mental health of married men and women. *Am. Soc. Rev.*, **47**: 216-277 (1982).
- Krause, N. and Markides, K.S.: Employment and psychological well being in Mexican American women. *J. Health Soc. Beha.*, **26**: 15-26 (1985).
- Mosteller, F., Ware, J. E. Jr. and Levin, S.: Advances in health status assessment: Conference proceedings. *Med. Care*, **276 (Suppl.)**: S282 - S297(1989).
- Mukhopadhaya, S.: Working status and stress of middle class women of Calcutta. *J. Biol. Sci.*, **21(1)**: 109-114 (1989).
- Papola, T.S.: Employment of women in South Asian countries. *Ind. J. Lab. Eco.*, **36**: 48- 56 (1993).
- Pearlin, Leonard I., and Carmi, Schooler: The structure of coping. *J. Health Soc. Beha.*, **19**: 2-21 (1978).
- Sastry, N. and Pandey, A.: Proceedings of 77th session of the Indian Science Congress, Calcutta: *Indian Science Congress Abstracts*. 102 (1990).
- Stewart, A. L. and Ware, J. E. Jr.: *Measuring, Functioning and Well Being- The Medical Outcomes Study Approach*. Duke University Press, Durham, N C **6**: (1992).
- Thoits, Peggy A.: Multiple identities and psychological well being. *Am. Soc. Rev.*, **48**: 174-187 (1983).
- Vebbrugge, Lois M.: Woman's social roles and health. In: *Women: A Developmental Perspective*. W. Phyllis Berman and R.Eslelle Ramey (Eds.) National Institutes of Health.Washington D.C 49-101(1983).
- Vittal, N.: Electronics industry on upswing. *Monthly Public Opinion Surveys*, **40 (2)**: 480 (1995).
- Warr, P. and Parry, G.: Depressed mood in working class mothers with and without paid employment. *Soc. Psychiatry*, **17**: 161-165 (1982).

Authors' Address: Sunanda Sharan and Shashikala Puttaraj, Department of Food Science and Nutrition, University of Mysore, Manasagangothri, Mysore 570 006, Karnataka, India.