Factors associated with the nutritional status of adults in Batticaloa district

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Abstract- Poor nutritional status is a chronic condition and the adult overweight and obesity is increasing rapidly worldwide due to environmental and behavioral changes such as urbanization and modernization. Data on nutritional status among adults in developing countries including the different regions are needed for primary prevention. This study was undertaken to assess the nutritional status among adults (above 18 years) in Batticaloa district and to examine the association of socio-economic, nutritional and lifestyle factors with weight distribution. A Cross-sectional survey was conducted among 400 adults aged above 18 years. Multi-stage sampling method was approached. Data on socio-economic, nutritional and lifestyle factors were collected and anthropometric measurements of weight, height and waist circumference were measured by using appropriate measuring scales. Under weight, normal weight, over weight and obesity were defined as Body Mass Index (BMI) <18.5 kg/m^2, 18.5-23 kg/m^2,> 23 kg/m^2 and > 27.5 kg/m^2 respectively. Nutritional status of adults and distribution of BMI by socio-demographic and lifestyle characteristics were assessed. Among 400 adults 11.7 % were underweight, 40.5 % were normal weight 30.3 % overweight and 17.5% were obese in Batticaloa district. In urban areas among 80 adults 6.3% were underweight, 31.2% were normal weight, 35.0% were overweight and 27.5% were obese. In rural areas among 320 adults 13.1% were underweight, 42.8 % were normal weight, 29.1% overweight and15.0% were obese. In the overall district, females were more overweight (17.3%) and obese (11.5%) than males. Adults belong to the age group of 35-44 years were more overweight and obese than others. Gender, age, marital status, ethnicity, occupation, smoking, alcohol intake, family history of overweight and obesity, sleeping habit after the meal in the evening, following weight reduction methods were the significant factors ($p<0.05$) associated with nutritional status of adults. As overall, majority of adults were in normal weight. In urban areas nearly one third percentage of adults were overweight and in rural areas most of the adults were in normal weight.

Index Terms- Nutritional status, Urban, Rural, Adults, Batticaloa.

I. INTRODUCTION

Poor nutritional status is a chronic condition which is caused by physiological, social, cultural, psychological, genetic, metabolic and behavioral factors (Kelly et al., 2008). The prevalence of poor nutritional status is increasing worldwide and the prevalence of adult obesity is increasing rapidly due to environmental and behavioral changes (Ramachandran & Snehalatha, 2010). Body Mass Index (BMI) is the indicator to identify whether a person is in underweight or normal weight or overweight or obesity. According to the Asian cut-offs BMI <18.5 kg/m^2 is under weight, 18.5-23 kg/m^2 normal weight, >23.0 is overweight and BMI >27.5 is obesity (Katulanda et al., 2010). Physical inactivity, dietary habit, smoking, alcohol use and high socio-economic status are some of the risk factors of overweight and obesity (Janssen, Katzmarzyk & Ross, 2002). Poor nutritional status leads to serious health problems mainly for non-communicable diseases (Janus et al., 2007). There were many studies regarding nutritional status conducted in Sri Lanka; however there were no studies on nutritional status among adults in the North and East provinces. Batticaloa has high prevalence of overweight and obesity among adult women (DCS &MOH, 2009). Therefore it was essential to conduct the study to assess the nutritional status and to examine the association of socio-economic factors, lifestyle factors and nutritional factors with weight distribution among adults to provide enough awareness and education to maintain a good nutritional status and to prevent the complications of poor nutritional status.

II. METHODOLOGY

A Cross-sectional study was conducted among 400 adults (above 18 years old) including 213 females and 117 males from five Divisional Secretariat divisions in urban and rural areas in Batticaloa district. From Manmunai North, Eravur Pattu, Porathivu pattu, Manmunai south and Eruvil Pattu and Koralai Pattu South administrative divisions 40 Grama Niladhari divisions were selected according to the population. Families from each Grama Niladhari divisions were selected by systematic random sampling method. One adult from each family was selected by the tossing method as a respondent. Data were collected from those who were willing to participate in the study and respondents who were not present at the time of study, who refused to participate in the study, who were physically disabled, adults who were mentally disabled, pregnant mothers and adults who were not a permanent resident of study areas were excluded from the study. The respondents were thoroughly explained about the study and written consent was obtained before the data collection. Anonymity was ensured throughout the study. Data were collected by investigators through a structured interviewer administered questionnaire and anthropometric measurements of weight, height and waist circumference of adults were measured by investigators. All anthropometric measurements were performed by standard procedures; weight was measured with a mechanical personal scale (model- CAMRY, model number –BS 2014); weighing scale was calibrated by taking an average of more than one measurement for a known weight and the difference was adjusted nearest to 100g. Height was measured in a standing position, without shoes and waist circumference was measured at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest with the nearest 1cm using a non-stretchable steel measuring tape and the BMI was computed as Weight (Kg) / Height^2 (m^2).Collected data were transferred to SPSS 19 statistical software and analyzed based on the research problem, objectives and variables. Gender and age related prevalence and overall prevalence were estimated for urban areas in Batticaloa district with the use of following equations.

III. RESULTS AND FINDINGS

Table 1: Description of the socio-demographic variables of adults in Batticaloa district

Variables	No.	(%)
Area		
Urban	80	20.0
Rural	320	80.0
Gender		
Male	187	46.8
Female	213	53.2
Age		
19-24	48	12.0
25-34	90	22.5
35-44	102	25.5
45-54	75	18.7
55-64	55	13.8
>64	30	7.5
Ethnicity		
Tamils	392	98.0
Muslims	8	2.0
Sinhalese	-	-
Religion		
Hindus	355	88.8
Islamic	8	2.0
Christians	37	9.2

Buddhist	-	-
Education		
Primary	72	18.0
Junior secondary	78	19.5
Senior secondary	189	47.3
Tertiary/Collegiate	52	13.0
No education	9	2.2
Family income(monthly)		
<15 000	148	37.0
15 000-30 000	175	43.7
30 001-50 000	63	15.8
>50 000	14	3.5
Smoking habits		
Yes	56	14.0
No	344	86.0
Family history of overweight and obesity		
Yes	87	21.8
No	307	76.8
Don't know	6	1.5
Following weight reduction		
Yes	62	15.5
No	338	84.5
Sleeping habits in evening		
Yes	215	53.8
No	185	46.2

The study was conducted among 400 adults who were above 18 years old in urban and rural areas of Batticaloa district. Out of them 80% (n=320) were from rural areas. 53.2 % (n=187) were males. Tamils (98 %, n=392) were the majority among the study samples. 25.5% (n=102) of adults come under the age group of 35-44 years; 47.3% (n=189) had senior secondary education, 37 % (n= 142) adults had family income of less than 15 000, 3.5% (n=14) had more than 50 000 and others had middle income. 14 % (n=56) were smokers; 21.8 % (n=87) adult had family history of overweight and obesity and 76.8 % (n=307) had no any family history of overweight and obesity; 84.5% (n=338); 53.8 % (n=215) adults had the habit of sleeping in evening after the meal.

Out of 400 adults 11.7 % were underweight, 40.5% were normal weight, 30.3% (n=121)were overweight and 17.5% (n=70) were obese.

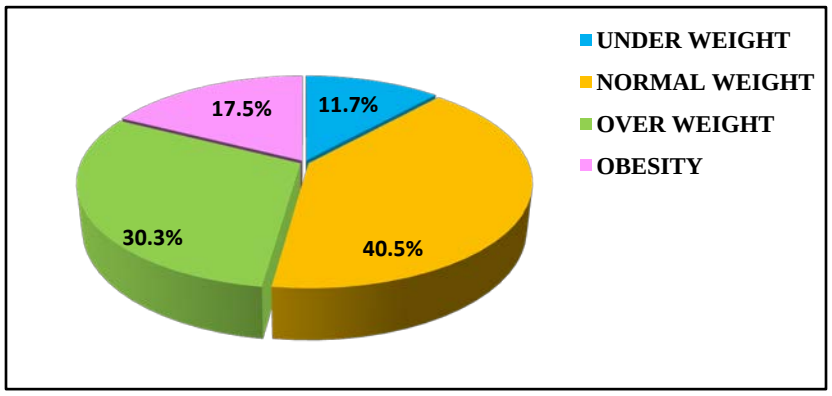

Fig 1:- Weight distribution of adults in Batticaloa district

Table 2: Nutritional status of adults in urban areas

Variables	Underweight		Normal weight		Overweight		Obesity	
	No	(%)	No	(%)	No	(%)	No	(%)
Gender								
Male	1	(1.3)	16	(20.0)	16	(20.0)	7	(8.8)
Female	4	(5.0)	9	(11.3)	12	(15.0)	15	(18.8)
Age								
19-24	-	-	5	(6.3)	1	(1.3)	-	-
25-34	3	(3.8)	6	(7.5)	6	(7.5)	4	(5.0)
35-44	1	(1.3)	7	(8.8)	9	(11.3)	10	(12.5)
45-54	-	-	3	(3.8)	7	(8.8)	6	(7.5)
55-64	-	-	3	(3.8)	4	(5.0)	2	(2.5)
>64	1	(1.3)	1	(1.3)	1	(1.3)	-	-
Over all status	**5**	**(6.3)**	**25**	**(31.3)**	**28**	**(35.0)**	**22**	**(27.5)**

In the urban areas 6.3%(n=5) were underweight; among them 5%(n=4) were females and 3.8 %(n=3) of adults were in the age group of 25-34 years. 31.3%(n=25) of adults were normal weight; among them 20%(n=16) were males and 8.8 %(n=3) of adults were in the age group of 35-44 years. 35% (n=28) of adults were overweight; among them 20% (n=16) of adults were males and 11.3% (n=9) of adults were in the age group of 35-44 years.27.5% (n=22) of adults were obese; among them 18.8% (n=15) of adults were females and 12.5% (n=10) of adults were in the age group of 35-44 years.

Table 3: Nutritional status of adults in rural areas

Variables	Underweight		Normal weight		Overweight		Obesity	
	No	(%)	No	(%)	No	(%)	No	(%)
Gender								
Male	22	(6.9)	72	(22.5)	36	(11.3)	17	(5.3)
Female	20	(6.3)	65	(20.3)	57	(17.8)	31	(9.7)
Age								
19-24	12	(3.8)	18	(5.6)	10	(3.1)	2	(0.6)
25-34	9	(2.8)	29	(9.1)	24	(7.5)	9	(2.8)
35-44	5	(1.6)	19	(5.9)	30	(9.4)	21	(6.6)
45-54	7	(2.2)	27	(8.4)	15	(4.7)	10	(3.1)
55-64	3	(0.9)	27	(8.4)	11	(3.4)	5	(1.6)
>64	6	(1.9)	17	(5.3)	3	(0.9)	1	(0.3)
Over all status	**42**	**(13.1)**	**137**	**(42.8)**	**93**	**(29.1)**	**48**	**(15.0)**

In the rural areas out of 320 adults 13.1% (n=42) were underweight; among them 6.9% (n=22) were males and 3.8 %(n=12) of adults were in the age group of 19-24years. 42.8% (n=137) of adults were normal weight; among them 22.5% (n=72) were males and 9.1 %(n=29) of adults were in the age group of 25-34 years. 29.1% (n=93) of adults were overweight; among them 17.8% (n=57) of adults were females and 9.4% (n=30) of adults were in the age group of 35-44 years.15.0% (n=48) of adults were obese; among them 9.7% (n=31) of adults were females and 6.6% (n=21) of adults were in the age group of 35-44 years.

Table 4: - Significant levels of significant variables for rural area.

Significant variables	p value
Family history	0.045
Activities to reduce the weight	0.000
Sleeping habit in evening	0.001
Duration of sleeping in evening	0.006

Activities taken to reduce the weight (p=0.000) was more significantly associated and family history was less significantly associated (p=0.045) with overweight and obesity than other significant variables among the adults in rural area. There were no any significant associations of variables with weight distribution in the urban area.

Table 5: - Significant levels of significant variables for Batticaloa district

Significant variables	p value
Gender	0.008
Ethnicity	0.003
Religion	0.013
Smoking	0.010
Family history	0.002
Following weight reduction	0.000
Sleeping habit in evening	0.000
Frequency of meal intake in a day	0.034

When assess the significant levels of significant factors for Batticaloa district, following weight reduction (p=0.000) and the sleeping habit in the evening after the meal (p=0.000) were highly significant and frequency of meal intake in a day (p=0.034) was the less significant with overweight and obesity of adults in the Batticaloa district.

IV. DISCUSSION

Poor nutritional status is a chronic condition, caused by physiological, social, cultural, psychological, genetic, metabolic and behavioral factors (Kelly et al., 2008). The prevalence of overweight and obese people is increasing worldwide and the prevalence of adult obesity is increasing rapidly due to environmental and behavioral changes (Ramachandran & Snehalatha, 2010).Nutritional status of adults and the associated risk factors of weight distribution were assessed for Batticaloa district. The present study reveals that majority of adults present with normal weight as well as overweight and not obese or underweight. Similar association was seen in other studies done in Vietnamese adults (Trinh et al., 2009) and done in young adults in Uganda (Balawa et al., 2010). at the same time some other studies show the opposite association, done in adults from rural and urban areas of United States (Michimi &Wimberly, 2010) and in Mississippi (Zhang & Mozee 2014).

The present study reveals that in the urban area, males were normal weight and overweight and obesity was high in females, and similar finding was there in a study which was done in China among rural adults (Tian et al., 2009). There are no any significantly associated risk factors to overweight and obesity in the urban area. Another study shows the associated risk factors of overweight and

obesity of adults in the urban area, such as social and lifestyle factors; done in north Iran (*Hajian-Tilaki&Heidari, 2007*). Majority of rural women presented with overweight and obesity; a study done in Thailand rural areas shows that prevalence was low in women (Aekplakorn et al., 2007) and family history of obesity, activities for weight reduction, sleeping habit after the meal in evening and the duration had significant association with overweight and obesity in rural areas.

Overweight and obesity was high among both males and females those who were between the age of 35-54 years and less in the age group of 19-24 years and above 64 years and underweight or normal weight adults come in the age group of 19-34 years; as similar, a study which was done among Shanghai adults in china reveals that BMI was significantly high in age group of 35-44 years and low above 65 years (Hou et al., 2008); another study done in Indian women shows the higher prevalence in the age group of 40-49 years(Garg et al., 2010) and a study done in province of Vojvodina, Serbia shows the higher prevalence in both males and females of 60-69 years(Grujic et al., 2009).

Present study reveals that gender, marital status, ethnicity, religion, smoking habit and frequency in a day, alcohol intake, were significantly associated factors for the overall weight distribution for Batticaloa district rather than the significant variables observed in rural areas. A study done in Chinese adults in Shanghai shows that, overweight and obesity had negative association with smoking and positive association with alcoholism and having family history of overweight and obesity (Hou et al., 2008); another study done in Netherland regarding prevalence of overweight and obesity shows the similar association with significant variables of sleeping habit and weight reduction activities (Deurenberg & Hautvast, 1998).

Number of parity of women was significantly associated with overweight and obesity in Batticaloa district. A study done in urban Indian women regarding prevalence of overweight and obesity shows the association with the significant variables of number of parity and marital status (Gouda & Prusty 2014) and another study shows positive association of marital status with increased BMI in both men and women which was done in Greek adults (Tzotzas et al.,2010). Present study reveals that the dietary habit, frequency of food intake in a day and places of meal taking were significantly associated with increased weight. A study done in Swedish adult women shows, the risk of overweight and obesity was low in vegetarians than omnivorous (Newby , Tucker & Wolk 2005); and another study done among adults in United Kingdom reveals the significant association of dietary habit (Spencer., et al 2003); and a study done in adult population of United States indicates that frequency of food intake and taking meals from outsides were significantly associated with increased body weight (Yunsheng., et al 2003).

V. CONCLUSION AND RECOMMENDATION

Nearly 50% of adults were normal weight in Batticaloa district. In the urban and rural areas around 50% of adults were overweight and obese. Overweight and obesity were high in urban adults than rural adults. Females were obese than males in both urban and rural areas. Underweight and normal weight adults come under the age between19-34 years. 35-54 years adults were more overweight and obese than others. Awareness programs should be carried out in the community regarding weight reduction measures and primary prevention of overweight and obesity by eliminating risk factors. Health education programs have to be done for public regarding the consequences of overweight and obesity, especially for adults of 35-54 years age group, who were more vulnerable.

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