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Letter to the Editor

Subscapular skinfold thickness is a handy tool till body mass index in the evaluation of obesity

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ABSTRACT

The most commonly used anthropometric measurement to diagnose obesity is the body mass index (BMI), which is calculated as weight in kilograms divided by height in meters squared. However, the use of BMI has limitations, because it does not distinguish between fat mass and muscle or identity the distribution of body fat. The aim of this brief report was to compare clinical assessment of obesity with measurements obtained using BMI and subscapular skinfold thickness (SST). According to our study results and present report, we observed that female adults with excess body weight had higher SST which is a handy indicator for obesity evaluation.

Keywords: body mass index, subscapular skinfold thickness, obesity

Dear Editor;

Obesity has become one of the most important threats to human health worldwide. It is a major problem affecting sample population, about men 35,0% and women 36,8%, in the USA (1). Increasing data supports the associations between obesity and various disease including diabetes mellitus, cardiovascular diseases, and cancer (2). Although obesity classed as having a body mass index (BMI) of 30 or higher, indicators of central body fat distribution anthropometric measurements are used aiming to identify adolescents at risk for cardiovascular and metabolic diseases (3). Anthropometric measurements are often used as indirect measurements of visceral fat including waist circumference (WC) and waist-to-hip ratio (WHR). Both of them have been the most commonly used anthropometric parameters for abdominal obesity, and an increase in WHR is a potent indicator of central obesity in females than males. The most commonly used anthropometric measurement to diagnose obesity is the BMI, which is calculated as weight in kilograms divided by height in meters squared (3). For the last three decades obesity has been primarily diagnosed by using the BMI. Even though BMI has been used extensively in research and clinical practice, there are very few studies testing its diagnostic accuracy and no study has done this in a large, adult population representing men and women of all ages (4). It is the most widely used measure to diagnose obesity, the diagnostic accuracy of BMI to detect excess in body adiposity is largely unknown. Because, BMI is calculated using total body mass, it consists of two factors that have opposite biological effects, namely adipose tissue and lean mass. While adipose tissue has been associated with detrimental health outcomes, preserved lean mass is positively related with physical fitness, higher caloric consumption and exercise capacity, all of which are correlated with a better survival (5). In addition, the diagnostic performance of BMI decreases as age increases, and this limitation of BMI has been also reported in pediatric populations (6).

Anthropometric measurements include circumferences of various body parts; waist, hip, thigh, calf, and sagittal abdominal diameter, as well as subscapular skinfold thickness

Table 1: *Analysis results of BMI and subscapular ST by ROC*

Test result variables	Area under the curve (AUC)	95% Confidence interval	Best Cutting Point	P value
BMI (kg/m^2)	1.000	0.000	29.9	0.000
Subscapular ST (mm)	1.000	0.000	31*	0.000

* The value is found by computer

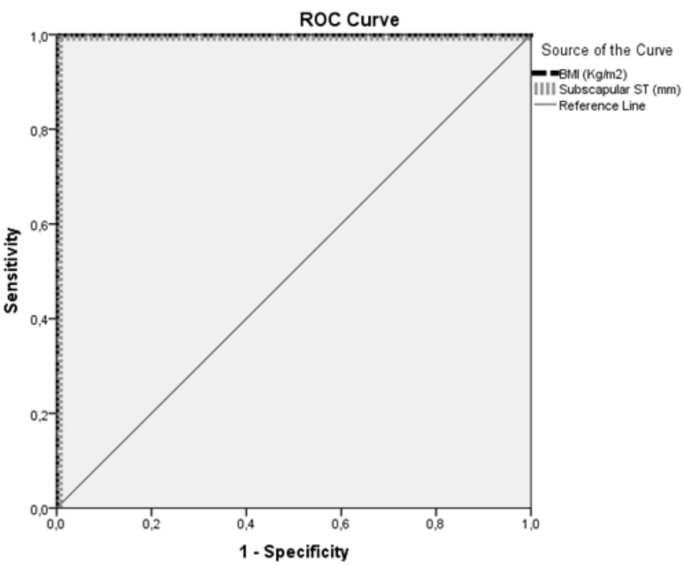

Figure 1: *Receiver-operating characteristics (ROC) curves for BMI and subscapular skinfold thickness in predicting obesity in the obese women*

(SST). Subscapular skinfold thickness (SST) is measured by calipers at standardized skin pinch points to determine the subcutaneous fat layer thickness (3). The use of BMI does not always distinguish between fat mass and muscle or identity the distribution of body fat. Conversely, SST distinguishes fat from muscle; because between 70-90% of all adipose tissue is subcutaneous, SST accurately measure total body fat. Moreover, BMI and skinfold thickness are both widely accepted indices for measuring fatness and defining obesity. In the recent

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Table 2: *According to IR, area under the curve and comparison of two parameters*

Test result variables	Area (AUC)	Std. Error	Asymptotic Sig	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
BMI (kg/m^2)	0.787	0.057	0.000	0.676	0.898
Subscapular ST (mm)	0.836	0.050	0.000	0.737	0.934

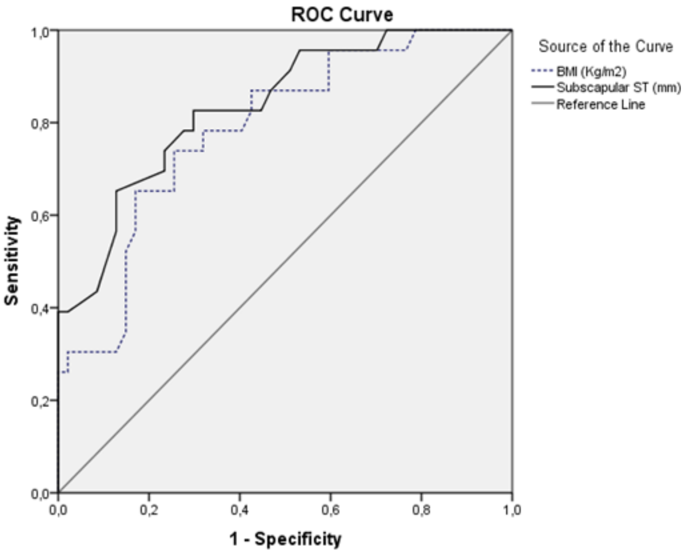

Figure 2: *According to IR (HOMA index), ROC curves for BMI and Subscapular ST*

years trend has increased as parallel for both measurements (7).

Although, previous studies have highlighted the limitations of BMI, both in adults and in the growing child, incorporating skinfold measurements has been suggested in clinical practice (8). In one of those studies, Nooyens et al. (9) reported that adolescent sum of 4 SST were better predictors of adult body fatness than was adolescent BMI.

Receiver operating characteristic (ROC) analysis was used to show the change in sensitivity/1-specificity pairs according to changes in the cutoffs for BMI- and ST-obesity. The ROC analysis demonstrated the overall specific power of a diagnostic test over the whole range of test values. The area under the curve (AUC) is the measure of separability of two probability distributions (classifying functions): excellent for AUC values bigger than 0.9 (good 0.8; fair 0.7; poor 0.6) and fail for values

Table 3: *Comparison of BMI and subscapular ST Pearson correlation coefficients in terms of some metabolic laboratory variables*

	BMI	Subscapular ST
HOMA-IR	r: 0.277 p: 0.020	r:0.368 p:0.002
Triglyceride	r:0.453 p: 0.001	r: 0.473 p: 0.001
HDL-Cholesterol	r:-0.389 p: 0.001	r:-0.489 p: 0.001
Fasting glucose	r:0.346 p:0.003	r:0.418 p:0.001
Fasting insulin	r:0.290 p:0.015	r: 0.379 p:0.001
Uric acid	r: 0.289 p: 0.015	r: 0.323 p: 0.006

smaller than 0.6. It is reported that BMI and WC had a good power in the diagnosis of obesity (10). However, interestingly, in our recent study (3), consisted of 20 healthy and 50 obese women participants, the AUC value for the presence of obesity was found to be 100% due to BMI (Figure 1 and Table 1).

As the AUC value for subscapular SST was also 100%; logistic regression analysis was performed via the forward stepwise (likelihood ratio) method using both variables together. SST can be said to be more effective according to the results of Computer SPSS program (Figure 2 and Table 2).

Moreover, it was found that; first HOMA-IR and many metabolic biomarkers (e.g. glucose, triglyceride and uric acid) exhibit a more significant relationship with SST when metabolic syndrome laboratory variables frequently seen in the obese were compared with BMI and SST (Table 3).

As a result, according to our study results and present report, we observed that female adults with high body fatness had higher SST which is a key predictor of health risk. Therefore, the measurement of adult women SST would yield a simple risk indicator for high adult body fatness, as much as the measurement of BMI. Although our observation does not take the position that SST is superior to BMI as a measure of obesity in the women subjects, an examination of trends in obesity based on the only alternative measure of fatness that is consistently available -skinfold thickness- is worthwhile. Therefore, SST may be useful screening tool to determine which female subjects are at increased risk of becoming adults with obesity. Still, appropriate cut-off values for SST still need to be assessed in larger populations.

DISCLOSURE STATEMENT

The authors declared no conflict of interest.

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