Comparative assessment of two behavioural risk factors (physical inactivity and unhealthy diet) among obese Bengalee women in rural and urban areas of West Bengal, India

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Research Article

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Abstract

Background:

Unhealthy diet and physical inactivity are the behavioural risks, closely associated with obesity which is a metabolic risk leading to the development of Non Communicable Diseases (NCDs). Dietary transition and sedentary living is also significant even in rural India which might be accountable to uprising NCDs there. So the aim of our study was to assess dietary pattern and unhealthy dietary factors, to determine the prevalence of physical inactivity among obese bengalee women in rural and urban areas of West Bengal

Methods:

This study was conducted in Hooghly district of West Bengal, India and 150 female subjects (75 from rural area and 75 from urban area) of 20-40 years age group were recruited for the study considering inclusion and exclusion criteria. Different physical and socio-demographic variables were measured and dietary information was collected using questionnaire. Global Physical Activity Questionnaire (GPAQ) was used to collect information about physical activities of the study participants. Different anthropometric parameters (body weight, height, Body Mass Index [BMI], waist circumference [WC], hip circumference [HC], waist to hip ratio [WHR] and waist to height ratio [WHtR]) were measures as the strong prediction tools for assessing their risks related to NCDs.

Results:

We found that most of the daily energy comes from carbohydrate in the diet of both groups, consumption of food groups like animal protein and dairy products, fruits, visible fat and sugar were significantly higher in urban group whereas dietary fibre, green leafy and other vegetables, pulses and nuts intake was significantly high in rural group. Physical inactivity prevalence was 64% in rural and 78.7% in urban and there was significant difference between rural and urban group regard to all the anthropometric indices.

Conclusions:

In summary, the behavioural risk factors those were assessed are undoubtedly apprehensive and anthropometric indices are pointing out towards associated possible metabolic risks which were poorer in urban group than rural, so further clinical investigation along with proper intervention measure is indispensable.

Introduction

Unhealthy eating, physical inactivity and obesity are the trio, amongst many others to heighten the ubiquity of Non Communicable Diseases (NCDs) for the last few decades worldwide. Since the late nineteenth century the pattern of diseases and the cause of mortality of the then developed countries had started to take a shift from communicable infectious diseases to chronic diseases which were not infectious or transmissible (1). This epidemiological transition was the outcome of 'complex

modernization' of those societies which also have had social, technological, economical and demographical transition leading to increase in life expectancy and simultaneous decrease in death rate. Like the other low or middle income countries, India is also a witness of such transition. Rapid modernization, urbanization, industrialization, fast progression of technology and medical science, improved hygiene and sanitation all boost up the socio-economic level, upraise the standard of living, pull the mortality down, take the life expectancy up and change the demography. And all these led to the development of 'Lifestyle Diseases' which are the by-products of 'fast-paced modern lifestyle'; the way people live their daily lives, adopt habits those belittle healthy living and head towards sedentary alive and lead to the development of different chronic medical problems. Lifestyle diseases are also called 'non communicable diseases' (NCDs) or 'disease of the civilization' (2). Such diseases slowly progress over years, chronic in nature and are the major reasons of adult deaths, diseases and functional impairments or disabilities across the world in the present era. According to report of World Health Organization (WHO), amongst all global deaths 71% is accountable to NCDs (3, 4). As estimated that every year 15 million or more deaths happen due to NCDs is 'premature death' (i.e. death in between 30–69 years) and 85% of such deaths occur in countries with low or middle socio-economic background. Disease burden of NCDs is rising by leaps and bounds every year in India as well. As per WHO report 2014, India contributes two-third of all deaths from NCDs occur in south East Asia region of world health organization. And in India, amidst all deaths, 60% death results from NCDs. And out of all deaths coming from NCDs in India, 45% comes from cardio-vascular (including heart diseases, stroke and hypertension) diseases, 22% is the contribution of chronic pulmonary diseases followed by different cancers (12%) and 3% results from diabetes (5). The behavioural risk factors (unhealthy diet; physical inactivity; tobacco and alcohol consumption) interact with one's genetic make-up and lead to metabolic changes (obesity, raised blood sugar, hypertension and dyslipidemia) and provide the complex aetiology behind the commencement of NCDs (6). The scenario of NCDs among Indian is quite distressing. Age standardized prevalence of obesity, hypertension and hyperglycaemia have raised by 22%, 10% and 9% respectively among both sexes (age group ≥ 18 years) within four years i.e. 2010–2014. Arokiasami (2018) published a report on increasing trends of NCDs in India and noted that in 2016 almost 4 million people in India have lost their lives by cardio-vascular and respiratory disease and then in diabetes. The mortality rates due to cardio-vascular diseases, chronic obstructive pulmonary disease and diabetes have escalated by 34.3%, 29.2% and 29.7% respectively from 1990 to 2016 in India. Mortality burden for diabetes was more prevalent in women (3.4%) than men (2.9%) (7). So, India which is facing 'double burden of diseases' (both non-communicable and infectious diseases), time to time monitoring and surveillances on the behavioural and metabolic risk factors among people residing in different states or regions of the country, are utmost important for making health care policies and programmes. In India many surveys have been carried out to assess the NCDs risk factors and Nethan et al. (2017) reviewed and produced a comprehensive report from the available data of different surveillances across the country and noted that as per National Family Health Survey (NFHS) prevalence of obesity and overweight has raised from 10.6–12.6% among women from 1998-99 to 2005-06; Anjana et al. (2014) revealed 54.4% Indians are physically inactive and it is more prevalent in urban than rural and among women than men; and urban people are more hypertensive than rural (8). According to NFHS-4 report, prevalence of overweight,

obesity and hypertension raised hand in hand in both sexes. For women (age group 15–49 years) prevalence of hypertension and hyperglycaemia ranged from 8–18% and 3% to 11% respectively (9). Sharma et al., based on NFHS-4 (2015-16) report observed that prevalence of having at least one NCD is higher among women than men and some other studies also showed that NCD burden is more upon women than men which may be due to the biological and social factors of women (10). So Indian women, who have been kept in the centre of Sustainable Development Growth (2015-30) need more surveillances to lessen their burden of NCDs.

West Bengal also follows the similar trends as prevalence of overweight or obesity in female has risen from 11.4% (NFHS-3, 2005-6) to 19.9% (NFHS-4, 2015-16). And in every cases urban women were more prevalent than rural (overweight or obesity in urban- 30.6%, rural – 15%; mild & very high hyperglycaemia in urban- 8.7% and 4.2% in rural-6.8% and 3.2%) mild, moderate and severe hypertension in urban-9.1%, 2.1% and 0.8% in rural-7.3%, 1.7% and 0.7% respectively) (9). So, the aim and objectives of this study is to assess dietary and physical activity pattern among obese women in both the selected rural and urban parts of West Bengal to make a comparison between these two groups regarding those behavioural factors and to make them aware about their health status and possible cardio-metabolic risks through the assessment of the anthropometric parameters amongst them.

Materials And Methods

This study was a community based cross sectional study of urban and rural areas of Hooghly district in West Bengal. Urban areas are the municipal areas and rural areas are the villages of gram panchayat under Community Development Block of the same districts. Municipal areas and villages were purposively selected based upon the distance, accessibility and familiarity of the researchers. Among municipal areas first wards then streets and in villages streets were chosen through simple random method and then subjects were chosen from the households on the streets by systematic random sampling based on the study criteria. As inclusion criteria, all the females were Bengalee (Hindu), permanent residents in those households, age group were 20–40 years and with a BMI between 25–30 kg/m² and free from any clinically diagnosed NCDs; also, they never consumed any form of tobacco or alcohol. As exclusion criteria, those, who were physically, mentally challenged or non-ambulatory; already suffering from chronic diseases or are on certain medications (like anti depressant, anti- hypertensive, contraceptives, steroids or others; underwent any surgery, on weight reduction therapy; pregnant, lactating or planning for conception were excluded. Total 150 (n) obese females were selected from both rural (n₁ = 75) and urban (n₂ = 75) areas. Background information like name, age, sex, residence, ethnicity, education, marital status, occupation, family income and size were collected. Modified B.G. Prasad scale 2019 was used to classify socio-economic classes of the subjects (11).

Dietary information

24 hour recall method on multiple, non-consecutive days was done avoiding days of fasting or feasting. Dietary diversity on week days or on weekends also considered. Subjects were asked to remember all

foods and beverages starting from breakfast they had on the day before survey day. Standardised, measured and locally used utensils were utilized during survey. Ingredients used in every meal, foods that consumed outside and their portion size were also asked. Mean consumption of different nutrients and foods under various food groups were calculated using Diet Cal software (which used nutritive values of Indian foods). According to WHO diet low in fruits and vegetables (< 400gm/day), high in saturated fat and dietary salt is considered as unhealthy diet.

Physical activity

Global Physical Activity Questionnaire (GPAQ), developed by WHO was used in the study to collect information on physical activities of subjects. This questionnaire involved three domains i.e. work, travel and recreation for assessing MET scores. Metabolic Equivalent (MET) is the ratio of an individual's metabolic rate during work and is relative to the person's resting metabolic rate. 1 MET = energy expenditure at sitting quietly and is equivalent to 1 kcal/kg/hour calorie consumption. To determine the physical activity of the participants in the study, the mentioned guidelines were followed considering every domain and their sub domains of physical activity; 4 METs and 8 METs are assigned for time spends in moderate and vigorous intensity activities respectively; total time was measured which the participant had spent in all physical activities in a typical week, the intensity and the days were also considered. If an individual is involved in 75 minutes vigorous or 150 minutes moderate intensity activities across all the domains in a week or if the MET-minute value is 600 equivalent combination of both vigorous and moderate intensity activities in a week will be considered as physically active. Depending on MET scores/ week classification of physically inactive, active and highly active are:

< 600 MET-minutes – Physically inactive

600–1200 MET-minutes – Physically active

> 1200 MET-minutes- Highly active (12, 13)

Anthropometric Measurement

Body weight, height, waist circumference (WC) and hip circumference (HC) were measured using standardized protocols and instruments (14). Body Mass index (BMI), ratio of waist circumference to hip circumference and waist circumference to body height i.e. Waist to Hip Ratio (WHR) and Waist to Height Ratio (WHtR) were respectively calculated as well. BMI is used to categorize generalised obesity and is derived from dividing body weight (kg) by height (in meter squared) and when it is $\geq 25\text{kg/m}^2$ then the condition is considered as obesity for Asian-Indian. WC and WHR are more unique to detect abdominal obesity and WC ≥ 80 cm is considered as abdominal obesity, whereas WHR < 0.85 is regarded as normal for Indian women (15). WHtR > 0.5 is seen as strong predictor of cardio-metabolic risk in obesity (16).

Ethical consideration

The Human Ethical committee of Srerampore College in Hooghly district under university of Calcutta has approved the study design and protocols and written informed consent was obtained from each

participant before the study.

Statistical analysis

Descriptive statistics like mean, standard deviation (SD) was done and to compare the mean values between the groups two tail, unpaired t-test was performed. When p value was < 0.05, difference was considered as significant (17).

Result

Age group and residence wise distribution of selected subjects

The mean age $\pm$ SD of rural and urban female group was 35.7 ± 10.3 and 35.3 ± 7 respectively. Among rural women 44% and 56% belong to the age group of 20–35 years and 36–50 years whereas in urban it was 46.7% and 53.3% respectively. Table 1 shows the age wise distribution of samples between rural-urban areas.

Table 1
Age and residence wise distribution of subjects

Age group	Rural ($n_1 = 75$)	%	Urban ($n_2 = 75$)	%
20–35 years	33	44	35	46.7
36–50 years	42	56	40	53.3
Mean age $\pm$ SD	35.7 ± 10.3		35.3 ± 6.97	

Table 2
Socio-demographic profile of rural and urban subjects

VARIABLES	RURAL (n ₁ = 75)		URBAN (n ₂ = 75)	
	No	%	No	%
Marital status				
Ever married	67	89.3	63	84
Unmarried	8	10.7	12	16
Educational status				
Primary schooling or less	26	34.7	14	18.7
High schooling or above	49	65.3	61	81.3
Occupation				
Professionals/ skilled worker	4	5.3	13	17.3
Semi-skilled workers	13	17.4	19	25.3
Unskilled manual	22	29.3	11	14.7
Housewife	32	42.7	25	33.3
Student/ unemployed	4	5.3	7	9.3
socio economic status				
Upper	5	6.7	17	22.7
Upper-middle	17	22.7	26	34.7
Middle	29	38.6	21	28
Lower-middle	13	17.3	7	9.3
Lower	11	14.7	4	5.3

Socio-demographic data

Socio-demographic profile from both the areas was studied and observed that 89.3% rural and 84% urban females are ever married, higher percentage of urban females attended high schools or above (81.3%) than rural females (65.3%) whereas 18.7% and 34.7% had primary schooling or less among the urban and rural subjects respectively. In occupational sector, in urban group highest percentage of subjects was only housewife (33.3%) whereas in rural areas mostly was involved in unskilled manual labours (38.7%); percentage of those urban women engaged in semi-skilled, professional or skilled, unskilled labour and were student or unemployed are 25.3%, 17.3%, 14.7% and 9.3% respectively whereas in rural areas percentage of housewife is 30.7%, semi-skilled workers is 20% and same percentage of rural females is

seen in both skilled or professional and student/unemployed groups (5.3%). According to socio-economic status, 22.7% and 6.7% belongs to upper class, 34.7% and 22.7% is in upper-middle class, 28% and 38.6% falls in middle class, 9.3% and 17.3% in lower middle and 5.3% and 14.7% in lower class among both the urban and rural groups respectively.

Dietary profile

In Table 3 Data analysed from collected information, revealed that mean intake of calorie/ day by rural subjects is 1941.5 ± 168.9 kcal and urban is 2027.4 ± 166.3 kcal and this difference is significant. In contrast, mean daily dietary fibre intake is significantly higher in rural females than their urban counterparts (19.5gm in rural and 16.5 in urban). Average daily consumption of different food groups was also calculated and it showed that there was no significant difference between both the groups regarding the mean consumption of whole and refined cereals and the root and tuber groups which is mostly potato (314.7 gm and 310.2 gm cereals and 100.2 gm and 99.7 gm root and tubers by rural and urban subjects respectively). But results revealed strong significant difference between these two groups in terms of having other food groups like dairy products and other animal protein food group (p value 0.000), visible fats (p value 0.003), fruits (p value 0.004) and added sugar (p value 0.01). In all cases consumption was significantly higher in urban group whereas when it comes to the mean daily intake of food groups like pulses (p value 0.02), green leafy vegetables or other vegetables (p = 0.000) and nuts and oil seeds (p = 0.001), rural women showed significantly higher intake than urban women. No significant difference was found between both the group regards to dietary salt intake (mean intake of rural subject 10.1 ± 1.6 gm and in urban 9.8 ± 1.6 gm).

Table 3
Average nutrient consumption of study participants

Variables	Rural (Mean $\pm$ SD)	Urban (Mean $\pm$ SD)	Level of Significance (≤ 0.05)
Calorie (Kcal)	1941.5 $\pm$ 168.9	2027.4 $\pm$ 166.3	0.002
Dietary fibre (gm)	19.5 $\pm$ 5.5	16.5 $\pm$ 4.4	0.0003
Consumption of food groups			
Whole grain + refined cereals (gm)	314.7 $\pm$ 29.1	310.2 $\pm$ 21	≥ 0.05
Pulses (gm)	30.3 $\pm$ 4.7	28 $\pm$ 7.2	0.02
Egg/meat/fish/poultry (gm)	23.5 $\pm$ 7.7	30.6 $\pm$ 10.3	0.0000
Dairy products (gm)	64.1 $\pm$ 23.9	84.2 $\pm$ 23.4	0.0000
Root & tubers (gm)	100.2 $\pm$ 26.6	99.7 $\pm$ 9.9	≥ 0.05
Green leafy vegetables (gm)	22.1 $\pm$ 8.4	15.7 $\pm$ 8.4	0.0000
Other vegetables(gm)	74.1 $\pm$ 10	50.7 $\pm$ 11.2	0.0000
Fruits (gm)	21.8 $\pm$ 6.7	25.2 $\pm$ 7.3	0.004
Visible fats & oils	38.7 $\pm$ 7.4	42.4 $\pm$ 7.9	0.003
Nuts& oilseeds(gm)	2.2 $\pm$ 1	1.7 $\pm$ 1	0.001
Added sugar (gm)	31.5 $\pm$ 6.2	34.5 $\pm$ 8.1	0.01
Added Salt (gm)	10.1 $\pm$ 1.6	9.8 $\pm$ 1.6	≥ 0.05

Not only the food groups but also the mean percentage of energy/day derived from macronutrients like carbohydrate (carb), protein, fat and saturated fat was studied in both the groups as well, which showed rural subjects derive more energy from carbohydrate than urban subjects. Figure 1 has represented the mean consumption of percentage of energy from those nutrients along with its SD values.

Physical activity

Data revealed that 64% of rural subjects and 78.7% of urban subjects are physically inactive i.e., MET scores was < 600; percentage of active females (MET score 600–1200) is 32 and 21.3 in rural and urban areas respectively; whereas only 4% rural female subjects are highly active (MET score ≥ 1200) and unfortunately among urban subjects that is nil considering all the domains of activity, shown in Table 4.

Table 4
Sample distribution on total energy expenditure on low/ moderate/
vigorous activity/week

MET VALUE	RURAL $n_1 = 75(\%)$	URBAN $n_2 = 75(\%)$
PHYSICALLY INACTIVE < 600	48 (64%)	59 (78.7%)
ACTIVE 600–1200	24 (32%)	16 (21.3%)
HIGHLY ACTIVE ≥ 1200	3 (4%)	0

Table 5 has depicted that among the subjects in both the areas prevalence of physical inactivity in particular domains were also assessed and it was found that among rural subjects, most was inactive in recreational domain (69.3%) and lowest percentage of inactivity was seen in travel domain (50.6%). On the other hand among urban female subjects mostly was inactive in occupational domain (76%) and least in travel domain (58.7%).

Table 5
Percentage of sample (rural and urban) physically
inactive in the following domains

DOMAIN	RURAL		URBAN	
	$n_1 = 75$	(%)	$n_2 = 75$	(%)
WORK	45	60	57	76
TRAVEL	38	50.6	44	58.7
RECREATION	52	69.3	49	65.3

Though higher percentage of female subjects in rural area showed inactivity in their leisure than the urban females but when it was studied according to the age group (20–35 yrs and 36–50 yrs) it indicated that subjects belong to the 36–50 year of age group was more inactive than the age group of 20–35 yrs in both the areas, shown in Fig. 2.

In Table 6 the mean time/ day spend on various domains with vigorous to moderate intensity activity was calculated and whether the differences on that time spent between both groups is significant or not was tested too. No significant differences were found regard to mean time spent on vigorous work and recreation but differences were significant in terms of travel and moderate intensity occupational work domains. Urban obese subjects spend more time on sitting than rural and the difference was significant (p value = 0.03).

Table 6
Mean time spend on different activities/day (Mean $\pm$ SD) and level of significance

ACTIVITY	DOMAIN			
		Rural	Urban	Level of Significance (< 0.05)
VIGOROUS	WORK	9.61 $\pm$ 40.1	1.4 $\pm$ 3.21	$\geq$ 0.05
	RECREATION	0.61 $\pm$ 1.9	0.83 $\pm$ 1.64	$\geq$ 0.05
MODERATE	WORK	16.6 $\pm$ 35.6	6.5 $\pm$ 12.3	0.02
	TRAVEL	8.9 $\pm$ 10.1	5 $\pm$ 6.8	0.005
	RECREATION	3.09 $\pm$ 5.4	3.12 $\pm$ 5.1	$\geq$ 0.05
SITTING		327.7 $\pm$ 99.9	366.5 $\pm$ 117	0.03

Anthropometric profile

Table 7 has expressed the anthropometric indices of both the groups and indicated that in every parameter urban obese female subjects had significantly higher values than their rural counterparts. Body weight and BMI which indicates generalised obesity was 71.6 kg and 28(kg/m²) in urban and 69.5kg and 27.4 (kg/m²) in rural females. WC and WHR i.e. indicators of abdominal obesity was also significantly higher in urban group. WHtR was 0.57 $\pm$ 0.02 for rural and 0.58 $\pm$ 0.02 for urban group and was significantly different (p value 0.04).

Table 7
Anthropometric profile of rural and urban samples (Mean $\pm$ SD)

Variables	RURAL	URBAN	Level of significance < 0.05
Body weight (kg)	69.5 $\pm$ 5.05	71.6 $\pm$ 5.9	0.01
BMI(kg/m ²)	27.4 $\pm$ 1.4	28 $\pm$ 1.6	0.008
WC (cm)	91.7 $\pm$ 3.4	93 $\pm$ 3.4	0.02
WHR	0.89 $\pm$ 0.02	0.9 $\pm$ 0.02	0.000
WHtR	0.57 $\pm$ 0.02	0.58 $\pm$ 0.02	0.04

Discussion

In our study, two major behavioural factors like unhealthy diet and physical inactivity of NCDs along with anthropometric parameters among the obese Bengalee women (20–50 years of age) from selected parts of both rural and urban groups were studied. And the overall view that has been emerged is utterly dreadful.

Like other developing countries, India has been a witness to dietary transition as a consequence of urbanization, industrialization and globalization. Changed dietary pattern has been observed even among the rural residents; easily accessibilities to fast foods/junk foods/ready to cook or eat foods have displaced the traditional food consumption pattern in India(18–20). Numerous studies have been done on changed dietary pattern of Indians and all of these noted that consumption of dietary fibre, fruits and vegetables are gradually decreasing whereas intake of visible fats and added sugar are escalating rapidly (21).

In this study, researchers have also found such similarities in the dietary pattern of both rural and urban groups which was characterised by low intake of fruits, vegetables but high intake of dietary fat and sugar. Consumption of plant and animal protein was lower than the recommended value in both groups. Urban obese group was having more animal protein, dairy products, fruits, visible fat and oil and added sugar than rural group whereas rural group was consuming more pulses, green leafy and other vegetables and nuts and oil seeds. And these differences were significant, on the other hand there was no such differences regard to the cereals, root and tubers which was mainly potato and in salt consumption between the both groups.

Our study revealed that most of the daily energy is coming from carbohydrate, a reason behind increasing diabetes in India and consumption of poor amount of vegetables and fruits and increased amount of cereals indicate that those subjects' diets are greatly unhealthy (22–25).

Poor consumption of dairy products and animal protein especially in rural group which is observed in this study differs from the observations of Shetty (2002) (21). But the study made by Sharma et al.(2020) that compared Indian diet considering all the districts and the rural-urban areas in India with the recommendation made by Eat-Lancet, mentioned that calorie intake from protein from both the animal and plant sources is quite below the referred range and in rural diet only 6% of energy comes from protein, which is similar to our findings. This study also put forward that low intake of whole cereals, fruits and vegetables except potato and high intake of fat, added sugar and salt is the cause behind the escalating NCD burden of India (26).

A cross-sectional study on rural, urban and migrants in the industrial areas of four large cities in India found that % of energy from nutrients in both rural and urban females were 63.9% and 62.6% from carbohydrate, 10.7% and 11.3% from protein, 24.9% and 26.4% from fat and 7.3% and 7.9% from saturated fat respectively. Except carbohydrate all the values were higher than our study. But in connection to food group consumption showed similar results i.e. fruits and vegetables, dairy products and meat intake were significantly higher in urban female group than the rural group (27). Rural-urban difference in dietary pattern among ever married women in Orissa, pointed out higher percentage of women (age-15-49 years) with BMI > 18.5 from urban area were consuming fruits, green leafy and other vegetables, dairy products and animal protein than their rural counterpart. And also more percentage of urban female was vegetarian than rural which may be a reason behind their high consumption of vegetables (28). Dietary and nutrient intake by urban females (mean age 45.8 ± 9.8) in a North Indian

study noted urban diet was low in cereal, pulses, fruits and vegetables but rich in saturated fat, trans fat and total fat than the recommended values (29). ICMR-NIN (2020) reports on 'what India eats', showed that almost 97% in rural and 69.8% in urban region consume more than recommended amount of cereals and overall poor intake of fruits and vegetables and dairy products irrespective to sex and regions of India is the reason behind the elevated events of diabetes and hypertension accordingly. It also remarked that refined cereals and carbohydrates are contributing highest amount of energy to meet their daily energy needs (22). Another study in south India by Sowmya et al. (2016), where 58% of participants were women, aged over 20 years, unveiled similar findings that most energy is coming from cereal group and carbohydrate and less from fat and also noted low intake of fruits, vegetables, dietary fibre, tubers and sugar (30). Survey conducted by National Nutrition Monitoring Bureau (NNMB) 2017 on urban male and females in all states, concluded that people of both sexes consume a bulk amount of cereals and lower amount of fruits, vegetables and dairy products which was prevalent in all states but in few states including West Bengal tuber (mainly potato) consumption was very high (31). Many STEP-studies have been done in various parts of India on both sexes of rural and urban areas in different times which also put forward similar findings in terms of consumption of fruits and vegetables (as selected indicator of NCDs) and amongst almost all cases rural intake of fruits and vegetables were less than urban (32–35).

Physical activity which has been measured in this study, another behavioural risk factor for lifestyle diseases was also not satisfactory as well. More than half of all subjects, in both groups were inactive i.e. MET score < 600. Urban obese women were more inactive (78.7%) than rural group (64%). Only 4% among rural subjects were only highly active whereas it was 0 in urban. This observation may be due to our selection of only obese female group. Across all the domains, urban subjects were mostly inactive in occupational domain whereas highest percentage of inactivity among rural subjects was found in recreational domain. Mean time/day spent on different sub-domains were also recorded and expressed that rural group spent only 9.6 minutes in vigorous work, 16.6 minutes in moderate work whereas it were 1.4 minutes and 6.5 minutes respectively for urban group. In travel domain it was 8.9 minutes and 5 minutes for rural and urban group respectively and was significantly higher in rural group but regarding recreation in both the sub domains (vigorous and moderate) no such differences was noted. Age group wise (20–35 years & 36–50 years) participation in leisure activity was measured and emerged that older age group was less active in leisure among both the groups.

Ample researches have been done on physical activity pattern on both the sexes among adults in different regions covering both the rural-urban parts across India and most of them specified more physical inactivity amongst urban females than their rural counterparts, which also goes with our observation. ICMR-INDIAB (2014) studied on different states and rural-urban areas there in, showed 59.6% of rural female and 71.2% of urban females were inactive whereas only 12.6% and 5.8% were highly active from selected rural and urban India respectively. Among urban areas, highest percentage of women from Chandigarh were physically inactive (83.2% in urban and 75.1% in rural) and least from Jharkhand (55.3% from urban and 44.2% from rural). And mean time spent/day on moderate to vigorous physical activity (MVPA) among all domains indicated that females in Tamilnadu spent least time in work domain (25.7 minutes) and highest was in Maharashtra (43.5 minutes), whereas in travel and

leisure domains Tamilnadu spent lowest time in a day (11.6 minutes and 12.7 minutes respectively). This study also showed activity in recreational domain gradually decreases with increase in age and was alike our report (36). Study of Shah and Mathur (2010) surveyed the prevalence of cardio vascular risk factors in India based on ICMR surveillance reports and noted that higher number of urban females were more inactive in work and travel domain whereas rural females were more inactive in leisure domain (37). Another South Indian study revealed that only 14% urban females were highly active whereas 50.7% females were engaged in the same from rural area (38). Mathew et al. (2009) in their study in South India on difference of physical activity among women in rural and urban areas produced the similar results as well (39). Tripathy et al. (2016), studied rural-urban differences regarding diet, physical activity and obesity on both male and female in North India (Punjab) and unveiled that 27.4%, 24.1%, 94.3% urban females and 24.7%, 32.8%, 95.2% of rural females were inactive in work, travel and recreational domain accordingly. But there no significant differences were found between rural and urban females regarding daily mean time spent on three domains and that is contrast to our study but such result might be due to selection of areas or the subjects (40). And that result also differed from other studies in South India, like Devamani et al. 2019 showed inactivity of urban females were (70.8%) far above than rural group or the report of Newtonraj et al. (2019) which again noted lesser percentage of physical inactivity in rural females than urban which was 22.5%, almost comparable to the prevalence of global physical inactivity i.e. 27.5% (41–43).

The subjects those who were chosen from both the rural and urban areas, were obese i.e. BMI > 25 kg/m². So the mean value of various anthropometric indices measured would definitely be higher when compared to general groups. Though we haven't studied or compared obesity prevalence between selected rural-urban females but all the anthropometric parameters those have been studied [like body weight (kg), BMI (kg/m²), WC (cm), WHR, WHtR] were significantly higher in urban obese females than their rural counterparts. And we hypothesised such lofty parameters are indicators of different health issues like cardio-vascular diseases, insulin resistance, diabetes mellitus, metabolic syndrome, reproductive hassles, different cancer and so on among both the groups.

Copious studies have been done on obesity prevalence between rural-urban groups in different regions, which remarked that the anthropometric indices were higher in most cases among urban group than rural ones (44,45). Increased body weight and BMI are the yardsticks for generalised obesity and is significantly correlated to different NCDs like asthma, hypertension, dyslipidemia, metabolic syndrome and others as studied in women (46–49). For Indian women WC > 80 cm and WHR > 0.85 is considered as abdominal obesity and significantly associated with cardiovascular problems, diabetes, metabolic syndrome, pulmonary disorders, osteo-arthritis, reproductive problems and so on (50,51). Midha et al. 2014 decided WC > 78cm in women as a cut off for hypertension among Indian (52). WHtR which is now considered a better predictor of NCDs was found high in obese females and associated with different health issues (53–56) including other sever infectious diseases(57,58).

Limitation of the study

The sample size included in the study was not enough to comment on generalised population as we only consider the obese group. The data which have been considered are self-reported so any fabrication can mislead the investigation. Though we predict the possible health risks but due to shortage of resources we could not do biochemical investigation as it may depict explicit picture of the situation studied.

Conclusion

In the present study, dietary pattern, physical activity profile of obese bengalee female from both rural and urban sectors of the selected parts of West Bengal were assessed. The result showed presence of unhealthy diet in both the rural-urban groups whereas physical activity profile was worse in urban females than the rural group. The anthropometric parameters though were more heightened in urban group but were also dangerous enough even in the rural group to predict their associated clinically undiagnosed health risks and need to undergo clinical investigations. Lifestyle modification through dietary intervention and recommendation of enough physical activity can be beneficial to cut down the risk factors which could be investigated in future as well.

Abbreviations

NCD	
Non communicable diseases	
WC	
Waist circumference	
HC	
Hip circumference	
WHR	
Waist to Hip Ratio	
WHtR	
Waist to Height Ratio	
MET	
Metabolic Equivalent	
GPAQ	
Global Physical Activity Questionnaire	
NFHS	
National Family Health Survey	

Declarations

Conflict of interest:

Authors declare no conflict of interest.

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Ethics approval (include appropriate approvals or waivers): Included

Consent to participate (include appropriate consent statements): Consent were taken

Consent for publication (consent statement regarding publishing an individual's data or image): Consent were taken

Availability of data and material (data transparency): Data available and will be provided on request

Code availability (software application or custom code): Not Applicable

Authors' contributions:

Chaitali Bose: Conceptualization, data collection, data analyses

Julekha Sultana: Literature management, data collection

Oly Banerjee: Data collection, data management, statistical analysis

Siddharth Singh: Writing original draft, statistical analysis

Sandip Mukherre: Conceptualization, writing original draft

Alak K. Syamal: Conceptualization, Supervision, writing original draft.

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Figures

Figure 1

Mean percentage of energy derived from nutrients

Figure 2

Percentage of inactivity in leisure domain (age wise)