HUNGARIAN SOCIETY OF ARTERIAL STIFFNESS

How does obesity influence arterial stiffness in asymptomatic adults ?

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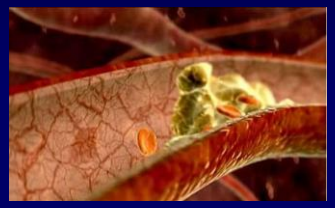
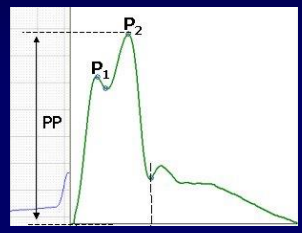
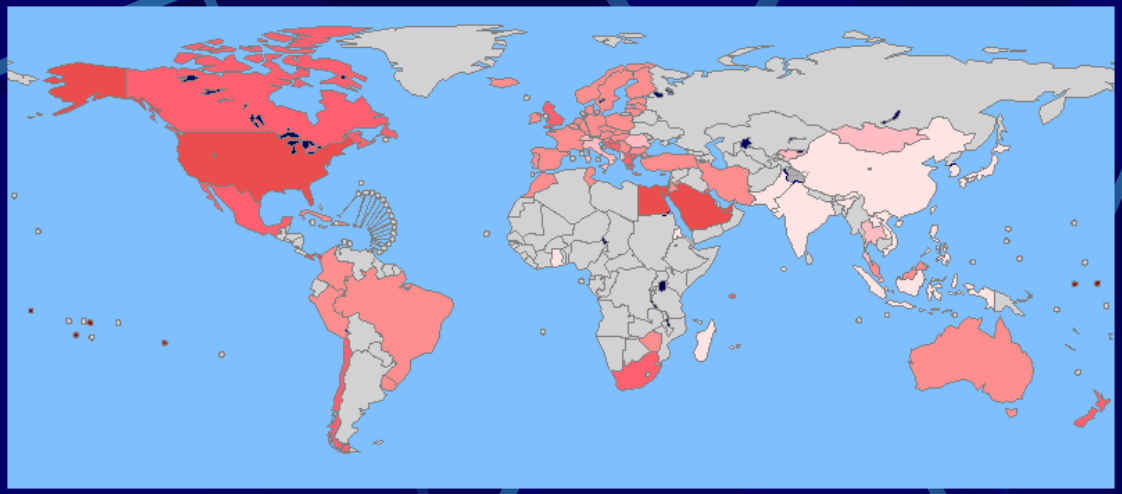




Faculty Disclosure of interests

I have nothing to disclose any conflicts of interests

The global epidemic of overweight and obesity - "globesity" - is rapidly becoming a major public health problem

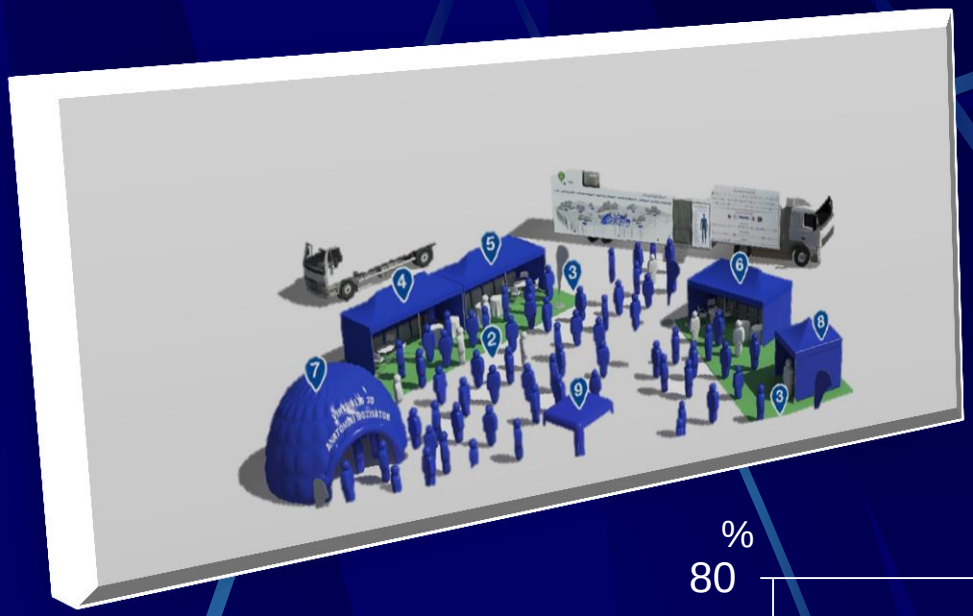


All the people of the world is fasting!

One part is on diet,

the other is starving...

Prevalence of overweight and obesity in Hungary



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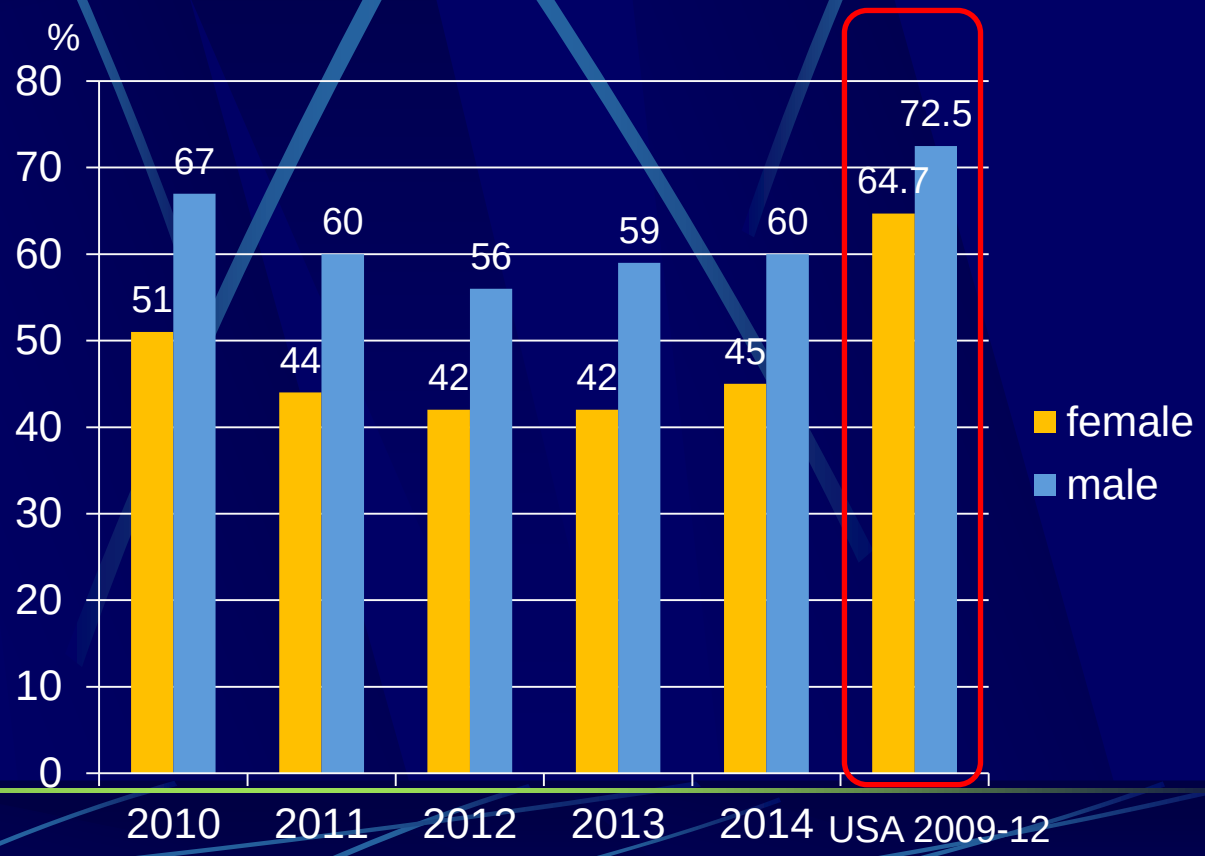


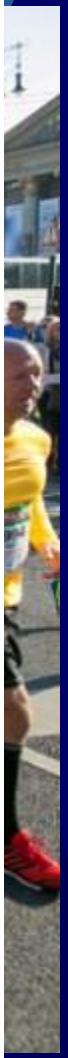
I. Kiss, G. Dankovics, I. Barna, E. Kekes, T. Daiki: The comprehensive health screening programme 2010-2020.

EUROPE'S OBESITY LEAGUE

Prevalence of obesity among population aged 15 and over

Hungary	28.5%
United Kingdom	24.7%
Ireland	23.0%
Luxembourg	23.0%
Malta	22.9%
Czech Republic	21.0%
Greece	19.6%
Estonia	19.0%
Slovenia	18.3%
Latvia	16.9%
Slovakia	16.9%
Spain	16.6%
Poland	15.8%
Finland	15.8%
Cyprus	15.6%
Portugal	15.4%
Germany	14.7%
France	14.5%
Belgium	13.8%
Denmark	13.4%
Austria	12.4%
Netherlands	12.0%
Sweden	11.8%
Bulgaria	11.5%
Italy	10.4%
Romania	7.9%

Source: OECD Health At A Glance Europe 2014. Data collected in 2012



Highest Cardiovascular Disease Death Rates

Here's a look at the top 10 countries with the highest death rates for heart disease, stroke and high blood pressure per 100,000 men and women, ages 35 to 74.

Russian Federation	1,173
Ukraine	1,067
Romania	657
Hungary	524
Cuba	359
Brazil	347
Czech Republic	347
Argentina	305
Mexico	261
United States	235

Russian Federation	466
Ukraine	454
Romania	312
Hungary	218
Cuba	209
Brazil	205
Czech Republic	142
Argentina	139
Mexico	137
United States	117

Sources: World Health Organization, National Center for Health Statistics and National Heart, Lung, and Blood Institute

Predictive value of arterial stiffness (aoPWV)
17 longitudinal studies, 15.887 pts, 7.7 ys follow-up

Prediction of Cardiovascular Events and All-Cause Mortality With Arterial Stiffness

A Systematic Review and Meta-Analysis

Charalambos Vlachopoulos, MD, Konstantinos Aznaouridis, MD, Christodoulos Stefanadis, MD

Athens, Greece

Objectives The purpose of this study was to calculate robust quantitative estimates of the predictive value of aortic pulse wave velocity (PWV) for future cardiovascular (CV) events and all-cause mortality by meta-analyses of longitudinal studies.

Background Arterial stiffness is increasingly recognized as a surrogate end point for CV disease.

Methods We performed a meta-analysis of 17 longitudinal studies that evaluated aortic PWV and followed up 15,877 subjects for a mean of 7.7 years.

Results The pooled relative risk (RR) of clinical events increased in a stepwise, linear-like fashion from the first to the third tertile of aortic PWV. The pooled RRs of total CV events, CV mortality, and all-cause mortality were 2.26 (95% confidence interval: 1.89 to 2.70, 14 studies), 2.02 (95% confidence interval: 1.68 to 2.42, 10 studies), and 1.90 (95% confidence interval: 1.61 to 2.24, 11 studies), respectively, for high versus low aortic PWV subjects. For total CV events and CV mortality, the RR was significantly higher in high baseline risk groups (coronary artery disease, renal disease, hypertension) compared with low-risk subjects (general population). An increase in aortic PWV by 1 m/s corresponded to an age-, sex-, and risk factor–adjusted risk increase of 14%, 15%, and 15% in total CV events, CV mortality, and all-cause mortality, respectively. An increase in aortic PWV by 1 SD was associated with respective increases of 47%, 47%, and 42%.

Conclusions Aortic stiffness expressed as aortic PWV is a strong predictor of future CV events and all-cause mortality. The predictive ability of arterial stiffness is higher in subjects with a higher baseline CV risk. (J Am Coll Cardiol 2010;55:1318–27) © 2010 by the American College of Cardiology Foundation

Obesity correlates with vascular stiffness

Measures

Rachel P. Wi

Abstract—Obesity h
vascular systems
to assess the asso
African American
aortic pulse-wave

Higher bo

Results were cons
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Nordstrand *et al. BMC Cardiovascular Disorders* 2011, **11**:7
http://www.biomedcentral.com/1471-2261/11/7

BMC Cardiovascular Disorders

RESEARCH ARTICLE Open Access

The relationship between various measures of obesity and arterial stiffness in morbidly obese patients

N No

PWV was positively correlated with WC, W/H ratio, BMI and visceral fat area in obese females

Abs

Backg carotid femoral pulse wave velocity (PWV) is an independent predictor of card ality. We aimed to investigate how various measures of body composition affect ar

Methods: This is an analysis of cross-sectional baseline data from a controlle changes in arterial stiffness after either surgery or lifestyle intervention in a population of nts. High-fidelity applanation tonometry (Millar®, Sphygmocor®) was used to measure pulse w Carotid femoral PWV is a direct measure of arterial stiffness and is considered to be the gold d. The Inbody 720 Body Composition Analyzer was used for bioelectrical impedance analysis (B s correlation, independent samples *t*-test, chi-square tests, Fisher's exact test and multiple ession analyses were used as statistical methods.

Results: A total of 133 patients (79 women), with a mean (SD) age of 43 (1 ears were included in the study. Men had a significantly higher prevalence of obesity related comorbidities and significantly higher PWV, 9.1 (2.0) m/s vs. 8.1 (1.8) m/s, p = 0.003, than women. In the female group, PWV was positively correlated with WC, WHtR, BMI and visceral fat area. In the male group, PWV was negatively correlated with BMI. Multiple linear regression analysis showed that increasing BMI, WC, WHtR, visceral fat area and fat mass were independently associated with higher PWV in women, but not in men, after adjustment for age, hypertension and type 2 diabetes.

Conclusion: Most measures of general and abdominal obesity were predictors of arterial stiffness in female morbidly obese patients.

Trial registration: ClinicalTrials.gov Identifier NCT00626964

Wileman RP et al:

Nordstrand et al. BMC Cardiovascular Disorders 2011, 11:7.

Subjects and methods

- Aim of the study: to collect eligible amount of measurements derived from a huge population of (apparently) healthy individuals with wide range of age to create a database in order to define reference values of pulse wave velocity

- The purpose of this stud was to assess the association between arterial stiffness and obesity

- AoPWV and cSBP were assessed with an oscillometric device (TensioMed Arteriograph) in 9073 normotensive adults without any CV disease and not treated for hypertension, diabetes or dyslipidemia

- 3749 men (41%) and 5327 women (59%) were included into the analysis (mean age: 48.2 ± 14,1 ys)

- Individuals were categorized according to their BMI-values to determine the correlation between BMI and stiffness-parameters (PWV, Aix, cSBP)

- Statistical analysis was carried out with IBM SPSS 20 statistical software

Characteristics of the whole population (n=9073)

Group Statistics

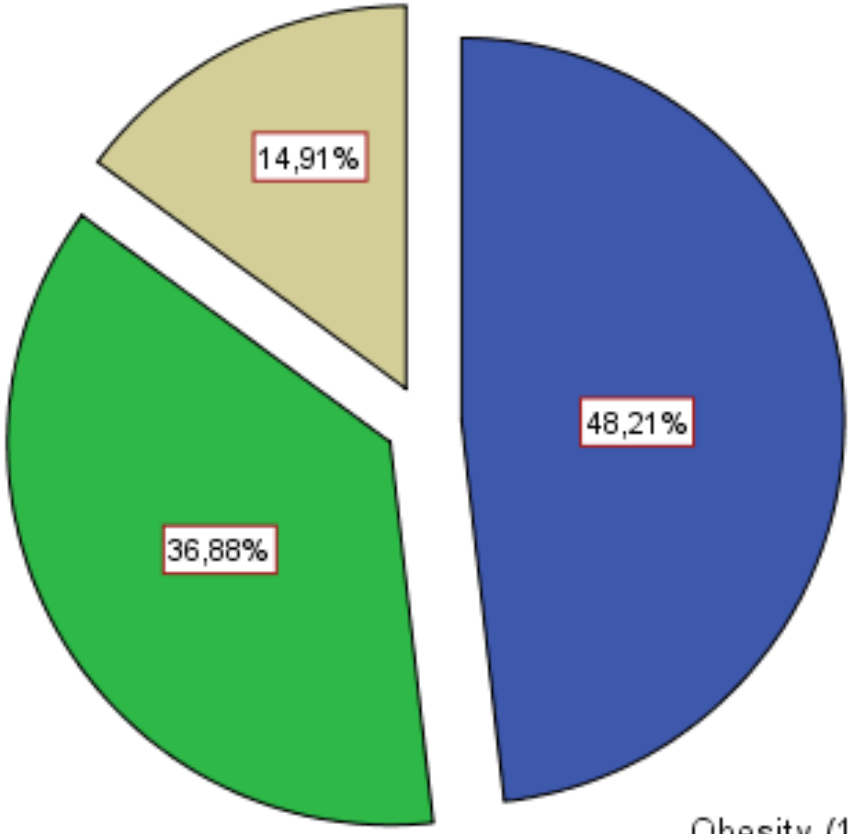
	Sex (0-male; 1-female)	N	Mean	Std. Deviation	Std. Error Mean
Age [years]	0	3749	47,64	15,087	,246
	1	5327	48,67	13,462	,184
BMI	0	3749	26,5505	3,94999	,06451
	1	5327	25,0558	4,34171	,05949
Sys [mmHg]	0	3749	125,96	9,399	,153
	1	5327	123,21	10,378	,142
Dias [mmHg]	0	3749	76,21	7,652	,125
	1	5327	74,67	7,740	,106
HR [1/min]	0	3749	68,67	10,699	,175
	1	5327	71,78	10,262	,141
MAP [mmHg]	0	3749	92,80	7,208	,118
	1	5327	90,85	7,857	,108
PP [mmHg]	0	3749	49,75	8,653	,141
	1	5327	48,54	7,995	,110
AixBra	0	3749	-32,8568	26,77543	,43730
	1	5327	-13,2200	28,04689	,38428
RT [ms]	0	3749	136,21	31,244	,510
	1	5327	115,61	29,441	,403
PWVao [m/s]	0	3749	8,5495	2,25685	,03686
	1	5327	9,4486	2,56010	,03508
SBPao [mmHg]	0	3749	115,9324	9,81734	,16034
	1	5327	116,8873	11,84381	,16227

male: 0

female: 1

Distribution of population according to BMI-categories

(n=9073)



Worldwide based on WHO-data:

44.77% (normal)

35.5% (overweight)

17.7% (obese)

Obesity (1-normal; 2-overweight; 3-obese)

1
2
3

Parameters of vascular function according to BMI-categories

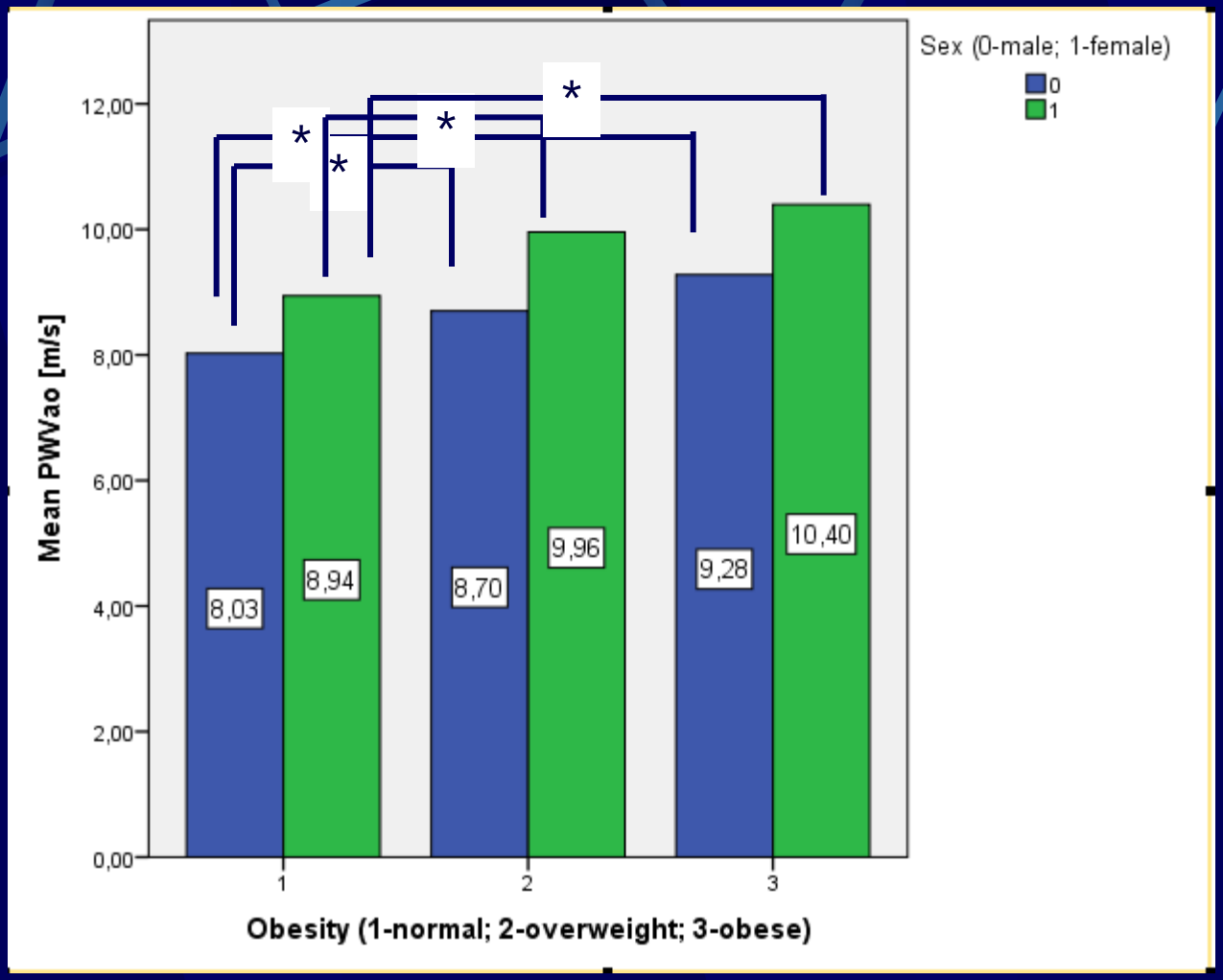
(n=9073)

Report

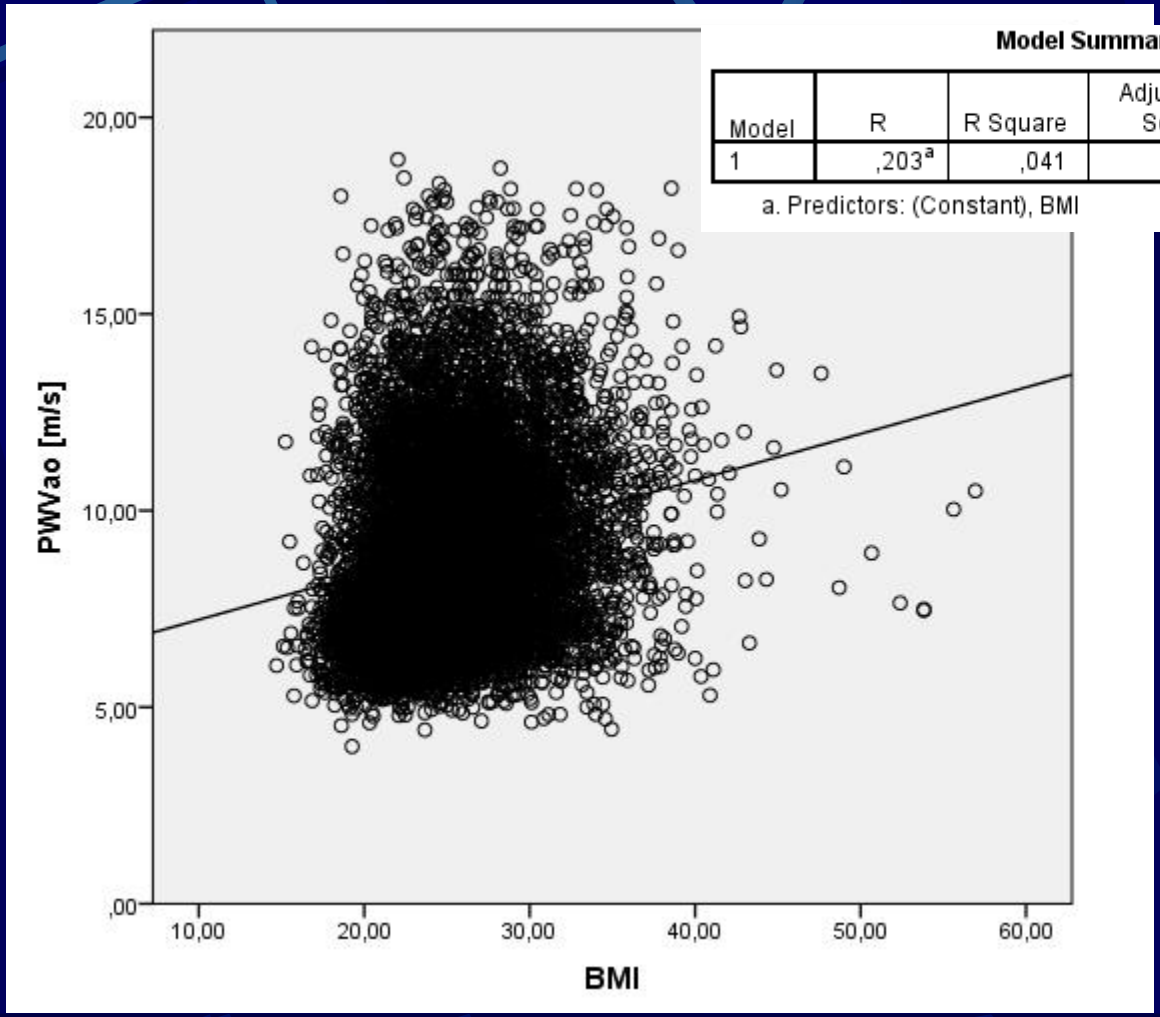
Obesity (1-normal; 2-overweight; 3-obese)		Sys [mmHg] *	Dias [mmHg]	HR [1/min]	MAP [mmHg] *	PP [mmHg]	AixAo	RT [ms] *	PWVao [m/s] *	SBPao [mmHg] *	cPP
1	Mean	122,25	73,56	71,16	89,79	48,68	19,0567	128,20	8,6474	114,0788	40,5180
normal	N	4374	4374	4374	4374	4374	4374	4374	4374	4374	4374
	Std. Deviation	10,345	7,947	10,837	7,873	8,466	9,99031	32,158	2,41515	11,42460	7,77413
2	Mean	125,75	76,60	69,80	92,99	49,15	20,4992	121,50	9,3278	118,2544	41,6579
overweight	N	3346	3346	3346	3346	3346	3346	3346	3346	3346	3346
	Std. Deviation	9,579	7,305	10,172	7,161	8,192	9,15022	31,007	2,43210	10,44712	8,06914
3	Mean	127,66	77,76	70,11	94,40	49,90	20,3185	117,40	9,8499	119,9289	42,1713
obese	N	1353	1353	1353	1353	1353	1353	1353	1353	1353	1353
	Std. Deviation	8,839	6,775	10,445	6,538	7,905	8,88332	31,157	2,52888	9,51810	7,75668
Total	Mean	124,34	75,31	70,50	91,65	49,04	19,7769	124,12	9,0777	116,4911	41,1849
	N	9073	9073	9073	9073	9073	9073	9073	9073	9073	9073
	Std. Deviation	10,077	7,742	10,556	7,657	8,294	9,55133	31,858	2,47932	11,06231	7,90879

* $p < 0.05$

Higher BMI was correlated with higher PWV (n=9073)



Correlation between PWV and obesity (n=9073)



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,203[a]	,041	,041	2,42790

a. Predictors: (Constant), BMI

Multiple regression analysis: BMI has shown the second strongest correlation with PWVao after age

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	,089	,303		,294	,769	-,505	,684
	BMI	,133	,010	,229	13,842	,000	,115	,152
	Weight [kg]	-,042	,003	-,252	-15,768	,000	-,047	-,037
	Age [years]	,085	,002	,484	50,557	,000	,081	,088
	Sys [mmHg]	,029	,002	,120	13,154	,000	,025	,034
	HR [1/min]	,013	,002	,055	6,140	,000	,009	,017

a. Dependent Variable: PWVao [m/s]

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,527[a]	,278	,278	2,10693
2	,540[b]	,291	,291	2,08702
3	,545[c]	,297	,297	2,07844
4	,560[d]	,313	,313	2,05510
5	,562[e]	,316	,316	2,05095

a. Predictors: (Constant), Age [years]

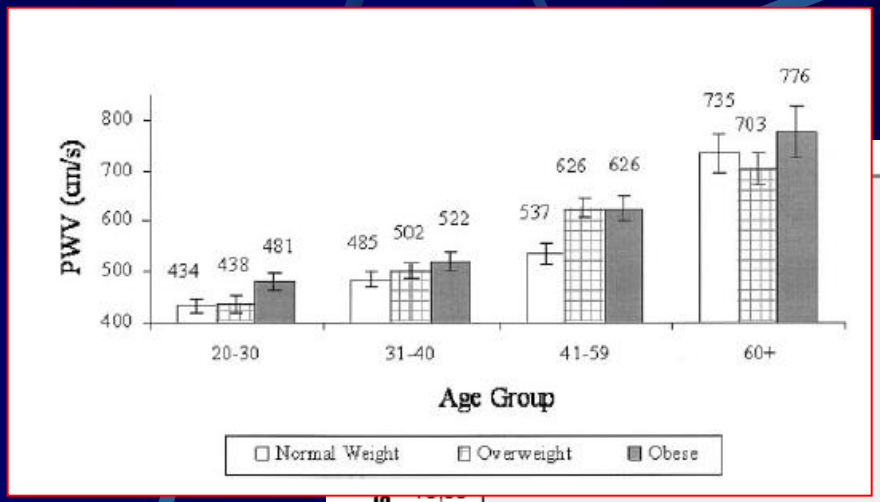
b. Predictors: (Constant), Age [years], Sys [mmHg]

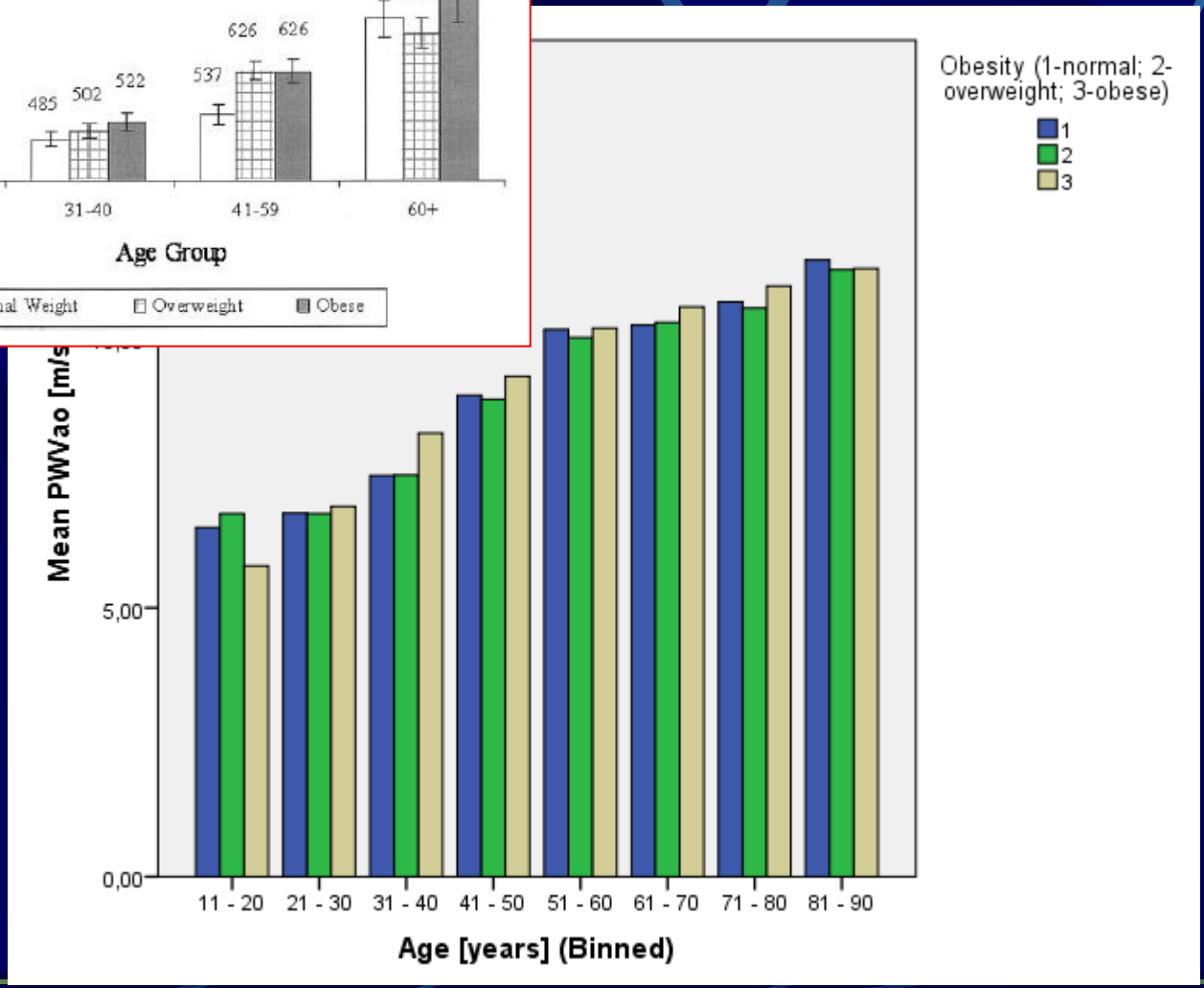
c. Predictors: (Constant), Age [years], Sys [mmHg], Weight [kg]

d. Predictors: (Constant), Age [years], Sys [mmHg], Weight [kg], BMI

e. Predictors: (Constant), Age [years], Sys [mmHg], Weight [kg], BMI, HR [1/min]

Increase of PWV according to age and BMI (n=9073)

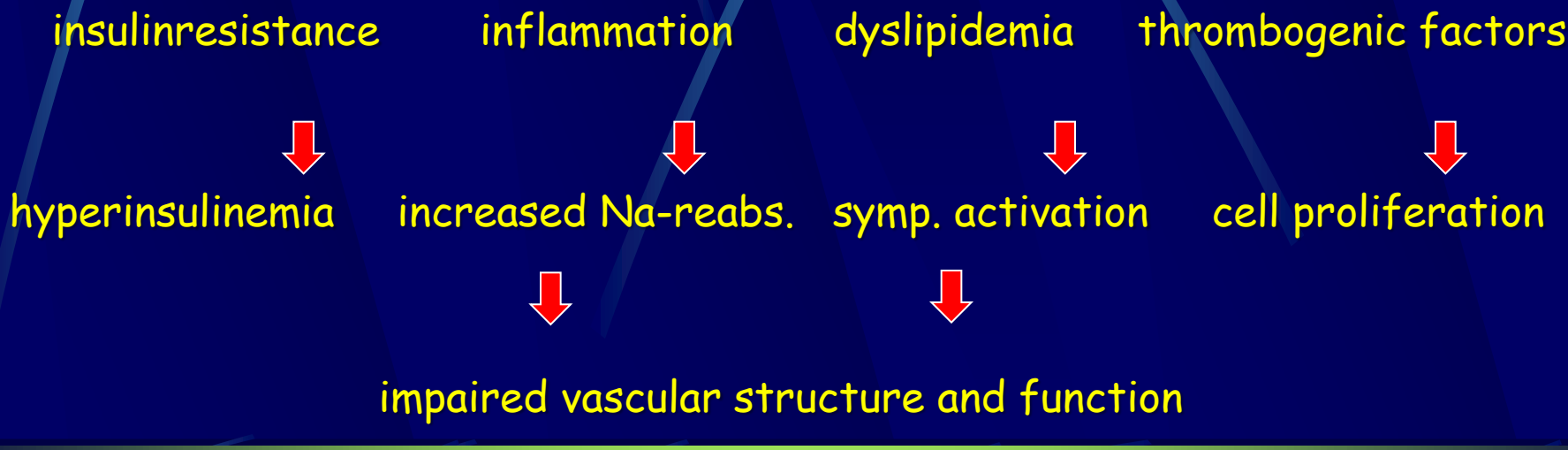




Wildmann et al: Obesity and arterial stiffness. *Hypertension*. 2003;42:468-473.

Potential links between obesity and arterial stiffness

- Fat gain particularly which is distributed in central (abdominal) area is an important cause of cardiovascular disease
- Obesity might also exert adverse affects on the vascular system by increasing arterial stiffness, thus predisposing the individual to hypertension and premature aging of the vascular system
- Central (dysfunctional) fat produces adipocytokines in excessive amount



Conclusions and limitations

- Age is the strongest predictor of the several factors contributing to PWV but obesity can play also an important role
- Increased body weight coincides with significantly higher PWV
- It would be more beneficial to investigate those parameters which better characterize overweight and central obesity (waist circumference, waist-to-hip-ratio)
- Long-term follow-up studies are needed to better understand the link between obesity and vascular stiffness

- Effect of weight-control/loss on arterial stiffness is poorly investigated (probably improves??)

Thank you for your attention!

Vizsgálatok :

Dátum / Idő

2014.10.28. 17:07
2014.10.28. 17:10
2015.03.01. 17:08
2015.03.01. 17:11
2015.06.23. 22:38
2015.06.23. 22:41
2016.04.21. 12:13
2016.04.21. 12:15

PÁCIENS ADATOK

Vezetéknév

Keresztnév

Szül. dátum 1969.04.06

Sys 125
Dia 77
MAP 93
PP 48
HR 75

Aix brachial:
-56.6 [%]
Aix aortic:
9.0 [%]
ED
300 [ms]
RT
145 [ms]

PWVao
8.1 [m/s]
SD PWVao
— [ms]

PPao
35.2 [mmHg]
SBPao
112.2 [mmHg]

2:1

Kurzor

Bezárás