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Prediction of Visceral Fat using Routinely Measured Anthropometrics and Laboratory Tests

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ABSTRACT

Background: Body Fat (BF%) and Visceral Fat (VF) have been linked to morbidity and mortality of non-communicable diseases (NCDs). Dual-energy X-ray absorptiometry (DEXA) scan is the gold standard for measuring BF% and VF; however, it has several limitations. For that reason, the purpose of this study is to develop an alternative tool using anthropometrics and other lab measures.
Methods: *recruited data from Qatar Biobank* of 375 participants includes (BF% and VF), anthropometry measurements, lipid and serum profiles were analyzed. Multivariate linear regression models were built to predict BF % and VF, using anthropometrics, clinical and lipid-serum profile measurements.
Results: Both BF% and VF models had a high proportion of the variance explained with adjusted R^2 of 86.4% and 74.2 for BF% and VF respectively. Lipid and serum profile and, clinical measurements along with comorbidities were found not to be independent predictors for BF% or VF.
Conclusion: BF% and VF could be measured using simple anthropometric measures, instead of DEXA scan. Further studies are required to develop utilized tool for the Qatari population.

INTRODUCTION

BF% and VF have been linked as a risk factor for morbidity and mortality of many NCDs such as cardiovascular disease, diabetes, Hypocholesteremia and hypertension. Dual-energy X-ray absorptiometry (DEXA) scan is the gold standard for measuring body fat and VF; however, it is an expensive procedure, not widely available, and exposes the patient to ionizing radiation. Therefore, the study aim is to develop a predicting tool using routinely measured anthropometrics and other lab measures, to estimate the body fat percent and VF that could serve as an alternative of DEXA scan.

RESULTS

The model for BF % included gender, age, hip and waist circumference, weight, and height as independent predictors; while the VF model included gender, age and waist only. Both models had a high proportion of the variance explained with adjusted R^2 of 86.4% and 74.2 for fat% and VF respectively. Lipid profile measurements were found not to be independent predictors for BF % and VF.

Table 1: Distribution of Sociodemographic factors (SDF) of the study population (n=375)

SDF	Frequency	Percentage (%)
Gender		
Female	240	64.0
Male	135	36.0
Age		
<24	46	12.3
25-34	112	29.8
35-44	81	21.6
45-54	90	24.0
>55	46	12.3
Nationality		
Qatari	361	96.3
Non-Qatari	14	3.7
Marital Status		
Married	262	69.8
Single	91	24.3
Others[1]	22	5.9
Education		
High School	38	9.5
Diploma	93	23.4
Degree	225	56.5
Postgraduate	42	10.6
Employment		
Employed	226	61.8
Housewife	58	15.8
Retired	41	11.2
Student/trainee	36	9.8
Un-employed	5	1.4
Salary (Monthly QAR)		
<10,000	32	10.7
10,000-19,999	82	27.4
20,000-49,999	115	38.5
>50	70	23.4
Housing		
Owned	316	90.1
Others[2]	35	9.9
Siblings		
None	8	2.2
1-2	16	4.3
3-5	93	25.3
>5	251	68.2

1: Divorced/widow,
2: Rented/ shared ..etc.

Table 2: Independent predictors of VF (n=375) and Fat % *100 (n=358) obtained using Multiple Linear Regression

Predictors	Regression coefficient (95% CI)	P-value	Adjusted R2
VF in cm3			
Waist	33.8 (30.8 to 36.8)	<0.001	74.2 %
Age	11.8 (8.5 to 15.1)	<0.001	
Gender	158.5 (68.3 to 248. 7)	0.001	
Fat %×100			
Hip	20.2 (11.6 to 28.7)	<0.001	86.4 %
Gender	1269.9 (1131.2 to 1408.7)	<0.001	
Waist	7.0 (0.7 to 13.3)	0.029	
Age	9.5 (6.1 to 12.9)	<0.001	
Weight	23.7 (15.8 to 31.6)	<0.001	
Height	-19.9 (-27.1 to -12.7)	<0.001	

Note: This table depicts the Models that were chosen for our study in better predicting the VF and Fat %.

CONCLUSION

These findings suggest that the BF% and VF could be measured using simpler, non-invasive, routinely measured anthropometric measures, instead of more invasive and expensive DEXA scan that are currently employed. If confirmed in larger study with bit more sophisticated multivariate models, a tool specific to Qatari population could be utilized, given the strong link between CVDs and body fat, development of such screening tool could have important clinical implication in routine health care.

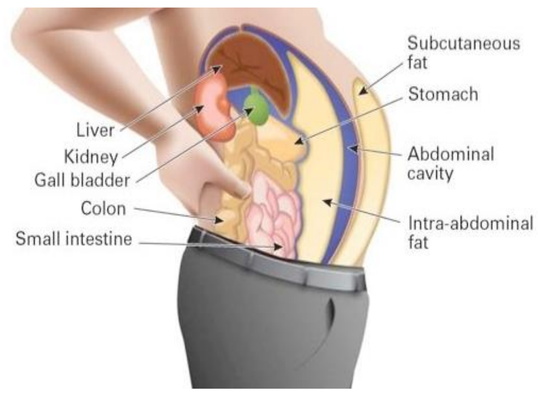

Figure: Intra-abdominal fat aka Visceral fat surrounding internal body organs
Image Source:
http://impowerage.com/wpcontent/uploads/2011/12/Visceral-Fat.edited1.jpg

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METHODOLOGY

Image Source:
http://dexabody.com/bodycomp_files/small_6315.jpg

Data from 375 participants recruited from Qatar Biobank including DEXA scan (body fat% and VF), anthropometry measurements, lipid and serum profiles were analyzed. Multivariate linear regression models were built to predict body fat % and VF content using anthropometric, lipid-serum profile measurements.

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