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Age group and gender-wise comparison of obesity indices in subjects of Varanasi

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ABSTRACT

Objectives: Deposition of body fat may differ in different age groups and gender-wise differences are also likely. The present study aims to evaluate age- and gender-wise differences in obesity parameters in healthy subjects of both genders of Varanasi.

Materials and Methods: Anthropometric measurements were performed in 346 subjects reported in health check-up camp. Parameters were compared between each age group for males and females separately as well as gender-wise comparison for each age group was also performed. Regression analysis was performed to observe the relationship of age with obesity parameters and body mass index (BMI) with other parameters of obesity.

Results: Both males and females had central obesity with males having higher waist circumference (WC) than females ($P = 0.002$) while females had higher body fat (fat %) ($P = 0.000$). Obesity indices of males of age group of 18–29 years were lesser as compared to other age groups. Obesity indices of female subjects were comparable in 18–39 years of age. Age group of 30–39 and 50–59 years males had higher WC than females ($P = 0.002$, 0.016, respectively) while fat % of females in each age group were significantly higher than males of corresponding age groups. Positive correlation of age with obesity parameters and BMI with WC and fat % was observed.

Conclusion: Gender-wise differences in BMI, WC, WHtR and fat % tend to increase with age, indicative of increase in adiposity and central obesity with progressing age. Males in general have higher WC than females but lesser fat %. Gender differences in obesity may show age group specific variations. Findings of the study may be useful for identifying age specific distribution of obesity indices in males and females.

Keywords: Age and obesity, Anthropometric measurements, Central obesity, Gender and obesity, Indian cutoffs of obesity, Obesity

INTRODUCTION

The obesity is an abnormal and excessive accumulation of fat, which may impair health.[1] India contributes a substantial proportion of obese/overweight population, according to ICMR-INDIAB study, 2015 approximately 135 million people suffer from obesity.[2] Age, gender and genetic susceptibility are important non-modifiable risk factors of obesity.[3] Apart from genetics, poor maternal nutrition induces the foetus to reduce metabolic capacities of vital organs such as pancreas, liver and kidney.[4] On exposure to availability of dense calorie food in later life leads to storage of fat and other metabolic compensations.[5] Nutrition transition from staple food to westernised diet, carbohydrate rich diet and decreased physical activity are some other important contributors of fat deposition.[6] Thus, due to low metabolic capacity resulting from low-birth weight and imposed high metabolic load, Indians are more at risk of developing obesity related metabolic dysregulations at lesser body mass index (BMI) and they tend to possess higher body fat (fat %) as compared with western counterparts;[5] hence, obesity cutoffs have been redefined for Indian population.[7]

Age and gender are important non-modifiable determinants of fat accumulation.[8] Body weight and fat mass increase with increasing age in early and middle adulthood and may decrease in old age.[9] Fat mass correlate positively with age while lean body mass and fat-free mass (FFM %) correlate negatively with age in adults aged more than 50 years.[10] FFM % tends to increase with age in younger individuals.[11] Rapid decline in lean mass with age is more marked in females of peri-menopausal and younger age in comparison to males in all age while increase in fat mass with age has been observed in both genders.[12] Visceral fat tend to increase throughout the life irrespective of gender.[8] Waist circumference (WC), which is an indicator of abdominal adiposity and an independent predictor of cardio-metabolic diseases,[13] increases with ageing.[8] Men have higher WC compared to women of same age[14] but women show greater increase in WC with age.[8] Change in obesity indices and its correlation with age and gender have been documented earlier but only few studies have used Indian cutoffs of obesity for comparison of anthropometric parameters in different age groups of both genders[2] and most studies either restricted to one gender and have not excluded other comorbid conditions or morbid obesity.[2,15]

Hence, in this paper, we explored age-wise differences in obesity parameters of male and female subjects separately. We also investigated gender-wise differences of each age group in subjects using BMI cutoffs of obesity for Indians. This study might prove useful in identification of the age of progression of obesity in both genders, and for planning of further studies aiming to administer lifestyle modifications in obesity.

MATERIALS AND METHODS

Participants aged 18 years or more were recruited for anthropometric assessment after taking informed written consent. Otherwise healthy lean, overweight and obese subjects of both genders based on BMI cutoffs of obesity[7] were included in the study. Morbid obesity is often associated with other metabolic complications and immobility,[16] metabolic complications or their treatment itself may alter the progression of obesity.[17] We wanted to recruit otherwise healthy overweight and obese subjects so, morbid obese subjects (BMI ≥35 kg/m²),[7] individuals having history of diabetes, peripheral arterial disease, cardiovascular disease, hypertension or other chronic diseases, any history of prolonged hospitalisation and immobility were excluded from the study.

Body weight was measured by digital weighing machine (Omron digital body weight scale HN-283) to the nearest 0.1 kg. Subjects were wearing light clothing with no footwear. Subjects were instructed to stand straight to the foot bar; legs were positioned to each side of digital scale.[14] Self-reported weight was not used in the data. Height was measured by stadiometer with movable head piece (PIPER stature meter – 2 m) to the nearest 0.1 cm. Subjects were asked to stand straight with heels, buttocks, shoulders blades and occiput touching the vertical back stand with both the arms loosely hanging by side. The headpiece was pressed sufficiently over the hairs.[18] BMI was calculated by Quetelet's formula i.e., weight (kg) divided by height (m²).[18] Mid abdominal WC was measured by measuring tape (Anthroflex-2 m) placed between iliac crest and lower rib margin.[19] For measurement, patients were made to stand straight with arms on contralateral side.[19] Waist-to-height ratio (WHtR) was calculated by dividing WC (cm) by height (cm).[20] Skinfold thickness (SFT) was measured precisely from the right side of the body at various sites, namely triceps, biceps, subscapular and suprailiac regions by with the help of skinfold calliper (Slimguide skinfold calliper C-120 B). At the triceps, SFT was measured on the midline of the back of the arm at the mid-point level between the acromion process and the tip of the olecranon process. Biceps SFT was measured over the biceps at the same level as the midpoint for the triceps. Subscapular SFT was measured below the inferior angle of the scapula at an angle of 45° to the spine. Suprailiac SFT was measured in the mid-axillary line above the crest of the ilium.[21] SFT chart for age and gender was used for calculation of fat %.[22] FFM% was calculated as 100 – fat%.[23] Study was approved from the Institute Ethical Committee (No. dean/2016-17/EC/737, dated: 31-03-2017) and ethical standards of Helsinki Declaration were followed while performing all the measurements.

For statistical comparison subjects of each gender were classified into five age groups of around 10 years interval: Group 1 (18–29 years), Group 2 (30–39 years), Group 3 (40–49 years), Group 4 (50–59 years) and Group 5 (≥ 60 years). IBM SPSS version 22 was used for all statistical analysis. Kolmogorov–Smirnov test was used for testing the normal distribution of the data. Polynomial (cubic) regression analysis was performed to check relationship of different parameters as it had best curve fit and highest correlation coefficient as compared other models of regression. WC, WHtR and fat % were compared with their respective cutoffs using one sample *t*-test. Independent sample *t*-test was used to compare anthropometric parameters of male and female participants and also to compare parameters of individual age groups of both genders. Age group wise comparisons of anthropometric parameters of each gender were done by one-way ANOVA and Turkey HSD *post hoc* test was used to measure differences among individual groups. $P < 0.05$ was considered statistically significant value.

RESULTS

Total 346 subjects participated in the study, out of those all parameters could be recorded for 283 subjects (Males = 198 and Females = 85) of age 40.95 ± 16.02 years (Mean ± SD). Subjects of both genders were categorised in five groups of approximately 10 years interval. Data of both genders were analysed for all parameters for different age groups.

Polynomial (cubic) regression analysis was performed to check the relationship of anthropometric parameters with age and BMI with WC, fat % and WHtR. Significant correlations of age were observed with BMI ($r^2 = 0.201$, $P = 0.000$), WC ($r^2 = 0.214$, $P = 0.000$) and fat % ($r^2 = 0.268$, $P = 0.000$) but not with WHtR ($r^2 = 0.009$, $P = 0.386$). BMI significantly correlated with WC ($r^2 = 0.561$, $P = 0.000$), fat % ($r^2 = 0.271$, $P = 0.000$) and WHtR ($r^2 = 0.047$, $P = 0.01$). Similar results were obtained when regression analysis was performed in males and females separately. Among males age had significant correlation with BMI ($r^2 = 0.261$, $P = 0.000$), WC ($r^2 = 0.243$, $P = 0.000$) and fat % ($r^2 = 0.304$, $P = 0.000$). BMI had significant correlations with WC (r^2= 0.657, $P = 0.000$) and fat % (r^2= 0.322, $P = 0.000$). No significant correlation was found between age and WHtR (r^2= 0.001, $P = 0.410$) or BMI and WHtR (r^2= 0.046, $P = 0.000$) in males. Significant correlations of age with BMI ($r^2 = 0.261$, $P = 0.000$), WC ($r^2 = 0.243$, $P = 0.000$), fat % ($r^2 = 0.304$, $P = 0.000$) and WHtR ($r^2 = 0.275$, $P = 0.000$) were observed in females. BMI was found to correlate significantly with WC ($r^2 = 0.659$, $P = 0.000$), fat % (r^2= 0.459, $P = 0.000$) and WHtR ($r^2 = 0.672$, $P = 0.01$) in females.

To check, whether subjects were centrally obese or not, WC of male and female participants was compared from their respective cutoff values of obesity (85 cm for male and 80 cm for females) for Indian population.[24] WC of both genders was found significantly higher than their respective cutoffs [Table 1]. Total 137 of 198 males had WC equal or higher than cutoff value for men while 61 out of 85 females had WC equal or higher than their respective cutoff. Similarly, WHtR in both genders and fat % of female participants was higher than their respective cutoffs of obesity,[23] while fat % in males were found lower than cutoffs, [Table 1]. WHtR of 58 out of 85 females and fat % of 54 out of 85 females had higher values than their respective cutoffs while WHtR of 141 of 198 males and fat % of 80 out of 198 males had higher values than their respective cutoffs.

Gender-wise comparison of age and anthropometric parameters resulted in males having higher WC than females ($P = 0.002$) while females had higher fat % than males ($P = 0.000$), [Table 2]. Gender-wise comparison of parameters in each age group reveals that BMI and WHtR were not significantly different for males and females. Groups 2 and 4 males had higher WC than females ($P = 0.002$, 0.016 respectively) [Table 3], while fat % of females were significantly higher than males of all age groups [Table 4].

ANOVA shows that anthropometric parameters in five groups were different in males as evidenced for BMI (F= 11.888, $P = 0.000$), WC (F= 15.312, $P = 0.000$), WHtR (F = 14.860, P= 0.000) and fat % (F= 21.348, P= 0.000). As Group 4 had highest BMI (26.27 ± 4.46 kg/m^2), WC (99.52 ± 19.39 cm), WHtR (0.59 ± 0.11) and fat% (26.03 ± 5.28%) and Group 1 has lowest of these values (22.08 ± 2.24 kg/m^2), (82.58 ± 9.2 cm), (0.49 ± 0.05) and (17.95 ± 7.33%), respectively. *Post-hoc* analysis of these groups reveals that Group 1 had significantly lesser BMI than Group 2 ($P = 0.012$), 3 ($P = 0.000$) and 4 ($P = 0.000$). WC, WHtR and fat % of Group 1 were lesser than all other groups ($P = 0.001$, $P = 0.000$, $P = P = 0.000$ and $P = 0.001$, respectively). Group 5 had lesser BMI than Group 4 ($P = 0.018$), [Table 5]. Almost similar results were observed when age-wise comparisons of anthropometric parameters were done for female participants separately. ANOVA shows that groups were different when compared for BMI (F = 5.214, $P = 0.013$), WC ($F = 7.732$, $P = 0.082$), WHtR ($F = 5.877$, $P = 0.000$) and fat % ($F = 4.988$, $P = 0.011$). BMI, WHtR and fat% of Group 1 were lower than Group 3 ($P = 0.001$, 0.022 and 0.018, respectively) and Group 4 ($P = 0.007$, 0.003 and 0.000, respectively) WC of Group 1 was lower than Group 4 ($P = 0.018$), [Table 6].

Table 1: Comparison of WC, WHtR and fat % with obesity cutoffs.

Parameters	Gender	Mean±SD	*t*-value	*P* value	95% confidence interval of the difference	
WC	M	90.21±12.77	6.040	0.000*	3.673	7.230
WHtR	M	0.53±0.07	6.721	0.000*	0.026	0.488
fat %	M	22.79±6.63	−0.467	0.000*	−3.136	−2.170
WC	F	85.21±11.92	4.055	0.000*	2.658	7.772
WHtR	F	0.55±0.08	3.671	0.000*	0.014	0.048
fat %	F	30.44±5.70	0.715	0.000*	−7.787	−1.671

*represents P≤0.05, M: Male participants, F: Female participants, test applied-one sample T test, cutoff values for WC (M)=85 cms, F=80 cms, WHtR (M)=0.5, F=0.52 and fat % (M)=25%, F=30%.

DISCUSSION

Age Correlates with Detrimental Body Composition Changes

Age-dependent progression of obesity in both genders is evident by the results obtained. Anthropometric parameters also exhibit correlation among them. Positive correlation of BMI with WC and fat % indicates that the BMI changes were primarily due to increase in fat content and that with WC and WHtR are indicative of abdominal obesity.[13,20] The subjects participated in the study had abdominal or central

Table 2: Gender-wise comparison of anthropometric parameters.

Parameters	Gender	Mean±SD	*P* value	95% confidence interval of the difference	
Age (Years)	M	41.25±16.66	0.589	−4.800	2.728
	F	40.21±14.34			
Weight (kg)	M	67.50±12.35	0.000*	−11.335	−5.713
	F	58.97±10.98			
BMI (kg/m²)	M	23.94±4.01	0.056	−0.267	1.952
	F	24.90±4.66			
WC (cms)	M	90.21±12.77	0.002*	−8.169	−1.818
	F	85.21±11.92			
WHtR	M	0.53±0.07	0.062	−0.002	0.098
	F	0.55±0.08			
fat %	M	22.79±6.63	0.000*	6.022	9.275
	F	30.44±5.70			
FFM %	M	77.20±6.65	0.000*	6.016	9.275
	F	69.56±5.70			

*represents *P*<0.05, M: Male participants, F: Female participants, Test applied-Independent sample *t* test

Table 3: Gender-wise comparison of WC in each age group.

WC (cm)					
Age group (Years)	Gender	Mean±SD	*P*-value	95% confidence interval of the difference	
18–29	M	82.58±9.19	0.148	−1.143	7.497
	F	79.40±10.03			
30–39	M	91.99±7.78	0.002*	3.645	14.681
	F	82.82±12.24			
40–49	M	96.89±10.14	0.016*	1.608	14.780
	F	88.70±13.65			
50–59	M	99.52±19.39	0.243	−5.172	19.670
	F	92.27±7.66			
Above 60	M	91.99±11.41	0.389	−4.411	11.111
	F	88.64±10.53			

*Represents *P*<0.05, M: Male participants, F: Female participants, Test applied-Independent sample *t* test

Table 4: Gender-wise comparison of fat % in each age group.

Fat %					
Age group (Years)	Gender	Mean±SD	*P*-value	95% confidence interval of the difference	
18–29	M	17.94±7.33	0.000*	−12.293	−5.900
	F	27.05±5.96			
30–39	M	23.44±3.68	0.000*	−9.065	−4.000
	F	29.97±5.46			
40–49	M	25.28±4.68	0.000*	−9.261	−3.954
	F	31.89±4.65			
50–59	M	26.03±5.28	0.000*	−12.661	−5.803
	F	35.26±2.48			
Above 60	M	26.83±4.13	0.002*	−7.944	1.882
	F	31.74±5.23			

*Represents *P*<0.05, M: Male participants, F: Female participants, Test applied-Independent sample *t* test

Table 5: Comparison of anthropometric parameters among individual age groups of male subjects.

Dependent variable	(I) Age group	(J) Age group	Mean difference (I-J)	*P*-value	95% confidence interval	
BMI	1	2	2.360*	0.012	−4.371	−0.348
		3	−4.468*	0.000	−6.556	−2.379
		4	−4.191*	0.000	−6.565	−1.816
		5	−1.241	0.437	−3.252	0.769
	2	3	−2.108	0.104	−4.465	0.249
		4	−1.830	0.306	−4.445	0.783
		5	1.118	0.663	−1.169	3.407
	3	4	0.277	0.999	−2.396	2.951
		5	3.227*	0.002	0.869	5.584
	4	5	2.949*	0.018	0.335	5.563
WC	1	2	−9.405*	0.001	−15.692	−3.119
		3	−14.313*	0.000	−20.841	−7.784
		4	−16.940*	0.000	−24.363	−9.517
		5	−9.405*	0.001	−15.692	−3.119
	2	3	−4.907	0.357	−12.275	2.460
		4	−7.535	0.086	−15.706	0.635
		5	0	1.000	−7.154	7.154
	3	4	−2.627	0.909	−10.986	5.731
		5	4.907	0.357	−2.460	12.275
	4	5	7.535	0.086	−0.635	15.706
Fat %	1	2	−5.492*	0.000	−8.632	−2.351
		3	−7.330*	0.000	−10.591	−4.068
		4	−8.084*	0.000	−11.793	−4.376
		5	−8.886*	0.000	−12.027	−5.746
	2	3	−1.837	0.644	−5.518	1.843
		4	−2.592	0.407	−6.674	1.489
		5	−3.394	0.072	−6.968	0.179
	3	4	−0.754	0.988	−4.930	3.421
		5	−1.556	0.772	−5.237	2.124
	4	5	−0.801	0.983	−4.884	3.280
WHtR	1	2	−0.045*	0.016	−0.084	−0.005
		3	−0.089*	0.000	−0.129	−0.047
		4	−0.102*	0.000	−0.148	−0.055
		5	−0.065*	0.000	−0.104	−0.026
	2	3	−0.043	0.071	−0.089	0.002
		4	−0.056*	0.02	−0.107	−0.005
		5	−0.020	0.712	−0.065	0.024
	3	4	−0.013	0.957	−0.065	0.038
		5	0.023	0.636	−0.022	0.069
	4	5	−0.036	0.287	−0.087	0.014

*Represents $P \leq 0.05$. Test applied-*post hoc* Turkey HSD, Age group 1–18 to 29, 2–30 to 39, 3–40 to 49, 4–50 to 59 years, 5–60 years and above

Table 6: Comparison of anthropometric parameters among individual age groups of female subjects.

Dependent variable	(I) Age group	(J) Age group	Mean difference (I-J)	*P*-value	95% confidence interval	
BMI	1	2	−2.647	0.318	−6.506	1.212
		3	−5.284	0.001	−8.965	−1.604
		4	−5.537*	0.007	−9.988	−1.087
		5	−2.774	0.416	−7.225	1.676
	2	3	−2.637	0.379	−6.719	1.445
		4	−2.891	0.449	−7.679	1.897
		5	−0.127	1.000	−4.915	4.661
	3	4	−0.253	1.000	−4.898	4.391
		5	2.510	0.560	−2.135	7.155
	4	5	2.764	0.590	−2.513	8.040
WC	1	2	−3.420	0.866	−13.226	6.387
		3	−9.296	0.052	−18.647	0.055
		4	−12.868*	0.018	−24.178	−1.560
		5	−9.233	0.163	−20.541	2.076
	2	3	−5.876	0.514	−16.248	4.495
		4	−9.449	0.203	−21.615	2.717
		5	−5.813	0.671	−17.979	6.353
	3	4	−3.573	0.916	−15.375	8.230
		5	0.064	1.000	−11.739	11.866
	4	5	3.636	0.942	−9.770	17.043
Fat %	1	2	−2.924	0.366	−7.395	1.546
		3	−4.843*	0.018	−9.107	−0.581
		4	−8.217*	0.000	−13.373	−3.062
		5	−4.699	0.091	−9.855	0.456
	2	3	−1.919	0.789	−6.648	2.809
		4	−5.293	0.069	−10.839	0.253
		5	−1.775	0.899	−7.321	3.771
	3	4	−3.374	0.410	−8.754	2.007
		5	0.145	1.000	−5.236	5.525
	4	5	3.518	0.498	−2.593	9.630
WHtR	1	2	−0.029	0.719	−0.092	0.035
		3	−0.0672*	0.022	−0.128	−0.007
		4	−0.0997*	0.003	−0.173	−0.027
		5	−0.069	0.076	−0.142	0.004
	2	3	−0.039	0.496	−0.106	0.028
		4	−0.071	0.095	−0.150	0.008
		5	−0.040	0.614	−0.119	0.039
	3	4	−0.033	0.758	−0.109	0.044
		5	−0.002	1.000	−0.078	0.075
	4	5	0.031	0.855	−0.056	0.118

*Represents $P \leq 0.05$. Test applied-*post hoc* Turkey HSD, Age group 1–18 to 29, 2–30 to 39, 3–40 to 49, 4–50 to 59 years, 5–60 years and above adiposity, as their mean value of WC and WHtR was higher than cutoffs decided for Indian population [Table 1].[21,24]

Age was found to correlate with all anthropometric measures indicating age-dependent increase in fat mass and this increase is primarily due to deposition of fat in the abdominal regions. FFM index and lean mass index have negative correlations with aging in Chinese Han males older than 50 years, whereas fat mass index had a positive correlation with age.[10] Increase in body fat and decreased lean mass with age suggestive of reducing resting energy expenditure (REE) with age and obesity being a contributing factor in lowering REE further setting a vicious cycle of detrimental change in body composition.[25,26] This also does not rule out the possibility of reducing REE of per unit cell mass of each organ (28). Another possibility includes decreased macronutrient oxidation rate with age and increased fat mass.[27]

Characteristic changes in anthropometric parameters are age group specific

Age group wise analysis of anthropometric parameters reveals an expected observation of lower BMI, WC and fat % in age group of 18–29 years in males indicative of higher activity level and higher REE in this age group [Table 5]. Subjects had their BMI, WC and fat % mean value lesser than the obesity/abdominal obesity cutoff values [Table 1]. This age group primarily indulges in sport and exercise activities and remains more concerned of body fitness as compared with childhood or higher age groups.[25]

There was no significant difference of anthropometric parameters between ages Groups 2 and 3 [Table 5]. This is the middle age group comprising 30–49 years age. This may be indicative of an interesting change in lifestyle pattern of present generation as there is increased fitness awareness and health consciousness in this age.[28] This is the period of onset of metabolically unhealthy obesity and related complications such as diabetes, hypertension and cardiovascular diseases[29]. Disease awareness through increased outreach of preventive measures has wider coverage; nowadays, strengthening dietary modifications, yoga and other exercise practices.[30]

Group 5 had lesser weight and BMI than Group 4, indicative of loss in body mass in older age [Table 5]. There have been observations of decreased lean body mass in subjects older than 60 years.[31] However, we did not observe any change in WC or fat % indicating no significant loss of weight in aged individuals. Lesser BMI with no change in WC or fat % has two probabilities; either there was loss of lean mass with no change in body fat, or loss of subcutaneous fat with or without decreased lean mass,[32,33] though we did not measure lean body mass to confirm it conclusively.

Age specific variations in parameters have gender differences

There were no significant differences of anthropometric parameters between Groups 1 and 2 indicative of no change in body weight in initial ageing in females [Table 6]. This is contrary to finding that these age groups in India, females are usually subjected to marriage and child birth, which is supposed to cause increased body fat.[34,35] Again the plausible reason for this may be the increased awareness toward maintaining proper body shape and fitness, which can abrogate pregnancy associated changes in body composition.[36,37] Groups 3 and 4 had higher BMI, WC and fat % as compared to Group 1, suggestive of age-related deposition of fat. Another important inference can be drawn from this observation is, age 30–39 years may be the age group of transition of fat accumulation in females. BMI was comparable among male and females in all age groups while WC was higher in males aged 30–49 years indicative of central obesity in males of this age group [Table 2]. Similar to the previous studies, we also reported higher fat % in females than males in each age group [Table 3].[11,38] Amount as well as sites of fat deposition is remarkably different in males and females. Females tend to accumulate fat at hip and thighs and males generally develop abdominal obesity.[8] Role of androgen and oestrogen is strongly implicated in differential distribution of body fat in males and females, respectively. Android type of fat distribution may be observed after menopause in females.[39]

Limitations

Detailed information regarding diet, physical activity, age at marriage and parity would have given an insight for explanation for observed differences. In addition, measurement of lean body mass and REE of each age group should have been performed to understand the physiology of age- and gender-wise differences in anthropometry parameters.

Future perspective: The findings of the study may be useful in identification of the age of progression of obesity in both genders, and for planning of further studies aiming to administer lifestyle modifications in obesity.

CONCLUSION

There exist differences in anthropometric measures in different age groups of both genders. BMI, WC, WHtR and fat % tend to increase with age, indicative of increase in adiposity and central obesity with progressing age. Males in general have higher WC than females but lesser total fat %.Younger age participants tend to have lesser body mass, fat mass and abdominal adiposity. Gender differences in obesity may show age group specific variations as males of middle age group have higher WC.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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