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## Correlation between physical activity, sedentary behaviour and obesity: a cross-sectional study among the Misings of Assam, North-east India

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### **Abstract**

*Physical inactivity or sedentary behaviour is considered as one of the foremost autonomous modifiable risk factor for chronic diseases and is one of the core causes obesity. Normal physical exercise is the crucial lifestyle behaviour for maintain of individual's health. Therefore, it is the fundamental effective power to reduce the possibility of overweight or obesity. Ramya et al. (2017) shows that physical activity is the any body movements that require energy expenditure. The inadequate physical exercise is the risk factor for non-communicable diseases as well as overweight or obesity. Physical inactivity is the fourth core risk factor reports for about 6% of global death, 13% of blood pressure, 9% of tobacco use and 5% of overweight or obesity (WHO, 2017). The main aim of this study was to determine the relationship between physical activity, sedentary behaviour and overweight or obesity among the Misings of Dhemaji district, Assam, North-east India. The present study was conducted in the homogenous Mising villages namely Lakhpathar Mising Gaon, Kulajan Mising Gaon and Akajan Mising Gaon located at Dhemaji District, Assam, India. It falls under Sissiborgaon Development Block, Dhemaji District, Assam. A total of 400 subjects, of which 200 men and 200 women in the age group of 18-65 years was constituted for the present research. Data on each subject is collected randomly following house to house visit during the months of May 2018 to January 2019. The data on anthropometric measurements such as height, weight, waist circumference and blood pressure were recorded from both men and women aged 18-65 years. The anthropometric rod and weighing machine was used to measure height and body weight of subjects wearing light clothes following the standard technique of Lohman et al., (1998). The WHO (2000) has proposed a redefined classification for evaluating overweight and obesity among Asia Pacific populations. This cut of points was used to evaluate the prevalence of overweight and obesity in the present research. According to Asian cut-off points, BMI  $\geq 25.00$  kg/m<sup>2</sup> has been considered as obese, BMI between 23.00-24.99 kg/m<sup>2</sup> is considered as overweight, BMI between 18.50 -22.99 kg/m<sup>2</sup> indicates normal and BMI below 18.50 kg/m<sup>2</sup> is considered as underweight.*



**Keywords-** *Physical inactivity, overweight or obesity, Misings, Dhemaji district, Assam.*

## Introduction

Overweight or obesity is now known as worldwide major public health problems. Both are excessive fat accretions in the body which are interrelated to serious diet-linked non-communicable diseases that influenced human physique. The word 'obesity' has been derived from the Latin word *Obesus*, means 'stout', 'fat or plump' while *Esus* means 'to eat' (Onion *et al.*, 1996). Individuals with marginal obesity (fat located on buttocks, hips and thighs) have fewer health risks than those with vital obesity (fat located around the stomach and gut). Hypertension, heart disease, diabetes, gall bladder and asthma have links to obesity (Saw and Rajan 1997; WHO 1998; American Academy of Pediatrics 2003; Mishra 2004). The health risks related with obesity depends on where the obese is located (Arner 1998). Moreover, obesity and overweight can contribute many problems in women's reproductive system like prolonged periods, menstrual pain, delayed ovulation, infertility, breast cancer, ovarian cancer etc. (Shannon 1993).

Snijder *et al.*, (2006) shown that, there are various methods for calculating body mass index (BMI), waist-hip ratio, skin-fold thickness, bioelectrical impedance analysis (BIA), magnetic resonance imaging (MRI) and dual x-ray absorptiometry (DXA). Therefore, for the present research, I want to focus on BMI, because it is the preferred measurement by the WHO as well as it is also used commonly in social science research related to overweight and obesity (Burkhauser *et al.*, 2008). Globally, body mass index is the most frequently used measure to examine adult obesity. Adolphe Quetelet, a social scientist first conceived the idea of BMI in the mid 1800s. From this time, it is widely considered as a basic tool for measuring adult obesity (Aronne 2002). In India, the occurrence of overweight and obesity is presently one of the foremost common health issues. Some global data indicated that such prevalence is more definite among the individuals who inhabiting in the city areas while match up to the rural areas of the countryside. It also shows that the consequences of different demographic, lifestyle and socio-economic aspects interrelated to overweight and obesity among the individuals.

## Aims of the present research

The main aim of this study is to determine the relationship between physical activity, sedentary behaviour and overweight or obesity among the Misings of Dhemaji district, Assam.

### **Location of the area of study and sample population**

The present study was conducted in the homogenous Mising villages namely Lakhipather *Mising* Gaon, *Kulajan Mising* Gaon and *Akajan Mising* Gaon located at Dhemaji District, Assam, India. It falls under Sissiborgaon Development Block, Dhemaji District, Assam. A total of 400 subjects, of which 200 men and 200 women in the age group of 18-65 years was constituted for the present research. Data on each subject was collected randomly following house to house visit during the months of May 2018 to January 2019.

### **Methods and Techniques**

#### **Anthropometry**

The data on anthropometric measurements such as height, weight, waist circumference and blood pressure were recorded from both men and women aged 18-65 years. The anthropometric rod and weighing machine was used to measure height and body weight of subjects wearing light clothes following the standard technique of Lohman *et al.*, (1998).

#### **Data on Overweight and Obesity**

The WHO (2000) has proposed a redefined classification for evaluating overweight and obesity among Asia Pacific populations. This cut of points was used to evaluate the prevalence of overweight and obesity in the present research.

According to Asian cut-off points, BMI  $\geq 25.00$  kg/m<sup>2</sup> has been considered as obese, BMI between 23.00-24.99 kg/m<sup>2</sup> is considered as overweight, BMI between 18.50 -22.99 kg/m<sup>2</sup> indicates normal and BMI below 18.50 kg/m<sup>2</sup> is considered as underweight.

### **Results**

#### **Anthropometric data on height and weight among the Mising men and women**

The data on height and weight are described statistically to find out the different results of different measurements. The mean and standard deviation of mean height for both men and women are given in the table- 1A.

Age groups	N	Height (cm) Men	
		Mean height	±SD
18-25	52	159.47	5.65
26-33	41	158.67	4.67
34-41	37	159.94	5.50
42-49	29	157.19	4.57
50-57	24	160.69	4.56
58-65	17	162.31	4.21
Total	200	159.40	5.50
Height (cm) Women			
18-25	47	153.22	5.27
26-33	42	150.85	4.60
34-41	31	151.86	3.01
42-49	32	148.88	4.52
50-57	25	146.56	4.15
58-65	23	145.52	6.40
Total	200	151.30	4.10

N= sample size, SD= standard deviation

**Table- 1A** fundamental data on height among the Mising men and women

The mean body height (159.40 cm) among the men is found higher than the mean height (151.30 cm) among the women. Age group wise comparison showed that men are taller than women in each age group.

**Table- 1B** fundamental data on body weight among the Mising men and women

Age groups	N	Body weight (kg) Men	
		Mean	±SD
18-25	52	61.28	6.59
26-33	41	67.42	7.01
34-41	37	68.13	7.67
42-49	29	69.94	8.00
50-57	24	66.98	6.89
58-65	17	58.70	6.61
Total	200	67.74	7.58
Body weight (kg) Women			
18-25	47	48.20	2.02
26-33	42	48.64	1.76
34-41	31	50.87	3.23
42-49	32	50.56	1.72
50-57	25	44.14	1.08
58-65	23	43.51	1.48
Total	200	47.58	3.38

N= sample size, SD= standard deviation and SE= standard error

Table 1B displays the basic data on mean body weight of Mising men and women of Dhemaji district in six different age groups. This table shows that the mean body weight among the Mising men and women are 67.74 kg and 47.58 kg respectively. Mean body weight increases with age until 49 years of age and decreases thereafter. The highest mean body weight of men are found in the age group 42-49 years whereas for women in the age group 34-41.

### Distribution of different BMI rates

The distributions of mean Body Mass Index (BMI) rates in different age groups are given below.

Age groups	N	BMI (kg/m <sup>2</sup> ) Men	
		Mean	±SD
18-25	52	20.50	2.25
26-33	41	17.07	2.75
34-41	37	21.90	2.55
42-49	29	23.14	3.00
50-57	24	20.54	2.23
58-65	17	19.21	1.12
Total	200	21.23	2.87
BMI (kg/m <sup>2</sup> ) Women			
18-25	47	30.10	1.98
26-33	42	31.28	1.51
34-41	31	33.38	1.97
42-49	32	32.87	1.87
50-57	25	32.49	1.57
58-65	23	33.84	2.04
Total	200	31.94	1.20

N= sample size, SD= standard deviation

**Table- 2** Distribution of mean BMI rate among the Mising men and women

This table displays that the mean BMI value is found low among men in the age group 26-33 years while the mean BMI value is found lower among women in the age group 18-25. The mean BMI value of all the age groups of men and women are found to be 21.23 and 31.94 respectively.

### Prevalence of overweight and obesity according to Asian cut-off points

According to Asian cut-off points the prevalence of overweight and obesity among men are given in the table- 3A. The highest prevalence of overweight (26.7%) and obesity (13.3%) is found among the Missing men.

Asian cut-off points (Men)					
Age groups	N	Under weight	Normal weight	Over weight	Obesity
18-25	35	1 (2.8%)	22(62.8%)	8 (22.9%)	4 (11.4%)
26-33	45	0 (0.0%)	27 (60.0%)	12(26.7%)	6 (13.3%)
34-41	37	1 (2.7%)	23 (62.2%)	9 (24.3%)	4(10.8%)
42-49	32	2 (6.3%)	18(56.3%)	8 (25.0%)	4(12.5%)
50-57	29	0 (0.0%)	22(75.9%)	5 (17.2%)	2(6.9%)
58-65	22	1 (4.5%)	16(72.7%)	4 (18.2%)	1 (4.5%)
Total	200	5 (2.5%)	128(64.0%)	46(23.0%)	21(10.5%)

**Table- 3A** Prevalence of overweight and obesity among the Missing men (According to Asian cut-off points, WHO, 2000)

Similarly, the prevalence of overweight and obesity according to Asian cut-off points among women are given in the table- 3B. The highest prevalence of overweight (27.6%) and obesity (13.7%) are found among the Missing men.

Asian cut-off points (Women)					
Age groups	N	Under weight	Normal weight	Over weight	Obesity
18-25	29	1 (3.4%)	17(58.6%)	8(27.6%)	3(10.3%)
26-33	40	1(2.5%)	23(57.5%)	11(27.5%)	5 (12.5%)
34-41	51	1 (1.9%)	29 (56.9%)	14(27.4%)	7 (13.7%)
42-49	42	0(0.0%)	25(59.5%)	12(28.6%)	5 (11.9%)
50-57	23	1 (4.3%)	13 (56.5%)	6(26.1%)	3 (13.0%)
58-65	15	0(0.0%)	9(60.0%)	4(26.7%)	2 (13.3%)
Total	200	4(2.0%)	116(58.0%)	55(27.5%)	25(12.5%)

**Table- 3B** Prevalence of overweight and obesity among the Mising women (According to Asian cut-off points, WHO, 2000)

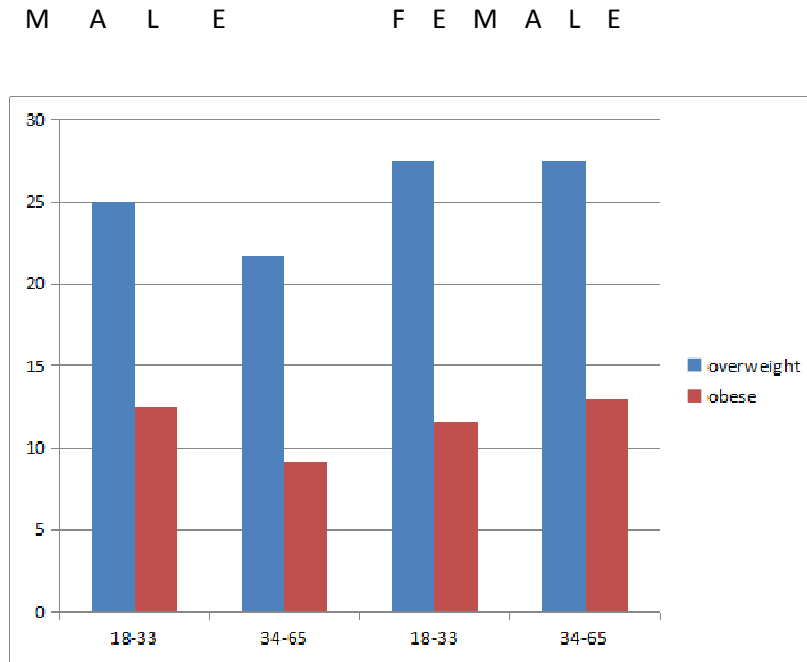
The overall prevalence of overweight and obesity according to Asian cut off points in both the sexes are displayed in the table- 3C (page no. and figure-1 page no..) The higher occurrence of overweight (25.0%) and obesity (12.5%) is found in men in the age group between 18-33 years. It is followed by overweight (21.7%) and obesity (9.2%) in the age group between 34-65 years. The difference of overweight and obesity among the men is statistically not significant ( $\chi^2=1.731$ ,  $df=3$ ,  $p<0.05$ ). Likewise, according to Asian cut-off points the higher occurrence of overweight and obesity among women are (27.5%) and 17(13.0%) respectively. However, the difference in the prevalence of overweight and obesity are found statistically not significant ( $\chi^2=0.495$ ,  $df=3$ ,  $p<0.05$ ).

Asian cut-off points					
Men					
Age group (year)	N	Under weight	Normal weight	Over weight	Obesity
18-33	80	1(1.3%)	49(61.3%)	20(25.0%)	10(12.5%)
34-65	120	4(4.8%)	79(65.8%)	26(21.7%)	11(9.2%)
Total	200	5(2.5%)	128(64.0%)	46(23.0%)	21(10.5%)
$\chi^2=1.731$ , $df=3$ , $p<0.05$ (p-value is 0.630)					
Women					
Age group (year)	N	Under weight	Normal weight	Over weight	Obesity
18-33	69	2(2.9%)	40(58.0%)	19(27.5%)	8(11.6%)
34-65	131	2(1.5%)	76(58.0%)	36(27.5%)	17(13.0%)
Total	200	4(2.0%)	116(58.0%)	55(27.5%)	25(12.5%)
$\chi^2=0.495$ , $df=3$ , $p<0.05$ (p-value is 0.920)					

**Table- 3C** Overall Prevalence of overweight and obesity among the Mising men and women (According to Asian cut-off points, WHO, 2000)



Percentage of overweight and obesity



**Figure-1** Prevalence of overweight and obesity among Mising male and female (According to Asian cut-off points, WHO, 2000)

**Prevalence of overweight and obesity in relation to physical activity according to Asian cut-off points**

Asian cut-off points (Men)						
Age groups (years)	Physical activity	N	Under weight	Normal weight	Over Weight	Obesity
18-33	Less than one hr	22	0(0.0%)	13(59.1%)	6(27.3%)	3(13.6%)
	One hr and above	58	1(1.7%)	36(62.1%)	14(24.1%)	7(12.1%)
Total		80	$\chi^2= 14.948, df= 3, p<0.05$ (p-value is 0.002)			
34-65	Less than one hr	99	1(1.0%)	67(67.7%)	22(22.2%)	9(9.1%)
	One hr and above	21	3(14.3%)	12(57.1%)	4(19.0%)	2(9.5%)
Total		120	$\chi^2= 9.537, df= 3, p<0.05$ (p-value is 0.023)			

**Table- 4A** Prevalence of overweight and obesity in relation to physical activity among the Mising men (Asian cut-off points, WHO, 2000)

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The prevalence of overweight and obesity in relation to physical activity among the Mising men are given in the table-7A. According to Asian cut-off points, the frequency of overweight (27.3%) and obesity (13.6%) are higher in the 18-33 years of age group who exercised less than one hour. It is followed by overweight (24.1%) and obesity (12.1%) who exercised over one hour. The differences are statistically significant ( $\chi^2= 14.948$ ,  $df= 3$ ,  $p<0.05$ ). Similarly, the frequency of overweight (22.2%) and obesity (9.5%) are higher among the age group between 34-65 years, who exercised below one hour and over one hour respectively. The table also displays that the occurrence of overweight (19.0%) and obesity (9.1%) are high among the men who exercised above one hour and below one hour correspondingly. The differences are statistically significant ( $\chi^2= 9.537$ ,  $df= 3$ ,  $p<0.05$ ).

**Table- 4B** Prevalence of overweight and obesity in relation to physical activity among the Mising women (Asian cut-off points, WHO, 2000)

Asian cut-off points (Women)						
Age groups (years)	Physical activity	N	Under weight	Normal weight	Over Weight	Obesity
18-33	Less than one hr	30	1(3.3%)	13(43.3%)	11(36.7%)	5(16.7%)
	One hr and above	39	1(2.6%)	27(69.2%)	8(20.5%)	3(7.7%)
<b>Total</b>		69	$\chi^2= 4.78$ , $df= 3$ , $p<0.05$ (p-value is 0.188)			
34-65	Less than one hrs	109	2(1.8%)	63(57.8%)	30(27.5%)	14(12.8%)
	One hr and above	22	0(0.0%)	13(59.1%)	6(27.3%)	3(13.7%)
<b>Total</b>		131	$\chi^2= 0.417$ , $df= 3$ , $p<0.5$ (p-value is 0.936)			

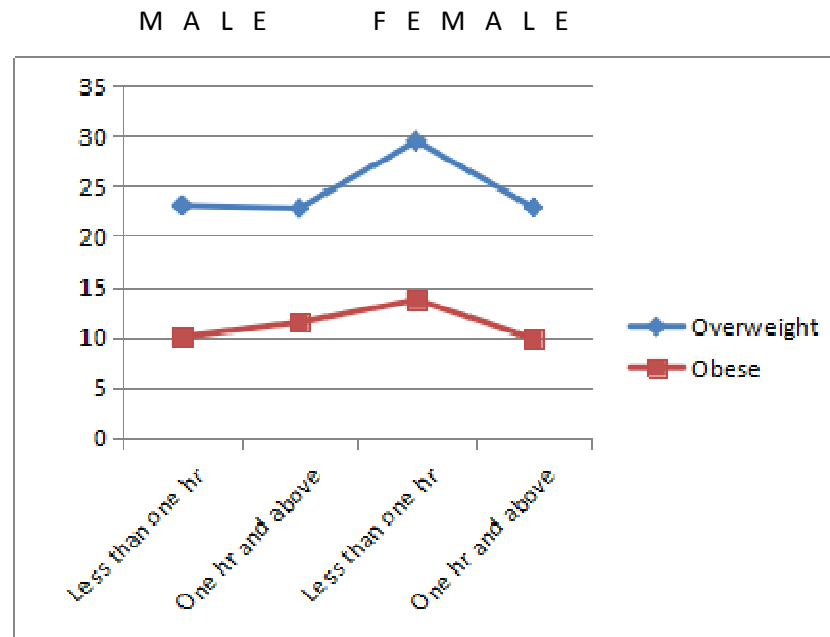
The prevalence of overweight (20.5%) and obesity (7.7%) are notably high among the men who exercised over one hour. Again, the frequency of overweight (27.3%) and obesity (13.7%) are higher among the men who exercised one hour and above. The differences are statistically not significant ( $\chi^2= 4.78$ ,  $df= 3$ ,

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$p < 0.05$ ). The table further displays that the frequency of both overweight (36.7%) and obesity (16.7%) are higher among the women, age group between 18-33 years, who exercised less than one hour. Furthermore, the frequency of overweight (27.5%) and obesity (12.8%) are higher among women age group between 34-65 years, who exercised less than one hour. The differences are statistically not significant ( $\chi^2 = 0.417$ ,  $df = 3$ ,  $p < 0.5$ ).

**Table- 4C** Overall prevalence of overweight and obesity in relation to physical activity among the Mising men and women (Asian cut-off points, WHO, 2000)

Asian cut-off points (Men)						
Age groups (years)	Physical activity	N	Under weight	Normal weight	Over Weight	Obesity
18-65	Less than one hr	121	1(0.8%)	80(66.1%)	28(23.1%)	12(10.0%)
	One hr and above	79	4(5.1%)	48(60.8%)	18(22.8%)	9(11.4%)
Total		200	$\chi^2 = 3.748$ , $df = 3$ , $p < 0.05$ (p-value is 0.290)			
Asian cut-off points (Women)						
18-65	Less than one hr	139	3(2.2%)	76(54.7%)	41(29.5%)	19(13.7%)
	One hr and above	61	1(1.6%)	40(65.6%)	14(22.9%)	6(9.8%)
Total		200	$\chi^2 = 2.084$ , $df = 3$ , $p < 0.05$ (p-value is 0.555)			



**Figure-2** Overall prevalence of overweight and obesity in relation to physical activity among Mising male and female (According to Asian cut-off points, WHO, 2000)

The overall prevalence of overweight and obesity in relation to physical activity among the Mising men and women are given in table- 7C and figure-5. The frequency of overweight (23.1%) and obesity (10.0%) are higher among men who exercise below one hour. Similarly, the frequency of overweight (22.8%) and obesity (11.4%) are higher among men who exercised one hour and above in the present study. The differences are statistically not significant ( $\chi^2=3.748$ ,  $df= 3$ ,  $p<0.05$ ).

Similarly, the frequency of both overweight (29.5%) and obesity (13.7%) are also recorded higher among women who exercised below one hour. These are followed by overweight (22.9%) and obesity (9.8%) among women who exercises more than one hour. The distributions are statistically not significant ( $\chi^2= 2.082$ ,  $df= 3$ ,  $p<0.05$ ).

### Discussion

Overweight and obesity are comparatively new in human evolutionary history. Brewis (2011) shows that, before Neolithic period when agriculture lifestyles become prevalent, diets were based on foods gathered.



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While walking was the only way to go around, people naturally exercised. Therefore, the possibilities of being overweight and obesity in such an environment is exceptional.

Dhemaji, a small district of Assam, Northeast India has begun to experience remarkable changes. Urbanization and modernization have gathered speed and as a result of these there is a remarkable change seen in the socio-economic and lifestyle status of many of the residents of Dhemaji district, Assam. There is also a remarkable change among the inhabitant of Mising population in terms of occupation, economy, food habits, dietary intake, physical activity and overall lifestyles. The occurrence of overweight and obesity among Mising people differs by age and sex in the present research and it is similar to other research work.

The increasing occurrence of obesity among adult men and women in the present research could be ascribed to the accumulation or adding up of fats. Generally lesser participation in physical activities and gradually more sedentary lifestyles, adult people are more body fat than younger ones. Ferraro *et al.*, (2001) examined that, women are more likely to become obese at a number of periods like, during pregnancy, after childbirth, during menopause and at retirement.

Physical activity is a key feature in maintaining healthy health status because, it has a major impact on body composition, metabolism and increasing energy expenditure (Nowicka *et al.*, 2007). There is a negative association between the occurrence of overweight or obesity and physical activity in both the sexes in the present research. However, inactive physical labour may lead to more sedentary lifestyles and it may cause overweight and obese. In developing nations like India higher socio-economic status relates with less physical activity and more sedentary lifestyle. In the present research the majority of the women respondents had inactive lifestyle.

Women were leading sedentary lifestyle in greater numbers than men. The housing and town planning environment and political condition are of particular interest for decreasing physical activities among the Mising population. According to Blake and Macinko (2008), increasing land use for development, traffic density, restricted sport grounds and parks provide limitations of physical activity promoting behaviour. This could lead to more sedentary lifestyles and lead to the development of overweight or obesity in due course of time. The same reason is also applicable among the Mising populations.



## Conclusion

In conclusion, the prevalence of overweight and obesity within a population is considered a risk factor for non-communicable diseases. Moreover, fast economic development, nutritional alteration along with growing urbanization and ever-increasingly sedentary lifestyle has contributed to an increasing occurrence of overweight and obesity. It also may be concluded that, most of the socio-economic, demographic and lifestyle related determinants are significantly associated with the occurrence of overweight and obesity. It is very important to educate and create awareness programs to check the growing problems of overweight and obesity. It is worth mentioning that, regular examining of Body Mass Index (BMI) and body fat distribution for adults would be useful to control modest weight gain. In an ideal world, governments would have been monitoring population obesity trends and have acted early to implement the actions needed to prevent and reverse the overweight and obesity epidemic. Moreover, government and NGOs should be involved in constructing and protecting an environment that maintains the healthy growth and development in advancing age. However, proper healthcare policies and participations are required for reducing the prevalence of overweight and obesity. Research work integrating the different communities would be useful to indicate about the prevalence of overweight and obesity in regards to above mentioned determinants in Dhemaji, Assam.

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