

# Obesity as a risk factor for Atrial Fibrillation

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**Obesity** has reached epidemic proportions in the United States; nearly 65% of the population is overweight and nearly 31% is obese. Similarly, atrial fibrillation (AF) is reaching epidemic proportions, with nearly 2.5 million Americans currently affected.

**Obesity** is clearly associated with increased prevalence of hypertension, coronary artery disease, diabetes mellitus, LV hypertrophy, LA enlargement, and congestive heart failure. *JAMA* Vol. 292 No. 20, November 24, 2004

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## Obesity and the Risk of New-Onset Atrial Fibrillation

Obesity is associated with atrial enlargement and ventricular diastolic dysfunction, both known predictors of atrial fibrillation (AF).

*JAMA. 2004;292:2471*

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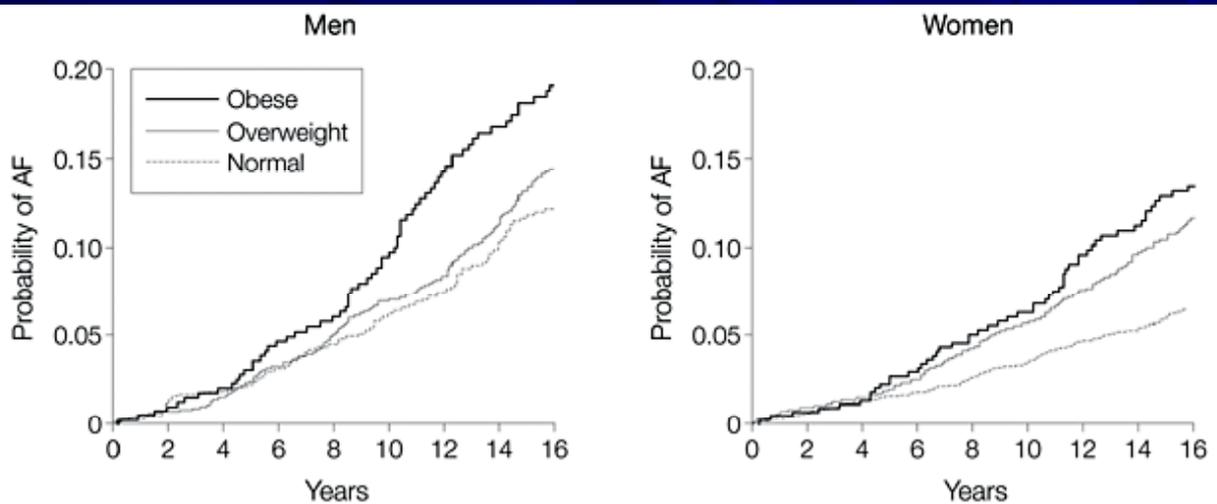
During a mean follow-up of 13.7 years, 526 participants (234 women) developed AF. Age-adjusted incidence for AF increased across the 3 BMI categories in men (9.7, 10.7, and 14.3 per 1000 person-years) and women (5.1, 8.6, and 9.9 per 1000 person-years). In multivariable models adjusted for cardiovascular risk factors, a 4% increase in AF risk per 1-unit increase in BMI was observed in men . *JAMA. 2004;292:2471*

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**Conclusions** Obesity is an important, potentially modifiable risk factor for AF.

The excess risk of AF associated with obesity appears to be **mediated by left atrial dilatation**.

These prospective data raise the possibility that interventions to promote normal weight may reduce the population burden of AF.



No. at Risk	0	2	4	6	8	10	12	14	16
Obese	413	380	336	280	238				
Overweight	1216	1143	1023	908	776				
Normal	755	699	614	557	482				

	464	444	397	345	299				
	898	852	776	696	614				
	1536	1476	1394	1282	1180				

Incidence of Atrial Fibrillation, by Body Mass Index Category

# Obstructive Sleep Apnea, Obesity, and the Risk of Incident Atrial Fibrillation

J Am Coll Cardiol, 2007; 49:565

Incident AF occurred in 133 subjects (cumulative probability 14%). Univariate predictors of AF were age, male gender, hypertension, coronary artery disease, heart failure, smoking, body mass index, OSA .

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**CONCLUSIONS:** Obesity and the magnitude of nocturnal oxygen desaturation, which is an important pathophysiological consequence of OSA, are independent risk factors for incident AF in individuals <65 years of age.

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# The Long- and Short-Term Impact of Elevated Body Mass Index on the Risk of New Atrial Fibrillation The WHS (Women's Health Study)

J Am Coll Cardiol, 2010; 55:2319

Objectives: The purpose of this study was to characterize the relationship between changes in body mass index (BMI) and incident atrial fibrillation (AF) in a large cohort of women.

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Results: During  $12.9 \pm 1.9$  years of follow-up, 834 AF events were confirmed. BMI was linearly associated with AF risk, with a 4.7% ( $p < 0.0001$ ) increase in risk with each kilogram per square meter.

Adjustment for inflammatory markers minimally attenuated this risk.

Participants becoming obese during the first 60 months had a 41% adjusted increase in risk of the development of AF ( $p = 0.02$ ) compared with those maintaining BMI  $<30 \text{ kg/m}^2$

J Am Coll Cardiol, 2010; 55:2319

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**Conclusions:** In this population of apparently healthy women, BMI was associated with short- and long-term increases in AF risk, accounting for a large proportion of incident AF independent of traditional risk factors.

A strategy of weight control may reduce the increasing incidence of AF. (Women's Health Study [WHS])

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**Obesity as a risk factor for the progression of paroxysmal to permanent atrial fibrillation: a longitudinal cohort study of 21 years.** Eur Heart J July 2008

The interrelationships of (BMI), (LA) size, and progression to permanent AF were analysed. Of a total of 3248 patients (mean age  $71 \pm 15$  years; 54% men) diagnosed with paroxysmal AF, 557 (17%) progressed to permanent AF over a period of 5.1 years. BMI independently predicted the progression to permanent AF (HR 1.04, CI 1.03–1.06;  $P < 0.0001$ ).

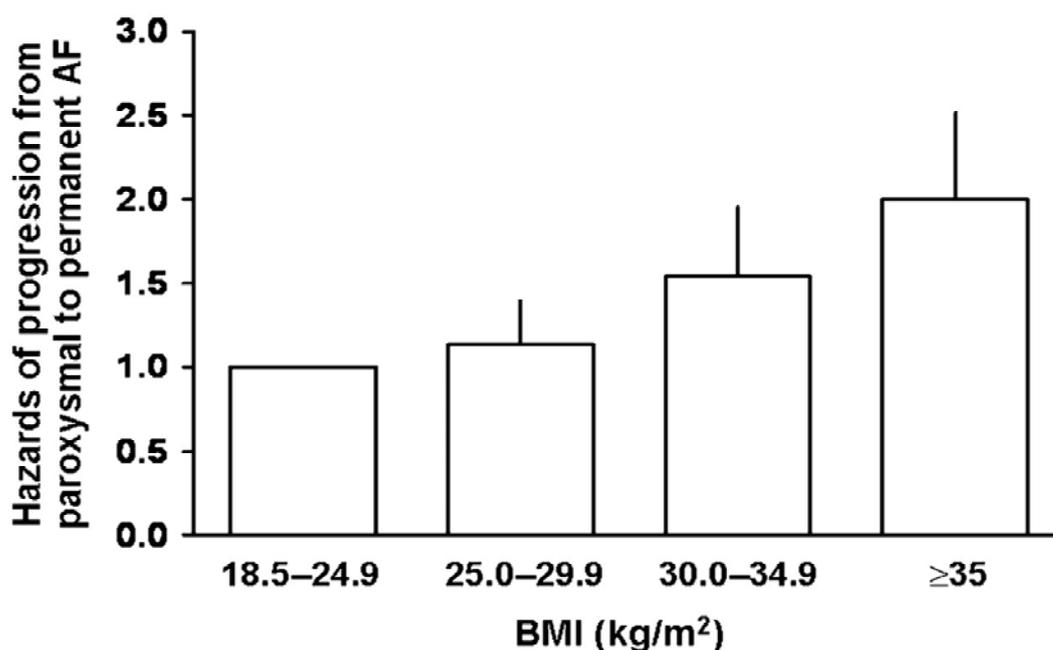
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Compared with normal BMI (18.5–24.9 kg/m<sup>2</sup>), obesity (30–34.9 kg/m<sup>2</sup>) and severe obesity (≥35 kg/m<sup>2</sup>) were associated with increased risk for progression [ $P = 0.0004$ ) and 1.87 ( $P < 0.0001$ , respectively)]. BMI remained highly significant even after multiple adjustments.

In the subgroup with echocardiographic assessment ( $n = 744$ ), LA volume was incremental to BMI, and did not weaken the association between BMI and progression to permanent AF ( $P < 0.0001$ ).

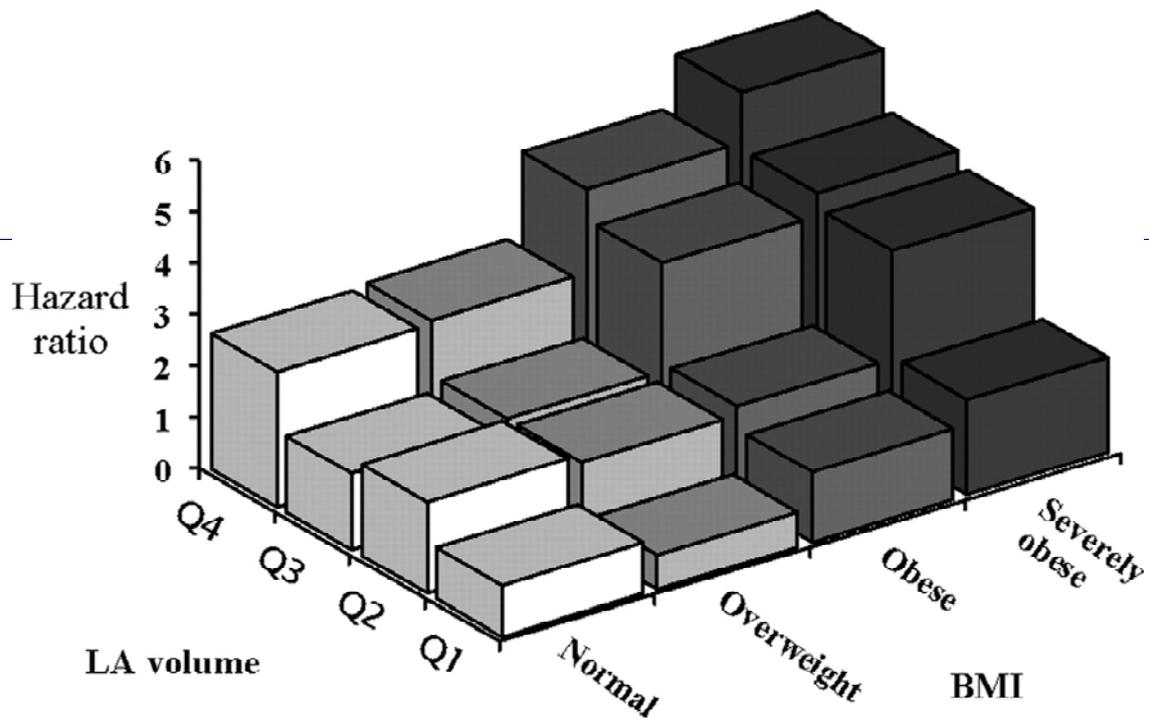
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Age- and sex-adjusted hazards of progression from paroxysmal to permanent atrial fibrillation by body mass index.



Tsang T S et al. Eur Heart J 2008;eurheartj.ehn324

Age- and sex-adjusted hazards of progression to permanent atrial fibrillation stratified by body mass index categories and LA volume quartiles.

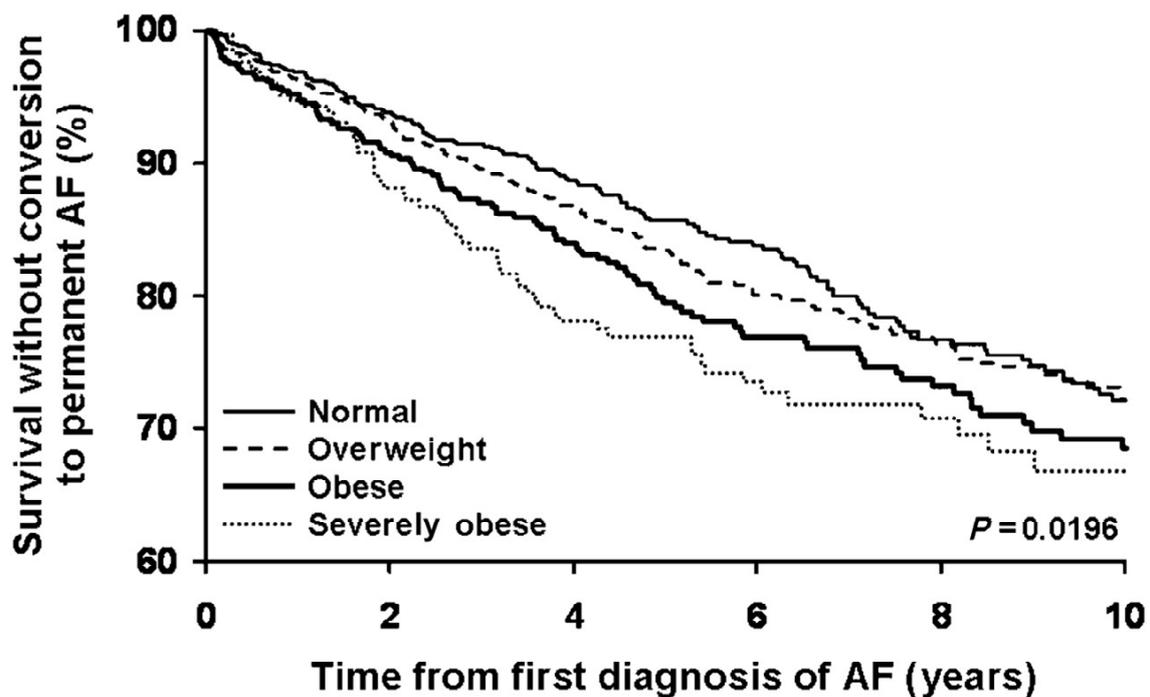


Tsang T S et al. Eur Heart J 2008;eurheartj.ehn324

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Survival without conversion to permanent atrial fibrillation.



Tsang T S et al. Eur Heart J 2008;eurheartj.ehn324

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## **Atrial Fibrillation and Obesity -- Results of a Meta-Analysis.** *American Heart Journal.* 2008;155(2):310-315

Of the 468 articles identified, 16 studies that enrolled a total of 123249 individuals met the inclusion criteria,

**Conclusions:** Our findings demonstrate that obesity increased the risk of developing AF by 49% in the general population, and the risk escalated in parallel with increased BMI.

**Obesity and Atrial Fibrillation  
Is One Epidemic Feeding the Other?**  
*JAMA.* 2004;292:2519-2520

## **Obesity Raises Risk of Left Atrial Enlargement, a Risk Factor for Atrial Fibrillation** . JACC. November 17, 2009

Data collected over 10 years from 1,212 men and women aged 25 to 74. Analysis found both obesity and high blood pressure to be “significant” and “independent predictors of LAE. The authors indicated that while more cases of atrial fibrillation today are related to hypertension than to other cardiovascular risk factors, obesity may overtake hypertension as the main atrial fibrillation risk factor.

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Left Atrial Epicardial Adiposity and Atrial Fibrillation. Circ Arrhythm Electrophysiol. 2010 May 26. Cleveland Clinic

Left atrium (LA) epicardial fat pad thickness was measured in consecutive cardiac CT angiograms performed for CAD or AF.

LA-Esophageal fat was thicker in patients with persistent AF versus paroxysmal AF ( $p=0.011$ ) or no AF ( $p=0.003$ ).

**CONCLUSIONS:** -Increased posterior LA fat thickness appears to be associated with AF burden independent of age, BMI, or LA-area.

**CONCLUSIONS:** BMI was associated with short- and long-term increases in AF risk, accounting for a large proportion of incident AF independent of traditional risk factors. A strategy of weight control may reduce the increasing incidence of AF.



## References for further readings

- Obesity as a Risk Factor for the Progression of Paroxysmal to Permanent Atrial Fibrillation: A Longitudinal Cohort Study of 21 Years. *Eur. Heart J.*, Sep 2008; 29: 2227-33.
- Atrial Fibrillation and Obesity -- Results of a Meta-Analysis. *Am Heart J*, Feb 2008; 155: 310-5
- Atrial Fibrillation, Sleep Apnea and Obesity. *Nat Clin Pract Cardiovasc Med*, November 2004
- Obesity May Top Hypertension as Risk Factor for LA Enlargement.
- Atrial fibrillation and obesity an association of increasing importance. *J Am Coll Cardiol.* 2010 May 25;55(21):2328-
- Obesity as a Risk Factor for the Progression of Paroxysmal to Permanent Atrial Fibrillation: A Longitudinal Cohort Study of 21 Years. *Eur. Heart J.*, Sep 2008; 29: 2227-33.

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- The long- and short-term impact of elevated body mass index on the risk of new atrial fibrillation the WHS (women's health study). *J Am Coll Cardiol.* 2010 May 25;55(21):2319-27.
- Metabolic Syndrome and Risk of Development of Atrial Fibrillation ... Watanabe. *JACC* 4/11/2008
- Big Men and Atrial Fibrillation: Effects of Body Size and Weight ... *JACC* 4 11 2008
- Obstructive Sleep Apnea, Obesity, and the Risk of Incident Atrial ... *JACC* 02/06/2007
- Obesity and the risk of new-onset atrial fibrillation. *JAMA*, Nov 2004; 292: 2471-7.
- Obstructive sleep apnea, obesity, and the risk of incident atrial fibrillation. *J Am Coll Cardiol*, Feb 2007; 49: 565-71
- Middle-aged men with increased waist circumference and elevated C-reactive protein level are at higher risk for postoperative atrial fibrillation following coronary artery bypass grafting surgery. *Eur. Heart J.*, May 2009; 30: 1270-8

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- Relation of obesity to atrial fibrillation after isolated coronary artery bypass grafting. Am J Cardiol, Mar 2009; 103: 663
- A Prospective Study Evaluating the Role of Obesity and Obstructive Sleep Apnea for Outcomes After Catheter Ablation of Atrial Fibrillation. J Cardiovasc Electrophysiol, Nov 2009
- Atrial fibrillation and obesity an association of increasing importance. J Am Coll Cardiol, May 2010; 55: 2328-9. Editorial
- Atrial fibrillation and obesity among older Chinese: The Guangzhou Biobank Cohort Study. Int J Cardiol, Nov 2009
- Association of obesity and atrial fibrillation among middle-aged and elderly Chinese. Int J Obes (Lond), Nov 2009; 33: 1318-25
- Overweight and obesity as risk factors for atrial fibrillation or flutter: the Danish Diet, Cancer, and Health Study. Am J Med, May 2005; 118: 489-95
- Obesity and risk of new-onset atrial fibrillation after cardiac surgery. Circulation, Nov 2005; 112: 3247-55

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- Effect of obesity on atrial size in older women with non-valvular paroxysmal atrial fibrillation. Aging Clin Exp Res. 2009 Aug-Oct;21(4-5):344-8.
- Metabolic syndrome in patients with atrial fibrillation in the absence of structural heart disease from a tertiary hospital in China. Chin Med J (Engl). 2009 Nov 20;122(22):2744-7.
- A Prospective Study Evaluating the Role of Obesity and Obstructive Sleep Apnea for Outcomes After Catheter Ablation of Atrial Fibrillation. J Cardiovasc Electrophysiol. 2009 Nov 17
- The aging process of the heart: obesity is the main risk factor for left atrial enlargement during aging the MONICA/KORA (monitoring of trends and determinations in cardiovascular disease/cooperative research in the region of Augsburg) study. J Am Coll Cardiol. 2009 Nov 17;54(21):1982-9

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