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Association of Age With Obesity Related Health Risk, Physical Activity Level and Dietary Intake Among Overweight and Obese Working Women

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ABSTRACT

Overweight and obesity is one of the major health hazard, an epidemic of 21st century and increasing worldwide. Women tend to gain weight with progression of age. The present study aimed to compute changes in obesity related health risk like weight, body mass index (BMI), waist circumference (WC), waist hip ratio (WHR), visceral fat (VF) and percent body fat (PBF), physical activity level (PAL) and dietary intake in different age groups of obese working women in B.H.U (respondents). For this cross – sectional study was done on 200 respondents and they were selected by purposive sampling technique. Pre-tested and pre-designed questionnaire-cum interview schedule was used for data collection. Anthropometric measurements were taken by standard technique (Jelliffe, 1966). The values of PBF and VF were taken by Omron Body Composition Monitor, HBF 212. The relationship between obesity related health risk, PAL and dietary intake was determined in three age groups i.e. ≤ 35 years, 36 - 50 years and > 50 years. A gradual increase in obesity health risk i.e. height, weight, BMI and PBF was observed with the advancement of age but it is not so in case of WC, WHR and VF. The PAL value ranges between 1.40 – 1.99 and the mean physical activity score was 1.58 ± 0.11. The PAL values showed that majority of respondent's falls in the category of sedentary lifestyle. The protein, carbohydrate, calcium, phosphorus and total fibre intake was higher in all the age group as recommended by recommended dietary allowances (RDA), 2010. Correlation between ages, obesity related health risk and nutrient intake was observed from the value of Pearson Correlation Coefficient (r).The age shows correlation with weight ($r= 0.195$, $P < 0.01$), BMI ($r= 0.190$, $P < 0.01$), WC ($r= 0.74$, $P < 0.05$) and PBF($r= 0.472$, $P < 0.001$) and a negative correlation with calcium ($r= - 0.178$, $P <0.05$). Therefore a diet with adequate amount of nutrients as recommended by RDA 2010 combined with exercise has a potential to substantially reduce the burden of overweight and obesity.

KEYWORDS**:** overweight, obesity, age, physical activity level, sedentary, dietary intake

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INTRODUCTION

Obesity is a condition in which the natural energy reserve, stored in the fatty tissues of human and other mammals is increased to a point where it is associated with certain health condition or increased mortality[1]. Obesity is escalating everywhere in the world both in developed and developing countries and among all the age group of human population. According to recent report of WHO, more than 1.9 billion adults, 18 years and older, were overweight as well as 600 million were reported to be obese in year 2014[2]. In 2010, it was reported that no state has a prevalence of obesity less than 20 percent ; thirty six states has a prevalence of 25 percent or more; twelve of these states had a prevalence of almost equal to or greater than 30 percent[3]. WHO further projects that by 2015 approximately 2.3 billion adults will be overweight and more than 700 million will be obese [4]. In many developing countries, obesity is now rapidly increasing and often coexists with chronic undernutrition[5].

The most comprehensive data on the prevalence of obesity worldwide are those of WHO MONICA project. It was concluded that the prevalence of obesity is increasing worldwide at an alarming rate both in developed and developing countries. In African and Asian countries, obesity is more prevalent in urban than in rural population. In economically advanced region, the prevalence rate may be as high as in developed countries. Another important finding of WHO MONICA project is that women generally have higher rates of obesity than men [6].

Obesity is considered as a gateway of many chronic diseases like type 2 diabetes, hypertension, heart burn, dyslipidaemia etc. On the other hand obesity in women leads to menstrual disorder, uterus cancer, infertility, breast cancer and orthopedic disorders[7, 8]. It was evident from several international and a regional study that factors causing obesity is multifactorial in origin. These factors may include biological and non – biological factors such as hereditary, age, sex, medications, chemical toxicity, loss of sleep, education, socio – economic level, physical inactivity, eating habits and psychological factors[9, 10]. Among various causes of obesity, advancing age plays an important role. Metabolic rate slows down on getting older and body needs fewer calories in respect to younger ages. Women are considered in vulnerable group because of hormonal changes occurring with advancing age. As women entering the menopause, their metabolic rate decreases robustly, so women starts gaining weight during menopause [10].

In the present study attempt was made to assess obesity related health risk, PAL and dietary intake with respect to different age group. The purpose was to assess the changes in the variables with the advancing age as well as to find correlation of age with obesity health risk and nutrient intake.

MATERIAL AND METHOD

Selection of respondents

The present study has been carried out on total 200 respondents between the ages of 23 – 64 years which were selected by purposive sampling technique from Banaras Hindu University, Varanasi, Uttar Pradesh, India. The data were collected from all respondents with the help of well designed questionnaire – cum – interview schedule.

Ethical Considerations

The studies were conducted under the rules and regulation of Institute Ethical Committee, IMS, BHU (Ethical Committee Letter Number - Dean/2012-13/183).

Socio – demographic characteristics

This section deals with the general characteristics of the respondent i.e. about their age, marital status, type of family, religion, education, occupation, family income per month, socio – economic status and body mass index (BMI).

Anthropometrical parameters

The anthropometrical measurements of the respondents i.e. height and weight were measured by using standard technique [11]. BMI was calculated by dividing weight in kilograms by height in meters square[12]. BMI was then categorized based on standards i.e. NHLBI Obesity Education Initiative 2000 and Report of WHO Expert Consultation 2008 were utilized for the assessment of obesity as given below[13, 14]:

World Body Mass Index (BMI) kg/m^2	Classification
>18.50	Underweight
18.5- 24.9	Normal
25.0-29.9	Overweight
30.0 – 34.9	Grade I obese
35.0 – 39.9	Grade II obese
> 40.0	Grade III obese

After that, waist and hip circumference were measured to assess the abdominal obesity. Waist hip ratio (WHR) was calculated by dividing the waist circumference and hip circumference. As per classification of WHO Expert Consultation 2008, the following cut off values used for WC and WHR for the assessment of central or abdominal obesity as given below[14]:

Indicator	Cut off points	Risk of metabolic complications
Waist circumference	<80cm for women	Normal
	>80 cm for women	Increased risk
Waist- hip ratio	≥0.85 for women	Substantially increased
	< 0.85 for women	Normal

Visceral fat (VF) and percent body fat (PBF) were also measured by using Omron Body Composition Monitor (HBF 212). As per Omron Body Composition guidelines, the following cut off values used for VF and PBF for the assessment of abdominal obesity and percentage of fat in the body as given below[15]:

Visceral fat level	Classification
1 - 9	Normal
10 – 14	High
15 - 30	Very high
Percent body fat	**Classification**
20.00 – 29.99	Normal
30.00 – 34.99	High
35.00 – 50.00	Very high

Physical activity level

Physical activity level (PAL) was calculated by energy expenditure and was determined by using a questionnaire – cum – interview schedule containing daily activity record. For this the time spent in minutes by each respondents were recorded for the period of 24 hours. The PAL was then calculated according to the formula given in a report of a joint FAO/ WHO/ UNU Expert consultation [16].

Dietary assessment

Nutrient intake of the respondents was recorded by 24 hour recall method with the help of nutritive value of Indian foods[17].The quantities of food consumed were converted into raw equivalents by using standardized utensils. The intake was compared with recommended dietary allowances [18].

Statistical analysis of the data

Statistical analysis was performed by using trial version of Statistical Package of Social Sciences (SPSS) Version 20.0. The data was analyzed by using descriptive statistics such as frequency and percentage. For determining the significance between the variables chi square test and F- test were used. To find correlation between the parameters Pearson correlation coefficient was used. Turkey HSD (post hoc) test was used to assess the significant pairs.

RESULTS AND DISCUSSION

Ageing is an irreversible process which can't be avoided but may be delayed. With advancing age, deterioration occurs at physical and metabolic levels and the function of the body affected [10]. Inspite of these, sedentary lifestyle, physical inactivity, genetics as well as faulty dietary practices can also be considered as contributing factor of obesity. In some studies, it was shown that the prevalence of obesity and hypertension has been observed higher in post menopausal women as compared to premenopausal women [19, 20].

At the outset, it is very important to know the background characteristics of the respondents included in the study. In this context, Table.1, present the frequency and percent distribution of the respondents. The age distribution shows that about 45 percent of the respondents belong to 36 – 50 years of age group and 32.5 percent of them lie in ≤ 35 years of age group. The mean age of the respondents was 42 years and the range varies between 23 – 64 years. More than 80 percent of the respondents were married. In context of type of family, 60 percent of the respondents live in nuclear type of family.

Table 1: Distribution of respondents according to socio- demographic characteristics

Characteristics	Number (200)	Percentage (%)
Age Group		
≤35	65	32.5
36-50	90	45.0
>50	45	22.5
Average ± S.D = 42.01 ± 9.86		
Range = 23 - 64		
Marital Status		
Single	14	7.0
Married	165	82.5
Widow	21	10.5
Type of family		
Nuclear	120	60.0
Joint family	80	40.0
Religion		
Hindu	174	87.0
Muslim	16	8.0
Christian	10	5.0
Education		
Profession or Honors	34	17.0
Graduate or Post – Graduate	90	45.0
Intermediate	12	6.0
High School	7	3.5
Middle School	20	10.0

Primary School	5	2.5
Illiterate	32	16.0
Occupation		
Profession	72	36.0
Semi- Profession	24	12.0
Clerical	26	13.0
Skilled Worker	4	2.0
Semi-skilled Worker	12	6.0
Unskilled Worker	62	31.0
Income per month (in Rs.)		
≥ 36,997	56	28.0
18,498 – 36,996	58	29.0
13,874 – 18,497	13	6.5
9,249 – 13,873	22	11.0
5,547 – 9,248	51	25.5
Socio-economic status		
Upper	70	35.5
Upper – middle	50	25.0
Lower middle	24	12.0
Upper lower	56	28.0
Worldwide Body mass index (BMI)		
Overweight	160	80.0
Obese Grade I	36	18.0
Obese Grade II	4	2.0

In the arena of educational status, 45 percent of them were graduate and post – graduate, 17 percent of them were holding Ph. D degree and 2.5 percent of them have primary school education. Nearly half of the respondents were found in education profession i.e. either they were assistant professor, associate professor, professor or teachers in BHU campus. In context of income per month 29 percent of the respondents have salary in the range of Rs. 18,498 – 36,996 and 6.5 of them have in the range of Rs. 13,874 – 18,497. Regarding socio – economic status of the respondents, it was interpreted that 35.5 percent of them belongs to upper socio – economic group, 37 percent of them in middle income group and 28 percent of them in lower income group. In context of nutritional status (body mass index i.e. BMI), 80 percent of the respondents were overweight, 18 percent of them belongs to obese grade I category and 2 percent of them in obese grade II category.

The Table 2 depicts the mean values of obesity related health risk parameters as per different age group. Comparison of mean values was done between the age groups ≤ 35 years, 36 – 50 years and > 50 years. Statistically higher mean values of height, weight, BMI and PBF were observed as we move from lower to higher age groups (≤ 35 years to > 50 years). In previous studies it has been

reported that with advancement in age body weight also increases [21 - 23]. The increase in obesity related health risk parameters with age may be due to faulty eating habit (i.e. diet rich in fats and carbohydrates), eating pattern (indulgence in late heavy night meal), increase consumption of fast and pre-prepared processed foods, lack of physical activity, hormonal imbalance as well as due to strenuous work habit. Significant difference was found through F test in weight and PBF i.e. F= 3.53, P < 0.05 and F = 22.50, P < 0.001 respectively with age. Turkey HSD (Post – hoc) is used to see the significant pairs.

Table 2: Mean and standard deviation of health risk parameters of respondents according to age.

Obesity related Health risk	**Age group (in years)** ≤ 35(I) (n=65)	36 – 50 (II) (n=90)	>50 (III) (n=45)	Total (n=200)	Statistical significance
Height(cm)	151.11 ± 6.94	152.10 ± 7.02	153.18 ± 6.57	152.02 ± 6.90	F= 1.21, P >0.05
Weight (kg)	62.51 ± 9.41	64.46 ± 8.31	66.89 ± 7.47	64.37 ± 8.62	F= 3.53, P < 0.05
BMI (kg/m^2)	27.29 ± 3.00	27.81 ± 2.67	28.42 ± 2.28	27.78 ± 2.72	F= 2.33, P > 0.05
WC (cm)	86.37 ± 7.86	89.01 ± 7.98	87.16 ± 8.80	87.74 ± 8.10	F= 2.14, P > 0.05
WHR	0.89 ± 0.06	0.88 ± 0.06	0.89 ± 0.06	0.88 ± 0.06	F= 0.84, P > 0.05
VF	10.57 ± 3.71	10.22 ± 4.37	10.40 ± 5.16	10.38 ± 4.34	F= 0.21, P > 0.05
PBF (%)	35.22 ± 2.75	36.51 ± 3.24	39.00 ± 2.44	36.65 ± 3.22	F=22.50, P < 0.001

Here, BMI = body mass index, WC = waist circumference, WHR= waist hip ratio, VF= visceral fat and PBF = percent body fat.

All values are in mean ± S.D and Post- hoc turkey significant difference test is used. Significant pairs for health risk parameters: Weight: I vs. III; PBF: I vs. II & III, II vs. III.

Sedentarism act as a driver in contributing overweight and obesity in the individual. In this connection Table. 3 illustrate the distribution of the respondent according to the physical activity level (PAL). It was observed that 85 percent of the respondents have sedentary lifestyle and 15 percent of them have moderate type of physical activity level. The mean physical activity score was 1.58 and the range lies between 1.40 – 1.99.The Table 4 reveals the association of age with PAL. It was interpreted that 97.8 percent of the respondents comes in sedentary lifestyle category in the age group of > 51 years and 20 percent of them comes in moderate physical activity category in the age group of 36 – 50 years. A significant difference was found between age groups and physical activity level (P < 0.05).

Table 3: Distribution of the respondents according to physical activity level (PAL)

PAL	Number	Percentage
Sedentary	170	85.0
Moderate	30	15.0
Total	200	100.0
Average physical activity score: 1.58 ± 0.11 Range: 1.40 – 1.99		

Table 4: Association of age with physical activity level

Age (Years)	Physical activity level (PAL)					
	Sedentary		Moderate		Total	
	No.	%	No.	%	No.	%
≤ 35	54	83.1	11	16.9	65	100.0
36 – 50	72	80.0	18	20.0	90	100.0
>50	44	97.8	1	2.2	45	100.0
Total	170	85.0	30	15.0	200	100.0
Statistical Significance	X^2 =7.72, df = 2, P <0.05					

Diet also plays a crucial role in maintaining the good health of the individual. In this context, Table 5 shows the mean and standard deviation of nutrient intake of respondents according to age group. The significant increase in mean values of protein is observed as we move from lower to higher in age groups (i.e. ≤ 35 years to > 51 years). It was also observed that the nutrient intake by the respondents were high except in the case of iron and fat as recommended by RDA 2010. This may be considered as one of the reason of overweight / obesity because excess intake of nutrient leads to storage of energy in form of glycogen in our body via metabolic pathways like glyconeogenesis. For comparison between the age group Turkey HSD (Post – hoc) is used to see the significant pairs. No significant difference in nutrient intake was observed except in the case of calcium (P < 0.05) with the age groups.

Table 5: Mean and standard deviation of nutrient intake of respondents according to their age groups.

Nutrient intake	Age groups (in years)				
	≤ 35 (I) (n=65)	36 – 50(II) (n=90)	>50 (III) (n=45)	Total (n=200)	Statistical Significance
Protein (g)	59.62 ± 11.43	61.24 ± 13.86	60.47 ± 12.07	60.54 ± 12.68	F= 0.31, P > 0.05
Fat (g)	37.45 ± 11.62	38.34 ± 14.34	40.91 ± 11.77	38.63 ± 12.95	F= 0.99, P > 0.05
Carbohydrate	320.26 ± 57.84	312.88 ± 72.00	313.73 ± 58.73	315.47 ± 64.56	F= 0.27, P > 0.05
Energy (kcal)	1894.85 ± 323.54	1865.06 ± 387.50	1893.20 ± 282.70	1881.07 ± 344.53	F= 0.18, P > 0.05
Calcium (mg)	710.20 ± 218.28	831.09 ± 300.59	836.16 ± 265.09	792.94 ± 273.11	F=4.58, P < 0.05
Phosphorus (mg)	1465.69 ± 298.39	1490.41 ± 347.80	1508.09 ± 394.07	1486.36 ± 342.53	F= 0.21, P > 0.05
Iron (mg)	18.58 ± 4.85	18.00 ± 5.63	18.67 ± 4.56	18.34 ± 5.14	F= 0.36, P > 0.05
Total fibre (g)	48.12 ± 11.83	46.80 ± 13.12	45.47 ± 12.92	46.93 ± 12.64	F= 0.59, P > 0.05

All values are in mean ± S.D and Post- hoc turkey significant difference test is used.

Calcium: I vs. II & III

To find the correlation between ages, obesity related health risk and nutrient intake; Pearson correlation coefficient (r) was used. In this connection, Table 6 depicts the Pearson correlation coefficient (r) between obesity related health risk parameters with age. The value of 'r' in this table reveals the significant association of weight ($P < 0.01$), BMI ($P < 0.01$), WC ($P < 0.05$) and PBF ($P < 0.001$) with age. The Table. 7 shows the Pearson correlation coefficient (r) between nutrient intake and age. The value of 'r' in this table reveals that there is no significant association found between nutrients intake with age except in the case of calcium which has negative correlation with the age ($P < 0.05$) among respondents.

Table 6: Correlation between age and health parameters of respondents.

Obesity related Health risks	Age (in years)	
	r' value	P - value
Height	0.082^{NS}	> 0.05
Weight	0.195^{S}	< 0.01
BMI	0.190^{S}	< 0.01
WC	0.074^{S}	< 0.05
WHR	-0.038^{NS}	> 0.05
VF	-0.009^{NS}	> 0.05
PBF	0.472^{S}	< 0.001

Here, BMI = body mass index, WC = waist circumference, WHR= waist hip ratio, VF= visceral fat and PBF = percent body fat.

S = significant and NS = non - significant

Table 7: Correlation between age and nutrient intake of respondents.

Nutrient intake	Age (in years)	
	r value	P - value
Protein (g)	0.034^{NS}	> 0.05
Fat (g)	0.075^{NS}	> 0.05
Carbohydrate (g)	$- 0.028^{NS}$	> 0.05
Energy (kcal)	$- 0.002^{NS}$	> 0.05
Calcium (mg)	$- 0.178^{S}$	< 0.05
Phosphorus (mg)	0.043^{NS}	> 0.05
Iron (mg)	0.005^{NS}	> 0.05
Total fibre (g)	$- 0.061^{NS}$	> 0.05

CONCLUSION

Ageing is an irreversible process associated with numerous physiological, metabolic and hormonal alterations across multiple organ system. The present study demonstrates the association of age

with weight and PBF (obesity related health risk parameters). Since PBF is a viable indicator of overweight and obesity, it is important to focus on whole body fat i.e. PBF which is highly associated with elevation of health risks. It is also important to sensitize the population in the community regarding the regular health checkups as well as how to manipulate diet according to their lifestyle to lead a healthy life. More studies are needed to investigate other body adiposity parameters in South Asian countries. This will help to establish practical approach suitable for health parameters for prediction of metabolic disorders for both clinical as well as for research purposes.

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