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Overweight and obesity in West Bengal: A Serious Public Health Issue

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ABSTRACT: The amount and distribution of fat and overweight in the human body are critical when determining the risk for different illnesses. Different disorders have a close connection to abnormal fat distribution and overweight. Obesity develops when a person's weight is out of proportion to their body fat. As a result, obesity rates have lately risen in both West Bengal and India. Overeating, a sedentary lifestyle, and a lack of physical exercise are the most evident causes of obesity and overweight. Excess fat and overweight are produced as a consequence, putting people of West Bengal at greater risk for health problems. The study's goals are to understand better and Identify the prevalence of obesity and overweight in the West Bengal population and keep track of it.

KEYWORDS: Health problem, Nutritional status, Obesity, Overweight.

1. INTRODUCTION

Overweight and obesity are now epidemics on a worldwide scale. Globe Health Organization (WHO) estimates that in 2015, there will be over 700 million obese persons and 2.3 billion overweight people in the world. An estimated 2.8 million persons die each year due to medical issues associated with being overweight or obese. The most often seen nutritional condition in developed countries is caused by an imbalance in one's energy intake resulting in an accumulation of stored energy, mostly in the form of body fat. Being overweight or obese has a number of negative consequences, one in four people will get diabetes, one in three will have ischemic heart disease, and one in four will develop a malignancy (WHO, 2013; Bhadra et al., 2005; Roy et al., 2016; Bhadra et al., 2018). Overweight is a condition in which a person's body weight has risen over what is considered normal or appropriate for their height and weight. Obesity is characterised by a high proportion of adipose tissue to maintain body mass (BMI) (Stunkard and Wadden, 1993; Khatun et al., 2016a; Khatun et al., 2016b). Kopelman (2000) defines obesity as "extra fatness" or obesity that results in disease. Although pinpointing the exact causes of this pandemic is challenging, a sedentary lifestyle, a lack of physical exercise and excessive consumption of energy-dense foods are the most common culprits (Sinha and Kapoor, 2010; Roy et al., 2016; Das et al., 2016a; Das et al., 2016b). Obesity is now the most global epidemic facing our country.

Public health implications for adolescents in West Bengal (Sarkar, 2016; Mistri, 2016; Mitra et al., 2017; Bhadra et al., 2017; Bhadra et al., 2018; Chakrabortyand Ghosh, 2019) and across India (Maiti, 2017; Devi et al., 2017; Algur et al., 2017; Madhu and Sarkar, 2016) include both under nutrition and over nutrition. When someone is undernourished, its because they aren't getting enough food, when this happens, people tend to

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lose weight and have various symptoms, including sluggishness and bone loss due to osteoporosis (slower blood pressure, dry skin, sleeplessness, and fractures). In addition, chronic hunger is associated with nutritional oedema and burning pains in the hands and feet.

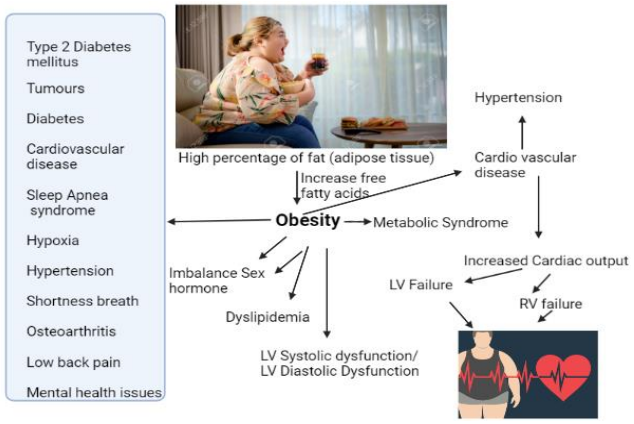

Fig. 1. Obesity is highlighted as a serious health problem (Figure was created using the Biorender programme)

1.1 Adult Weight Classification System:

BMI (body weight in kilogrammes divided by height in metres squared) is now the most generally used criterion for categorising obesity, and it varies from underweight or wasting (18.5 kg/m^2) to a state of extreme, even morbid, overweight (40 kg/m^2). A measure of abdominal adiposity and waist circumference has grown in importance and discrimination as an overweight/obesity indicator in clinical and research contexts (Hu, 2007). Fat around the organs, particularly visceral fat, is the primary cause of abdominal adiposity. This fat is also linked to metabolic dysregulation, increasing the risk of cardiovascular disease and other illnesses (Alberti et al., 2009). A waist circumference that increases cardiovascular risk is defined as being less than 94cm in men (European) and less than 80cm in women (European), with different cut points recommended within other racial and ethnic groups (e.g., less than 90 and less than 80cm, respectively, for men and women of South Asian descent and Chinese descent (Alberti et al., 2009).

1.2 Calculating Body Mass Index and Obesity:

The first step in the battle against obesity is adopting a standardised public health measure of ity and overweight. The NIH convened an expert panel in 1998 to define obesity and overweight using the BMI. BMI is a useful metric that only needs two factors: precise weight and height measurements. The BMI (body mass index) is a measurement of weight in proportion to height. The BMI is computed by multiplying the weight in pounds by the square of the height in inches and multiplying by 703. BMI may also be determined by dividing weight in kilogrammes by the square of height in metres (NIH, 1998).

1.3 Risk That Can Be Attributed:

When assessing the influence of obesity on morbidity, mortality, or disability, it is helpful to compute the percentage of an outcome that is due to obesity ('the attributable fraction') using the obesity prevalence and relative risk:

$$AF_p = \frac{p(RR-1)}{p(RR-1)+1},$$

Where AF denotes the attributable fraction, p is the percentage of males in each BMI group, and RR denotes the associated relative risk. Thus, relative risks may be compared to assess the distinct effects of obesity on morbidity and mortality since the percentage of obese individuals will be similar for each attributable fraction calculation. The relative risks associated with various BMI categories for all-cause mortality, coronary heart disease, type 2 diabetes mellitus, and stroke are highlighted in this review using data from the Health Professionals Follow-Up Study (Visscher and Seidell, 2001; Baik et al., 2000; Chan et al., 1994; Rimm et al., 1995**,** Walker et al., 1996) and the Nurses' Health Study in the USA (Carey et al., 1996, Manson et al., 1990, Rexrode et al., 1997). Both studies provide age-adjusted relative risks for these events.

1.4 Genetic Role of Obesity:

The rate of change in the human population's genetic makeup is too slow to factor in the obesity epidemic. However, if people respond differently to environments that promote inactivity and high-calorie eating, genes play a role in obesity development. Genes provide the body with advice on how to respond to environmental changes. Obesity, therefore, might be a result of genetic differences that enhance hunger and food intake.

Hereditary obesity in a family may sometimes be traced down to a single gene mutation (monogenic obesity). However, instead of being the result of a single gene or environmental factor, obesity is most likely the result of a complex interplay between several genes and factors that are still poorly understood (multifactorial obesity).

Health care workers frequently collect the family's health history to identify people at high risk of obesity-related problems such as cardiovascular disease, diabetes, and certain malignancies. Close relatives' health histories reveal the effects of shared genetics and environment. Families can't change their DNA, but they can encourage healthy lifestyle choices like eating well and exercising. These alterations can improve the health of family members and future generations' health records (Bouchard, 2010; Choquet and Meyre, 2011).

1.5 Physical Training and Obesity

Increasing overall energy expenditure may help you lose weight and be less obese by reducing your adipose tissue mass. Anaerobic and aerobic exercise are included in the ACSM current recommendations. Exercise that

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exhausts the muscles' supply of oxygen (such as running, cycling, rowing, etc.) is an aerobic activity. However, the amount of oxygen consumed during aerobic exercise is adequate to meet the muscles' energy needs without additional energy (Bateman et al., 2011). Anaerobic exercise, on the other hand, is a form of resistance training (i.e. weight lifting) in which the amount of oxygen consumed is insufficient to meet the energy demands placed on the muscles, causing the muscles to break down other energy sources ('such as sugars') to produce lactic acid and energy (Bateman et al., 2011). Exercise includes physical activity (PA), but not necessarily organised exercise regimens or sessions. Mets are used to assess the amount of energy used during "metabolic equivalent tasks," which is approximately comparable to the amount of effort and energy expended when a person sits passively. This emphasises the importance of getting regular physical exercise throughout the day and incorporates it into other lifestyle treatments. Active living encompasses various activities, including problem-solving, physical exercise during free time, and transportation. Cardiorespiratory fitness, body composition, and muscular fitness are all important outcomes to look. There has recently been a flurry of research showing the benefits of exercise for individuals of all ages, including their physical, cognitive, and emotional well-being (Bechara and Kelly, 2013).

Different scientists in West Bengal investigated regular exercise, physiological health measurements such as heart rate, blood pressure, VO_2Max and menstrual cycle and compared it to obesity, as were maximal breathing capacity and respiratory rate (Basak, 2019; Basak and Biswas, 2016; Basak and Dutta, 2016; Basak, and Hansda, 2016; Mandal, 2016; Pramanik, 2018).

Basak and Biswas, 2016 conducted the following research among 30 students at a West Bengal physical training college:

Table 1. Participants were distributed according to their BMI.

BMI	'No of subjects'	'%'
UW (<18.50)	'8'	'26.67'
AW (18.50-24.99)	'20'	'66.67'
OW (>25.00)	'2'	'6.67'
UV= Under weight; AW = Average weight ; Over weight = Over weight		
Source: Basak and Biswas, 2016		

Table 2. Risk factors for Dysmenorrhoea are as follows:

BMI	'Dysmenorrhea'		'Total'
	Positive	Negative	
UW (<18.50)	'8(34.78%)'	'0(0%)'	'8'
AW (18.50-24.99)	'14(60.87%)'	'6(85.71%)'	'20'
OW (>25.00)	'1(4.35%)'	'1(14.29%)'	'2'
	'23'	'7'	'30'
χ^2 =3.726, NS			
LC			
>20 D	'2'	'0'	'2'
20-30 D	'20'	'7'	'27'
>35 D	'1'	'0'	'1'
	'23'	'7'	'30'
UV= Under weight; AW = Average weight ; Over weight = Over weight; NS= Not significant; D = Days; LC = Length of cycle			
χ^2 =1.01, Not significant			
Source: Basak and Biswas, 2016			

1.5 Overweight and obesity in West Bengal:

Investigations are being carried out to determine the physical dimensions and nutritional quality of the state of West Bengal. Some of the information was gathered from several writers who conducted field surveys in various parts of West Bengal and collected information. Multiple groups, such as Bengalee Muslims, Hindus, tribals, and others, were shown in all of the data analyses.

Table 3. The physical condition of Muslim teenage males based on age groupings.

SS	AG	Wt. (kg) Mn (SD)	Ht (cm) Mn(SD)	BMI (kg/m²) Mn (SD)
'48'	'11.0-11.9'	'25.29 (6.34)'	'137.42 (7.12)'	'14.45 (1.71)'
'53'	'12.0-12.9'	'28.53 (7.16)'	'142.85 (6.79)'	'15.61 (2.34)'
'45'	'13.0-13.9'	'33.97 (8.34)'	'148.36 (8.44)'	'16.26 (1.87)'
'49'	'14.0-14.9'	'37.69 (8.42)'	'155.63 (6.94)'	'16.93 (2.07)'
'51'	'15.0-15.9'	'43.55 (7.82)'	'159.73 (7.58)'	'17.54 (2.43)'
'58'	'16.0-16.9'	'48.27 (6.93)'	'164.17 (8.47)'	'18.13 (1.96)'
'46'	'17.0-17.9'	'52.46 (7.28)'	'167.54 (6.86)'	'18.74 (2.19)'
'350'	'11.0-17.9'	'37.26 (9.81)'	'151.65 (10.54)'	'16.49 (1.97)'
AG = Age Groups; SS = Sample Size ; Ht = Height; Mn = Mean; Wt. = Weight				
Source: Bhadra et al., 2017				

Table 4. Teenage Muslim males' height and weight compared to the national average for each age group (ICMR, 1989).

AG	ICMR - 1989 IB Mn (SD)	Ht (cm) MB Mn (SD)	ICMR - 1989 IB Mn (SD)	Wt (kg) Muslim Boys Mn (SD)
'11.0-11.9'	137.42 (7.12)	133.40 (9.73)	25.90 (6.33)	25.29 (6.34)
12.0-12.9	142.85 (6.79)	138.30 (10.14)	28.50 (6.10)	28.53 (7.16)
13.0-13.9	148.36 (8.44)	144.60 (9.76)	32.10 (6.82)	33.97 (8.34)
14.0-14.9	155.63 (6.94)	150.10 (10.03)	35.70 (7.62)	37.69 (8.42)
15.0-15.9	159.73 (7.58)	155.50 (10.01)	39.60 (8.36)	43.55 (7.82)
16.0-16.9	164.17 (8.47)	159.50 (9.75)	43.20 (7.88)	48.27 (6.93)
17.0-17.9	167.54 (6.86)	161.40 (10.45)	45.70 (9.07)	52.46 (7.28)
AG = Age Groups; SS = Sample Size ; Ht = Height; Mn = Mean; Wt. = Weight; IB= Indian Boys; MB= Muslim Boys				
Source: Bhadra et al., 2017				

Table 5. Percentile values of BMI used by the WHO to determine nutritional status for various age groups (1995).

AG	SS	NL		UN	
		'No.'	'%'	'No.'	'%'
'11.0-11.9'	'48'	'28'	'58.33'	'20'	'41.67'
'12.0-12.9'	'53'	'28'	'52.83'	'25'	'47.17'
'13.0-13.9'	'45'	'21'	'46.67'	'24'	'53.33'
'14.0-14.9'	'49'	'17'	'34.69'	'32'	'65.31'
'15.0-15.9'	'51'	'21'	'41.18'	'30'	'58.82'
'16.0-16.9'	'58'	'27'	'46.55'	'31'	'53.45'
'17.0-17.9'	'46'	'22'	'47.83'	'24'	'52.17'
'11.0-17.9'	'350'	'164'	'46.86'	'186'	'53.14'
AG = Age Groups; SS = Sample Size ; NL = Normal; UN = Undernourished					
Source: Bhadra et al., 2017					

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Table 6. Anthropometric Variables in Children: Descriptive Statistics.

	'G' (n= 162)			'B' (n=186)			'O' (n=348)		
	Ht	Wt	BMI	Ht	Wt	BMI	Ht.	Wt	BMI
Mn	'114.01'	'18.82'	'14.21'	'114.03'	'18.46'	'14.02'	'114.02'	'18.63'	'14.11'
SD	'12.17'	'4.83'	'1.78'	'12.81'	'4.64'	'1.64'	'12.50'	'4.73'	'1.71'
B = Boys; G = Girls; O= Overall; SD = Standard Deviation; Wt. =Weigh; Ht. = Height; Mn = Mean									
Source: Bhadra et al., 2018									

Table 7. Children from Santal, Peru, were measured for anthropometric variables: Age Group Descriptive Statistics.

Age group (in Yrs)	Mn									Standard Deviation (+/-)								
	Wt			Ht			BMI			G			Ht			BMI		
	B	G	O	G	G	O	B	G	O	B	G	O	B	G	O	B	G	O
'4.0-5.9'	'13.95'	14.33	14.11	99.78	98.22	99.41	14.00	14.61	14.26	2.54	2.54	2.53	8.32	7.55	7.96	1.63	1.79	1.72
6.0-7.9	17.41	17.70	17.54	112.11	112.86	112.45	13.85	13.88	13.86	2.96	2.69	2.83	7.71	6.54	7.18	1.88	1.59	1.74
8.0-9.9	20.81	20.58	20.69	120.73	119.63	120.17	14.13	14.00	14.06	4.31	5.00	4.65	9.03	9.82	9.41	1.62	1.87	1.75
10.0+	23.48	23.48	23.48	128.56	125.53	127.17	14.20	14.70	14.43	2.44	3.96	3.19	5.74	7.71	6.82	1.19	1.81	1.51
SD = Standard Deviation; Wt. =Weigh; Ht. = Height; Mn = Mean; Yrs = years; B = Boys; G= Girls; O = Over all																		
Source: Bhadra et al., 2018																		

Table 8. The nutritional status of the children in the research is assessed by age group using the Weight for Age formula.

AG (in yrs)	SM		MM		NL		OW	
	B	G	B	G	B	G	B	G
'4.0-5.9'	'17' '(35.41)'	08 (22.22)	23 (47.92)	09 (25.00)	08 (16.67)	19 (52.78)	00 (0.00)	00 (0.00)
6.0-7.9	15 (26.79)	05 (10.64)	17 (30.35)	15 (31.92)	24 (42.86)	26 (55.31)	00 (0.00)	01 (2.12)
8.0-9.9	16 (31.37)	24 (45.28)	17 (33.33)	09 (16.99)	18 (35.29)	19 (35.85)	00 (0.00)	01 (1.89)
10.0+	02 (6.45)	02 (7.70)	10 (32.25)	09 (34.62)	19 (61.29)	15 (57.70)	00 (0.00)	00 (0.00)
B = Boys; G = Girls; O= Overall; AG= Age Groups; Yrs = Years; SM = Severe Malnutrition; MM = Moderate Malnutrition; NL = Normal; OW = Overweight								
Source: Bhadra et al., 2018								

Table 9. Using the Height for Age formula, the nutritional status of the children being studied may be determined by age group.

AG (in yrs)	SM		MM		NL		OW	
	'B'	'G'	'B'	'G'	'B'	'G'	'B'	'G'
'4.0-5.9'	'23' '(47.92)'	11 (30.55)	11 (22.92)	05 (13.89)	14 (29.16)	20 (55.56)	00 (0.00)	00 (0.00)
6.0-7.9	11 (19.64)	04 (8.52)	14 (25.00)	14 (29.79)	31 (55.35)	29 (61.71)	00 (0.00)	00 (0.00)
8.0-9.9	10 (19.61)	12 (22.65)	21 (41.17)	25 (47.16)	20 (39.21)	16 (30.18)	00 (0.00)	00 (0.00)
10.0+	02 (6.45)	01 (3.84)	02 (6.45)	09 (34.62)	27 (87.09)	16 (61.54)	00 (0.00)	00 (0.00)
B = Boys; G = Girls; O= Overall; AG= Age Groups; AG= Age Groups; Yrs = Years; SM = Severe Malnutrition; MM = Moderate Malnutrition; NL = Normal; OW = Overweight								
Source: Bhadra et al., 2018								

Table 10. BMI evaluated the nutritional status of the children in the research for Age, and the results were broken down by age group.

AGE	SM		MM		NL		OW	
	'B'	'G'	'B'	'G'	'B'	'G'	'B'	'G'
4.0-5.9	'05' '(10.41)'	02 (5.56)	05 (10.41)	04 (11.11)	38 (79.16)	29 (80.56)	00 (0.00)	01 (2.78)
6.0-7.9	10 (17.86)	02 (4.25)	09 (16.07)	05 (10.64)	37 (66.07)	40 (85.10)	00 (0.00)	00 (0.00)
8.0-9.9	04 (7.85)	03 (5.67)	13 (25.49)	09 (16.99)	34 (66.67)	41 (77.35)	00 (0.00)	00 (0.00)
10.0+	04 (12.91)	01 (3.85)	04 (12.91)	05 (19.23)	23 (74.19)	20 (76.93)	00 (0.00)	00 (0.00)
B = Boys; G = Girls; O= Overall; AG= Age Groups; AG= Age Groups; Yrs = Years; SM = Severe Malnutrition; MM = Moderate Malnutrition; NL = Normal; OW = Overweight								
Source: Bhadra et al., 2018								

Table 11. In West Bengal, the prevalence of poor nutrition among children and adolescents is high.

District	State	AGE	N	UW		
				Boys	Girls	OL
WM	'WB'	'2-6'	'410'	'44.5'	'43.9'	'13.7'
WM	Do	'1-14'	'165'	'35.3'	'33'	'33.9'
WM	Do	'11-18'	'1094'	'31'	'24.2'	'28.3'
WM, BK & Pl	Do	'6-18'	'4450'	'29.7'	'24.5'	'27.9'
BH	Do	'2-16'	'203'	'31.1'	'31'	'31.1'
WM	Do	'8-18'	'431'	'24.3'	'21.5'	'24.6'
N 24 PGS	Do	'1-5'	'899'	'65.5'	'60.9'	'63.6'
WM	Do	'3-5'	'299'	'60.8'	'69.9'	'65.2'
PL	Do	'5-12'	'442'	'35.8'	'31.5'	'33.72'
ND	Do	'3- 5'	'533'	'26.5'	'35.1'	'31'
WM	Do	'10-15'	'2016'			
WM	Do	'11-18'	'1094'			
BK	Do	'6-14'	'454'			
EM	Do	'5-10'	'569'			
N 24 PGS & HW	Do	'9-17'	'1153'			
N 24 PGS	Do	'11-14'	'559'			
WM	Do	'9-20'	'930'			
WM	Do	'10-12'	'1265'			
BH	Do	'2-16'	'203'			
PL	Do	'7-18'	'421'			
BH	Do	'4-10'	'348'	'62.91'	'50'	'56.9'
WM=West Midnapore; BK = Bankura; PL= Purulia; BH = Birbhum; N 24 PGS = North 24 Parganas; ND= Nadia; EM= East Midnapore; HW= Howrah; AG= Age group; yrs = Years; UW= Underweight; OL = Overall						
Source: Bhadra et al., 2018						

According to a study conducted by Bhadra et al. (2018), the total percentage of undernutrition was 53.36 (%). The prevalence of undernutrition ranged from 47.37 (%) among 16-year-olds to 57.50 (%) among children under 15. Between the ages of 11 and 15, there was a progressive increase in the prevalence of

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undernutrition. Following that, there was a minor downward trend in the rates of undernutrition among children under the age of 16 (47.37 %). Teenage years are marked by fast growth and maturity in the course of human development. In addition, adolescence is a time of increasing dietary needs, and adolescent anthropometry varies substantially around the globe. Therefore, information on teenagers' physical and nutritional well-being, especially in native communities, is limited. Because of this, it is necessary to create a database that includes information from various regions of the nation. In this communication, it has been attempted to examine the present physical development pattern and nutritional condition of adolescent Bhumij males from the Khatra block of Bankura district, West Bengal. An analysis of teenage males from Bhumij revealed that more than half (53.36 %) were undernourished in the current study.

Teenage years are marked by fast growth and maturity in the course of human development. Adolescence is thus a time of increasing dietary needs, with adolescent anthropometry differing widely around the globe (WHO, 1995). Although there is little information on teenagers' physical and nutritional state, especially among indigenous communities, there is a paucity of data. Because of this, it is necessary to create a database that includes information from various regions of the nation. In this communication, an effort has been made to examine the present physical development pattern and nutritional condition of teenagers in West Bengal and their levels of overweight and obesity.

2. Discussion and Conclusion:

There are substantial implications for epidemiological and clinical research regarding sexual dimorphism in body adiposity, and the differences may lead to an increase in the risk of obesity and other disorders. The health concerns linked with growing body mass are continuous, and the interpretation of BMI grading concerning risk may change depending on the demographic under consideration.

In part, this was ascribed to the fact that these people have grown more reliant on market economies, with their responsibilities and activity levels shifting from those associated with a subsistence-based economy to more reliant on industrial goods and wage labour.

Obesity was shown to be more prevalent among poorer populations, and it was found to be more prevalent among women in West Bengal than it was among males. According to the study's findings, the issue of obesity and overweight is more prevalent in urban areas. A prompt preventive strategy would lower the burden of several chronic comorbidities, such as diabetes, hypertension, cardiovascular disease, and infertility, on the healthcare system in West Bengal and throughout the rest of India. This may be accomplished either by implementing a distinct urban health programme or by including a specific provision in the proposed NUHP that emphasises the need for a nutritious diet and regular physical activity.

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