

Letters to the Editor

Obesity and diabetes

Dear Sir,

In their original paper, Modan et al. [1] stated "the association with degree of overweight was non-linear, with threshold effects of BMI ≥ 31 for Type 2 diabetes, which were evident in all age, sex and blood pressure categories and in three of our four ethnic groups". In their reply [2] to my letter, they retract this somewhat, stating that "there is a continuous increase throughout the body mass index range with a sharp increase when body mass index reaches values above 31 - evident in both Type 1 and Type 2 diabetes". Do they really mean Type 1? However, I now realise that neither position can be inferred from the data presented, for it does not allow for any effects of age upon the prevalence of diabetes at the second examination when glucose tolerance tests were performed, although the age range at the first examination was wide - from 40-70 years. It is true that past BMI significantly related to diabetes prevalence independently of age in their multiple logistic regression, but this does not provide information on the shape of the association with BMI, i.e. linear or non-linear. If the latter, then logistic regression may not be appropriate anyway.

The data of Westlund and Nicolaysen [3] were based on a narrow age range (40-49 years) and indicate a non-linear association between relative body weight and 10-year incidence of diabetes. However, given the small numbers it might not be possible to determine whether the non-linear association was indeed a threshold phenomenon. In the Gothenburg Study [4] a cohort of men aged 54 years was studied for 13 years, during which 37 (6.3%) developed diabetes. When incidence was plotted against the percentiles of distribution of BMI (and waist-hip ratio) the relationship was non-linear. There were no cases of diabetes from the lowest quintile of BMI distribution, but over the three intermediate quintiles, there was no observable trend in incidence. Incidence was approximately doubled above the 80th centile of BMI.

In the Pima Indian incidence study [5] there was only one case from amongst those with BMI < 20 , but age and sex adjusted rates were not significantly different between BMI categories 20-25 and 25-30.

It is possible to perceive some consensus from these several studies - that the risk of Type 2 diabetes is very different at the extremes of the distribution of BMI but that over a fairly wide range between those extremes there is little or no trend in risk, the implication being that over this range factors other than adiposity are determinants. Modan et al. [2] suggest that physical activity may be one of these. We, however, were unable to find a relationship of leisure time activity and either glucose tolerance or newly diagnosed Type 2 diabetes in the men in the Whitehall Study [6].

Yours sincerely,
R.J. Jarrett

References

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Response from the authors

Dear Dr. Berger,

1) There seems to be a misunderstanding on the part of Dr. Jarrett regarding the term "non linear" as used by us in our study to describe the relationship of the prevalence of Type 2 diabetes with BMI. We used it to describe an initial milder continuous increase and then a sharper one. Both increases were significant, as stated in Tables 3 and 4 of that paper [1].

2) The sentence "evident in both Type 1 and Type 2 diabetes" was an inadvertent editorial change (no galley proofs are forwarded for letters). Clearly our study refers to Type 2 diabetes alone.

3) Although the rate of diabetes increases with age in all BMI categories, the above described relationship with BMI occurs in all ages and thus cannot be accounted for by the confounding effect of age (Table 1).

Table 1. Rate of Type 2 diabetes by year of birth and BMI at the beginning of the 10-year follow-up^a

	1932-1941		1922-1931		1912-1921	
	No. of cases	% Type 2 diabetes	No. of cases	% Type 2 diabetes	No. of cases	% Type 2 diabetes
<21	138	2.9	104	7.7	57	21.1
21-22.9	137	4.4	125	8.8	87	19.5
23.0-24.9	168	4.8	202	13.9	152	23.0
25.0-26.9	142	7.0	158	15.8	154	33.8
27.0-28.9	76	10.5	117	20.5	112	41.1
29.0-30.9	41	7.3	65	33.8	71	39.4
>31	40	35.0	73	37.0	80	56.2

^a Ages were 30-60 at the beginning of follow-up. Diabetes includes newly found and previously known cases