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Anthropometric Characteristics and Multiple Myeloma Risk among Women in the California Teachers Study

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To the Editor

Epidemiologic studies of the association between anthropometric characteristics and multiple myeloma risk have yielded inconsistent results.[1–4] In particular, limited attention has been paid to anthropometric characteristics during early adult life.[2,3,5,6] Recent studies have suggested that height and body mass index (BMI) around age 20 years play a role in the etiology of lymphatic malignancies, and that the association varies by specific subtype.[2,3] We have analyzed data from the prospective California Teachers Study cohort to investigate the role of anthropometric factors in the etiology of multiple myeloma among women.

A detailed description of anthropometric data collection has been published elsewhere.[7] For this analysis, we included 121,216 women (ages 22–84 years) who, at cohort entry in 1995–1996, provided information on height and weight, currently and at age 18 years, and who had no prior diagnosis of hematopoietic malignancy. In a 1997–1998 follow-up questionnaire, 89,324 of these women, with no prior hematopoietic malignancy diagnosis, provided waist and hip circumference measures. During an average follow-up of 11 years through 2007, 111 women were diagnosed with multiple myeloma (International Classification of Diseases for Oncology, Third Edition, morphology codes 9731, 9732, 9734). Of these cases, 78 were after the 1997–1998 questionnaire. Age-stratified multivariable Cox proportional hazards regression models, with age as the time scale, provided hazard rate ratio (RR) and 95% confidence interval (CI) estimates.

The mean age at diagnosis was 72 years (range = 44 – 89). Risk was moderately elevated for women who were at least 64 inches tall relative to shorter women (for 64–65 inches, RR=1.66 [95% CI = 1.03–2.67] for ≥66 inches, 1.53 [0.92–2.55]) (Table). Although women in the second tertile of waist circumference had elevated risk (1.68[0.86–3.27]), this risk was not increased for women in the highest tertile, nor was a trend effect observed across tertiles. No association was observed for other anthropometric measurements. Further analysis after

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exclusion of women with less than 2 years follow-up after each questionnaire did not fundamentally change risk estimates (data not shown).

The biologic mechanisms for a link between adult height and multiple myeloma are not yet established. Insulin-like growth factor-1 is positively associated with height in childhood, and may influence the development of multiple myeloma by influencing B-cell survival and proliferation.[8] These findings of a modest association with height, but no association with the other anthropometric variables assessed, are consistent with findings from a recent European cohort study.[3] In contrast, results from the Iowa Women's Health Study demonstrated a positive association with BMI, weight, waist circumference and hip circumference, but no association for height or waist-hip ratio.[6] Finally, the Netherlands Cohort Study reported no increased risk for either taller or heavier women, although they found taller women had increased risk of all lymphatic malignancies combined.[2]

Depending on the average age of subjects, early adult BMI may represent lifetime body size status better than measurements at cohort entry or diagnosis, as the later measurements may be affected by later life events (e.g., menopause, illness). The Netherlands Cohort Study is the only previous study that examined the association of BMI in early adult life with the risk of multiple myeloma.[2] Although that study confirmed a positive association between BMI at age 20 and overall lymphatic malignancy risk, no association was detected for multiple myeloma. These results are consistent with those observed previously in the California Teachers Study for B-cell non-Hodgkin lymphoma[7] and here for multiple myeloma. Despite the null associations observed in these two studies for multiple myeloma, the number of cases in each study was small, limiting the statistical power to detect associations.

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TABLE

Association between anthropometric measurements and multiple myeloma among women in the California Teachers Study

	Person-years	No. Cases	RR (95% CI)
At cohort entry			
Height (inches)[a]			
<64	429,458	33	1.00
64–65	388,405	39	1.66 (1.03–2.67)
≥ 66	508,557	38	1.53 (0.92–2.55)
Test for trend			$P = 0.13$
Weight (pounds)[a]			
≤130	439,804	38	1.00
131–154	412,438	36	0.85 (0.54–1.36)
≥155	429,490	32	0.71 (0.43–1.16)
Test for trend			$P = 0.18$
Body mass index (kg/m^2)[c]			
<20	138,366	9	0.92 (0.45–1.86)
20–24.9	642,731	55	1.00
25–29.9	319,511	28	0.83 (0.53–1.31)
≥30	180,213	14	0.86 (0.48–1.55)
Test for trend			$P = 0.55$
Reported for age 18			
Weight (pounds)[c]			
≤118	437,160	37	1.00
119–130	441,627	40	1.10 (0.69–1.76)
≥131	397,927	30	1.00 (0.59–1.69)
Test for trend			$P = 0.97$
Body mass index (kg/m^2)[c]			
<20	428,238	41	1.00
20–21.9	432,664	31	0.74 (0.46–1.18)
≥22	409,253	34	0.97 (0.61–1.53)
Test for trend			$P = 0.98$
At second questionnaire			
Waist circumference (inches)[‡b]			
≤29	239,712	12	1.00
29.5–33.5	255,806	32	1.68 (0.86–3.27)
≥34	240,473	24	1.08 (0.54–2.19)
Test for trend			$P = 0.67$
Hip circumference (inches)[b]			
≤37.5	231,457	24	1.00
38–40.5	240,910	22	0.79 (0.44–1.42)

	Person-years	No. Cases	RR (95% CI)
≥41	261,931	23	0.71 (0.40–1.28)
Test for trend			*P* = 0.26
Waist-hip ratio[b]			
≤0.76	252,181	15	1.00
0.77–0.83	249,971	26	1.28 (0.68–2.43)
≥0.84	230,447	27	0.97 (0.51–1.85)
Test for trend			*P* = 0.70
Waist-to-height ratio[d]			
≤0.45	253,473	15	1.00
0.46–0.52	253,887	28	1.20 (0.64–2.27)
≥0.53	226,482	25	0.98 (0.51–1.88)
Test for trend			*P* = 0.78

Note: Categories representing participants with missing information on an anthropometric measure are not shown in the table.

[a]Model was adjusted for weight at cohort entry and race.

[b]Model was adjusted for height at cohort entry and race.

[c]Model was adjusted for height at age 18 and race.

[d]Model was adjusted for race.