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INFLUENCE OF WORK ENVIRONMENT ON THE BMI STATUS OF SELECTED WORKERS OF THOOTHUKUDI

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ABSTRACT

Keywords:

Obesity, Overweight,
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Work urgency, accuracy and demands compel the workers to spend longer hours in the workplaces without giving importance to their health, especially body weight. Increase of body weight leads to improper Body Mass Index (BMI). The objective of the study was to find out the status of BMI of workers in relation to their working environment. The total sample size was fixed at 966 consisting of 150 Drivers, 472 Teachers and 344 Construction workers. The study result concluded that the Teachers were more obese than others. Among the total workers (966) studied in the present study, about 33.13% were obese. The Teachers in the present study were the highest scorer of obese cases and the percentage observed was 42.80 and they were followed by the Drivers (26.00%) and Construction workers (22.97). On the contrary 25.05% of Construction workers, 14.00% of Drivers and 8.69% of Teachers were Under weight in their BMI status. As the years of experience of the workers increased, the BMI status also showed a significant increase.

INTRODUCTION

Overweight and obesity is recognized as a rapidly growing threat to the health of populations in developed countries and increasing in industrialized and developing countries^[1,2]. Body Mass Index (BMI) is an indicator of nutritional status and also a tool for indicating a person's weight status^[3]. It is a measure of body weight for a specified height (kg/m^2). BMI correlates with body fat and a high level of body fat may increase the risk of developing diseases. The relation between fatness and BMI differs with age and gender. The BMI is dependent on many factors like age, education, occupation, household economic status, food habits and sedentary lifestyles^[4,5]. An increasing trend of overweightedness and obesity in combination with a high prevalence of underweightedness is found to be common in many developing countries^[5,6]. Continued economic development, rapid urbanisation mainly in developing countries, globalisation of food production and changes in dietary patterns are some of the important causal factors^[6,7]. BMI is often divided into the following categories with respect to height: underweight, normal weight, overweight and obese^[8,9]. Common conditions that are related to being overweight or obese include: knee pain^[10], progressive physical disability^[11,12], diminished health-related quality of life^[13], knee osteoarthritis and rheumatoid^[14,15], premature death, cardiovascular disease^[16], high blood pressure^[17,18], some cancers^[19,20], increased risks for depression^[21] and noninsulin dependent diabetes mellitus^[22]. In addition, obesity has been found to reduce the quality of life for both men and women^[21,22] and markedly reduces life expectancy^[23]. Under nutrition is still prevalent in developing countries and continues to be a primary cause of poor health^[24,25]. Being underweight is normally the result of deficit energy consumption and is associated with distinct types of public health problems^[26].

Compared to living in rural areas, urban residency has been found to be associated with changed pattern of life style, feeding habit resulted in increased number of obeic cases^[27,28,29] mostly in women than men^[30,31]. Obesity now affects more than one in three adults^[32,33]. Recent reports showed that, in many developing countries the prevalence of overweight-obesity in women of reproductive age has raised steadily in the last two decades^[34,35].

The literature survey clearly showed that the association of workers health and other socioeconomic characteristics with the extremes of BMI is poorly studied in Thoothukudi. Hopefully, this study will enrich and contribute to developing appropriate interventions for reducing the extremes of BMI status among workers populations in Thoothukudi.

MATERIALS AND METHODS

In the present study, the researcher has chosen a small group comprising of 966 workers from Thoothukudi area, include both sexes of different age groups. Among the 966 subjects in the survey, 530 were men and 436 were women. The personal information and other related relevant information were collected from the respective workers by supplying a standardized questionnaire. Every day the researcher met ten workers and collected the necessary information by direct interview. The height and weight of the workers were obtained using graduated upright-height measuring device and digital electronic balance respectively. The BMI was calculated from the observed height and body weight of the workers using the formula reported by Srilakshmi^[36]. The information on other background characteristics like education, income, dietary habit and so on was also obtained from the respondents.

Assessment of BMI^[36]

$$\text{BMI} = \frac{\text{Weight (Kg)}}{\text{Height (M}^2\text{)}}$$

In order to classify subjects according to their BMI values, the cut-off points proposed by the World Health Organization^[37] was adapted. The individuals below 21.5 kg/m² are not able to perform high intensity work considered as BMI < 21.5 kg/m² are underweight, BMI >21.5 and < BMI = 25 kg/m² are normal and BMI >25 kg/m² are considered as overweight/obeic^[38]. The collected data on BMI status of the workers were carefully analyzed, statistically interpreted and the analyzed data were given in the form of tables. In order to test the validity of the observations the various statistical tools such as the 'Z' test to compare the control with the observed data and CV was used to compare the individual factors. The analyses were made based on the mean BMI with standard deviation and percentages of men and women representing the different ages. Statistical significance was considered when P < 0.05. Statistical analyses were made using Microsoft excel equation version 6.1.

RESULT AND DISCUSSION

Rapidly changing diets and lifestyles are fueling the global obesity epidemic^[39]. According to recent estimates, there are more than one billion overweight people worldwide, and some 300 million of these are estimated to be clinically obese^[40]. Even in countries like India, which are typically known for high prevalence of undernutrition, significant proportions of overweight and obese now coexist with the undernourished^[41]. The coexistence of higher prevalences of underweightness and overweightness may be an indication of the nutritional paradox in a wider context of urban areas^[3,42].

Among the total workers (966) studied in the present study, about 33.13% were obese. The Teachers in the present study were the highest scorer of obese cases and the percentage observed was 42.80 and they were followed by the Drivers (26.00%) and Construction workers (22.97). On the contrary 25.05% of Construction workers, 14.00% of Drivers and 8.69% of Teachers were Under weight in their BMI status. The increased percentage of obese cases observed in the present study were significantly higher in all types of workers studied than the Control (Table 1).

Table 1 Work-wise distribution of workers in relation to their BMI status. The total number observed, their percentage, the mean BMI with SD are given.

Workers	Normal Weight	Under Weight	Over Weight	Obese	Total Obese
Teachers(N=208)	229 (48.52)	41 (8.69)	174 (36.86)	28 (5.93)	
Mean ± SD	22.85 ± 1.45	17.55 ± 0.80	27.68 ± 1.24	35.57 ± 5.10	202 (42.80)
CV	6.35	4.58	4.48	14.34	
Z Test	0.66	41.81	52.03	13.26	
Construction Workers (N=100)	177 (51.45)	88 (25.58)	57 (16.57)	22 (6.40)	
Mean ± SD	22.04 ± 2.02	17.66 ± 0.75	26.57 ± 1.08	32.06 ± 1.17	79 (22.97)
CV	9.16	4.26	4.07	3.65	
Z Test	4.94	63.85	26.34	37.18	
Drivers (N=53)	90 (60.00)	21 (14.00)	34 (22.67)	5 (3.33)	
Mean ± SD	22.33 ± 1.70	17.31 ± 0.57	26.42 ± 0.98	31.04 ± 0.05	39 (26.00)
CV	7.63	3.31	3.69	0.18	
Z Test	2.58	43.86	21.67	36.80	

Table 2 Experience-wise distribution of Teachers in relation to their BMI status. The number observed, their percentage, the mean BMI with SD is given.

Experience (Yrs)	Normal Weight	Under Weight	Over Weight	Obese	Total Obeic
1-5 (N=208)	93 (44.71)	27 (12.98)	88 (42.31)		
Mean ± SD	23.17 ± 0.96	17.54 ± 0.86	27.91 ± 1.29		88 (42.31)
CV	4.15	4.93	4.64	-	
Z Test	3.85	31.56	37.12		
6-10 (N=100)	55 (55.00)	7 (7.00)	30 (30.00)	8 (8.00)	
Mean ± SD	22.63 ± 1.57	17.29 ± 0.56	27.39 ± 1.15	35.44 ± 5.99	38 (38.00)
CV	6.92	3.23	4.19	16.92	
Z Test	0.78	26.10	21.96	5.97	
11-15 (N=53)	53 (60.23)	7(7.95)	23 (26.14)	5 (5.68)	
Mean ± SD	22.41 ± 1.31	17.83 ± 0.76	27.69 ± 0.88	38.46 ± 5.59	28 (52.81)
CV	5.86	4.27	3.16	14.55	
Z Test	2.13	17.25	26.81	6.26	
16-20 (N=28)	18 (40.00)		19 (42.22)	8 (17.78)	
Mean ± SD	21.94 ± 0.78		27.51 ± 0.99	35.24 ± 3.47	27 (60.00)
CV	3.54	-	3.61	9.85	
Z Test	4.62		20.69	10.15	
>20 (N=31)	10 (32.26)		14 (45.16)	7 (22.58)	
Mean ± SD	23.50 ± 0.48		27.07 ± 1.54	30.66 ± 0.26	21 (67.74)
CV	2.06		5.69	0.86	
Z Test	4.62		10.39	78.94	

Table 3 Experience-wise distribution of Drivers in relation to their BMI status. The number observed, their percentage, the mean BMI with SD is given.

Experience (Yrs)	Normal Weight	Under Weight	Over Weight	Obese	Total Obeic
1-5 (N=19)	11 (57.89)	5 (26.32)	3 (15.79)		
Mean ± SD	22.73 ± 0.91	17.36 ± 0.89	27.07 ± 1.57		3 (15.79)
CV	3.99	5.18	5.79	-	
Z Test	0.23	13.51	4.72		
6-10 (N=65)	44 (67.69)	5 (7.69)	16 (24.62)		
Mean ± SD	22.47 ± 1.45	16.9 ± 0.35	26.75 ± 0.44		16 (24.62)
CV	6.46	2.09	1.65	-	
Z Test	1.46	37.25	35.90		
11-15 (N=47)	24 (51.06)	9 (19.15)	9 (19.15)	5 (10.64)	
Mean ± SD	22.56 ± 1.81	17.54 ± 0.42	25.61 ± 0.86	31.32 ± 0.66	14 (29.72)

CV	8.04	2.40	3.35	2.11	
Z Test	0.48	37.32	9.86	28.85	
16-20 (N=14)	8 (57.14)	2 (14.29)	4 (28.57)		
Mean ± SD	19.49 ± 0.34	17.15 ± 0.49	26.9 ± 1.39		4 (28.57)
CV	1.77	2.84	5.15	-	
Z Test	27.15	15.26	5.93		
>20 (N=5)	3 (60.00)		2 (40.00)		
Mean ± SD	24.5 ± 0.2		25.45 ± 0.49		2 (40.00)
CV	0.82	-	1.94	-	
Z Test	14.81		7.60		

As the years of experience of the workers increased, the BMI status also showed a significant increase. It was observed that in case of Teachers the observed percentage of obese cases with reference to the year of experience was 42.31 in 1 – 5 years, 38.00 in 6 – 10 years, 52.81 in 11 – 15 years, 60.00 in 16 – 20 years and 67.74 in >20 years of experience (Table 2). More or less the same type of observation observed in Drivers and Construction workers and the observed percentage was 15.79, 24.62, 29.79, 28.57 and 40.00 in Drivers (Table 3) and 12.75, 15.08, 14.18, 32.14 and 40.00 in Construction workers (Table 4) with the experience of 1-5, 6-10, 11-15, 16-20 and >20 years respectively.

Table 4 Experience-wise distribution of Construction workers in relation to their BMI status.

The number observed, their percentage, the mean BMI with SD is given.

Experience (Yrs)	Normal Weight	Under Weight	Over Weight	Obese	Total Obese
1-5 Yrs	53 (51.96)	36 (35.29)	13 (12.75)		
Mean ± SD	21.46 ± 1.69	17.46 ± 0.61	26.05 ± 0.94		13 (12.75)
CV	7.89	3.47	3.61	-	
Z Test	5.71	73.07	99.77		
6-10	82 (65.08)	25 (19.84)	13 (10.32)	6 (4.76)	
Mean ± SD	22.53 ± 1.93	17.94 ± 0.76	26.48 ± 1.41	31.42 ± 0.70	19 (15.08)
CV	8.57	4.22	5.31	2.24	
Z Test	1.24	118.53	67.89	109.53	
11-15	22 (32.35)	16 (23.53)	22 (32.35)	8 (11.77)	
Mean ± SD	21.60 ± 2.46	17.83 ± 0.69	26.72 ± 0.43	32.00 ± 0.92	30 (44.18)
CV	11.37	3.86	1.61	2.89	

Z Test	2.27	28.85	42.79	28.18	
16-20	14 (50.00)	5 (17.86)	5 (17.86)	4 (14.28)	
Mean ± SD	20.70 ± 1.87	17.58 ± 0.97	27.26 ± 1.62	32.55 ± 0.97	9 (32.14)
CV	9.02	5.51	5.95	2.98	
Z Test	4.19	12.04	6.16	20.10	
>20	6 (30.00)	6 (30.00)	4 (20.00)	4 (20.00)	
Mean ± SD	23.27 ± 1.67	17.95 ± 1.07	26.93 ± 1.82	32.65 ± 2.05	8 (40.00)
CV	7.17	5.94	6.77	6.27	
Z Test	0.69	11.13	4.54	9.63	

When the year of experience of the workers reached beyond 20 years the total obese percentage observed among the workers increased to several folds. The percentage of obese cases observed was 67.74 in Teachers, 40% in Drivers and 40% in Construction workers (Table 2-4). But the workers who had an experience of 1-5 years, very meager percentage was affected by obesity and the percentage observed was 42.31, 15.79 and 12.75 in case of Teachers, Drivers and Construction workers respectively^[43,44,45,46,47,48,49].

The results of the present study are consistent with the previous results of conducted in various countries like Bangladesh^[5], other parts of India^[50] and Indonesia^[51]. In United States during the past 40 years the obesity has increased from 13% to 36%^[33] and overweight adults now account for 66%^[52]. Furthermore, it is estimated that obese persons have one-and-a-half to two times the risk of premature death than individuals who maintain a healthy body weight^[53]. Women are more likely than men to be at risk for obesity^[53,54,55].

The present study clearly exposed the truth that among the different workers studied the Teachers were the most affected persons in relation to the BMI and least affected were Construction workers. In almost all workers studied the observed percentage of overweight and obese cases and the mean BMI level observed were significantly higher than the control population (Table 1-4). Teachers are economically better off persons having all facilities in their home and they lead sophisticated and comfortable life, consume energy rich food resulted in over weight and obesity^[56,57,58,59,60]. Apart from sophistication and other sorts of facilities, the stress on Teachers may contribute to obesity via its effects on behaviour and metabolism^[61]. Some previous study reported that, the biological and

behavioural effects of stress, tending to cause the deposition of intra-abdominal fat^[62,63] resulted in obesity. The increased percentage of obese and overweight cases among Teachers further aggravated by the excessive use of cars and other fuel-based vehicles, limited space for walking and physical activity, in their workplace, preference and consumption of fast and fatty foods and less preference for vegetables, using improved latest technologies for all requirements and changing lifestyles^[6,64]. As far as the Teachers are concerned mostly their spouses are also working. In such cases, for their food requirement they depend on hotels or packed food items which contain enormous calories resulting in obesity and its related disorders^[65,66].

When the Drivers and Construction workers were compared with the Teachers, they were very slightly affected with regard to their BMI status. Only 26.00% of Drivers and 22.97% of Construction workers were obese in nature (Table 1). The poor socioeconomic condition resulted in chronic malnutrition among these workers. The socioeconomically poor people cannot afford for expensive items such as milk, meat, poultry, fruits and other nutritious foods to the maximum^[67]. Without proper nutrition these poor workers perform very hard work, resulted in underweight^[7]. Problems of overweight and obesity are caused by chronic imbalance between energy intake and actual energy needs of the body. In many developing countries, with increasing urbanization, mechanization of jobs and transportation, availability of processed and fast foods, and dependence on television for leisure, people are fast adopting less physically active lifestyles and consuming more “energy-dense, nutrient-poor” diets^[39,41,68] resulting in overweight, obesity and associated chronic health problems, particularly among the middle-class urban populations^[39].

The prevalence of underweight was high among Construction workers (28.58%) followed by the Drivers (14.00%). As the year of experience increased the percentage of underweight cases observed among the Construction workers and the Drivers were significantly declined to a considerable level. While the year of experience of the Drivers was between 1-5 yrs the underweight cases observed was 26.32% and it was declined to 14.29% when the year of experience was 16-20yrs. In case of Construction workers the observed percentage was 35.29 when the experience was 1-5 yrs and it was declined to 30% the experience was >20 yrs (Table 1-3). The high prevalence of underweight

categories among these workers mainly due to their lack of awareness about food, inadequacy of food, their literacy, poor economy, unhygienic water usage and sanitation and so on^[7,69,70]. The construction industry is considered to be an extremely dangerous working environment, and therefore the health status of construction workers needs to be considered prior, during and on leaving the industry. Workers sometimes have no time to eat, no place to eat or no money to purchase food. Some workers are unable to consume enough calories to perform the strenuous work expected of them, all these end in underweight^[5,22,50].

Obesity observed among the workers had a lot of impact on their work. Obese workers are significantly more likely than their normal-weight counterparts to report poor work ability^[71] or a limitation in the amount, type, or quality of work^[72]. They also experienced more disability than the normal-weight adults^[73]. Obesity is an emerging pandemic. Educational level was associated with higher prevalence of overweight-obesity in Bangladesh, Nepal, and India^[35] and this may be due to the result of shifts from manual labor to more sedentary occupations and the related decline in physical activity^[74,75]. Recently Villamor *et al.*,^[76] observed that obesity was positively associated with socio-economic status among white collar workers. In fact, recent papers by McDonald and Kennedy^[77] and Christakis and Fowler^[52] pointed out the impact of social network on obesity. Undernutrition and overweight are global problems, especially overweight and obesity spreading even to developing world, where it is an increasing threat to health^[78,79]. The present study, observed that the obese workers exhibited a higher prevalence of self-reported hypertension, diabetes, heart disease, digestive problems, musculoskeletal pain, and respiratory problems than their non-obese counterparts^[80,81].

CONCLUSION

The present study concluded that among workers the BMI status remains crucial and it is not only because of undernutrition, but also because of malnutrition in their early life, is a risk factor for chronic diseases in later life. Therefore, public health programmes in Thoothukudi need to address both under-nutrition and excess-nutrition concurrently, and put forward interventions and awareness raising campaigns that emphasize the importance of a nutrition and lifestyle that promote optimal health and nutritional status among the entire population especially among the workers.

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