

# Prevalence and Predictors of Breast and Cervical Cancer Screening Among Spanish Women With Diabetes

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**OBJECTIVE** — To examine the use of mammography and Papanicolaou (Pap) smear among women with diabetes and to identify predictors of adherence to these tests.

**RESEARCH DESIGN AND METHODS** — We analyzed data of a nationally representative sample of Spanish women. Diabetes status was self-reported. Screenings were assessed asking whether they had a mammography ( $\geq 40$  years) and a Pap smear (18–69 years) within the previous 2 and 3 years, respectively.

**RESULTS** — Women with diabetes were less likely to receive mammography (57.9%) or have a Pap smear (61.5%) than women without diabetes (mammography 61.9%,  $P < 0.05$ ; Pap smear 65.6%,  $P < 0.05$ ). After adjusting for age, educational level, income, comorbidity, tobacco use, obesity, and physician visits, the corresponding odds ratios remained significant (0.84, 95% CI 0.72–0.97) and (0.82, 95% CI 0.66–0.98). Higher educational level was a positive predictor for both tests among diabetic women.

**CONCLUSIONS** — Spanish women with diabetes underuse breast and cervical cancer screening tests.

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Women with diabetes have an increased incidence of breast cancer, and women diagnosed with this cancer who have preexisting diabetes are at increased risk of breast cancer mortality compared with those without diabetes (1,2).

The relationship between diabetes and risk of cervical cancer remains to be evaluated, but cervical cancer mortality is higher in obese women, being these conditions are strongly associated with diabetes (3,4).

Spanish preventive practice guides recommend mammography for women aged 50–69 years every 1–2 years and beginning at 40 years if any condition that increases risk exists (5). For cervical carcinoma, recommendations include screening with Papanicolaou (Pap) smear for 2 years starting 3 years after women become sexually active, and if both yield normal results, repeat every 3 years (6). In

Spain, population-based programs for breast and cervical cancer prevention are established by the Public Health System and provide free mammography and Pap smears to target populations (5,6). However, adherence to the cancer screening guidelines is not known among Spanish women with diabetes.

Studies conducted in the U.S. and Canada have shown that women with diabetes undergo mammography and Pap smear less frequently than women without diabetes (7–10). We aimed to examine and compare the prevalence of receiving breast and cervical cancer screenings among women with and without diabetes and to identify predictors of adherence to these recommendations among women with diabetes.

**RESEARCH DESIGN AND METHODS** — This study was undertaken using individualized data of women

included in the year 2006 National Health Survey (NHS). Details of NHS methodology are described elsewhere (11).

Women were classified as having diabetes if they answered affirmatively to the question: “Has your doctor told you that you suffer from diabetes?”

Receipt of screening for breast cancer was assessed by asking women ages 40 years and older whether they had received a mammography in the previous 2 years and receipt of screening for cervical cancer by asking respondents aged 18–69 years whether they had received a Pap smear within the previous 3 years. The independent variables included in our analyses are shown in Table 1. The variable comorbidity was created and included women with one or more of the following conditions: hypertension, heart attack, chronic heart disease, asthma, or chronic bronchitis. The prevalence estimates for receiving cancer screenings by diabetes status were age-standardized to the 2006 Spanish population.

We have generated four multivariate logistic regression models. First, selecting only women eligible for breast cancer screening ( $n = 12,429$ ), we used mammography as the dependent variable and diabetes status (women without diabetes used as the referent) as the main independent variable, adjusting the model by the rest of covariates. Second, we did the same for Pap smear. Third, to determine which variables were independent predictors of adherence to mammography among women with diabetes, we selected women with diabetes eligible for this test ( $n = 1,222$ ), and using mammography as the dependent variable, we identified which of the covariates analyzed were significantly and independently associated to mammography uptake. Lastly, we repeated this for Pap smear.

**RESULTS** — Women with diabetes were significantly older than women without diabetes (mean ages 67.4 vs. 50.3 years). The prevalence of comorbidity (75.2 vs. 38.5%;  $P < 0.05$ ), obesity (56.1 vs. 25.3%;  $P < 0.05$ ), and “physician visit in the last 4 weeks” (65.7 vs. 44.9%;  $P < 0.05$ ) was higher among diabetic women,

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**Table 1—Age-standardized prevalences of Spanish women with and without diabetes who had received screenings for breast and cervical cancers by selected characteristics and predictors of adherence among diabetic women**

	Mammography (n = 12,429)			Pap smear (n = 13,739)			
	n	Without diabetes	With diabetes (n = 1,222)	Without diabetes	With diabetes (n = 614)		
		%	%	Predictors*	%	%	Predictors*
18–29 years old	1,987	NA	NA	NA	52.0	58.8	1
30–39 years old	3,191	NA	NA	NA	73.4	75.0	1.8 (0.5–6.5)
40–49 years old	3,414	50.8	46.3	1	75.4	68.6	1.6 (0.5–5.1)
50–59 years old	2,680	88.0	83.3	6.7 (3.6–12.5)	69.4†	57.3	1.0 (0.3–3.2)
60–69 years old	2,467	85.9	84.4	5.9 (3.4–10.4)	45.8†	36.2	0.5 (0.2–1.6)
≥70 years old	3,868	33.7†	29.2	0.6 (0.3–1.0)	NA	NA	NA
Primary studies or less	2,815	46.2	48.9	1	39.6	29.0	1
Secondary studies	12,332	64.5†	59.4	1.0 (0.7–1.3)	65.1†	62.6	1.8 (1.1–2.8)
University education	2,599	71.5	73.3	2.1 (1.0–5.5)	77.3	78.8	3.7 (1.3–10)
Income/month <1,200 Ç	8,156	55.9	55.5	NS	55.5	54.2	1
Income 1,200–100 Ç	3,813	66.1†	55.2	NS	68.2†	62.3	1.1 (0.6–1.7)
Income >1,800 Ç	3,760	70.1	66.2	NS	76.7	81.6)	2.0 (1.0–4.7)
No comorbidity‡	10,487	62.3†	56.8	1	66.3†	61.8	NS
Comorbidity	7,346	61.6†	57.3	1.6 (1.1–2.3)	63.8†	57.3	NS
BMI ≥30 kg/m <sup>2</sup>	4,909	56.2†	51.9	1	53.9	58.6	NS
BMI <30 kg/m <sup>2</sup>	12,924	64.4	63.9	1.5 (1.2–2.1)	68.4†	62.6	NS
Smokers	3,924	60.03	53.9	NS	67.3†	63.1	1
Ex-smokers	2,398	69.8	62.6	NS	78.3	78.3	2.3 (1.0–4.7)
Nonsmokers	11,511	60.9†	57.9	NS	60.7†	56.2	1.2 (0.7–2.3)
No physician visit§	8,271	57.6†	54.3	NS	62.9†	60.3	NS
Any physician visit	9,562	66.4†	59.9	1.5 (1.1–2.0)	69.3†	60.8	NS
Total	17,833	61.9†	57.9	NA	65.6†	61.5	NA

The age category prevalences have not been age standardized. \*Predictors are shown as adjusted odds ratio with 95% CI, with odds ratio being adjusted for those covariates with significant results. †P < 0.05, comparing prevalences between women with and without diabetes. ‡Comorbidity included women with one or more of the following: hypertension, heart attack, chronic heart disease, asthma, or chronic bronchitis. §Physician visit in the last 4 weeks. NA, not available.

and smoking was less frequent (6.9 vs. 23.2%; P < 0.05).

Shown in Table 1 are the age-standardized prevalences of screening practices broken down by covariates. Women with diabetes were less likely to receive mammography (57.9%) or have a Pap smear (61.5%) than women without diabetes (mammography 61.9%, P < 0.05; Pap smear 65.6%, P < 0.05). After adjusting for potential confounders, the corresponding odds ratio remained significant (0.84 [95% CI 0.72–0.97] and 0.82 [0.66–0.98]). Shown in Table 1 are the predictors for receiving the screening tests analyzed among diabetic women.

Having a mammography within the last 2 years was associated with age-groups 50–59 and 60–69 years, higher educational level, comorbidity, “visiting any physician in the last 4 weeks,” and BMI <30 kg/m<sup>2</sup>. For Pap smear, the positive predictors were higher educational level, higher income, and ex-smoker.

**CONCLUSIONS**— The main finding of this work is that after adjusting by

sociodemographic and health-related variables, women with diabetes had significantly lower use rates of breast- and cervical cancer–screening tests than women without diabetes. Previous studies have shown a reduction in mammography and Pap smear among women with diabetes (7,8,10). Several explications have been proposed to explain why diabetic women are particularly vulnerable to receiving inadequate preventive care, including increasing time constraints on physicians, more complex diabetes management leaving less time for preventive management, and a perception of diminished survival by patients and/or their physicians possibly making long-term disease prevention seem less important (8–10,12).

Our results also agree with other studies finding that lower economical and educational levels are associated with a lower compliance with screening recommendations, suggesting that sociocultural barriers to adequate health education may also contribute to lower screening in this population (5,8–10,13). Finally, as de-

scribed previously, clustering of unhealthy behavioral risk factors and nonadherence to cancer screening appear among Spanish women with diabetes (9,13,14).

Our study has several limitations. First, self-reported measures of diabetes status and the receipt of cancer screenings were used and are thus subject to recall bias. Second, the NHS does not collect information about characteristics of the diabetes (type, insulin use, duration) that may influence the adherence to the cancer screening guidelines. Lastly, the initial NHS response rate was 65%, so a possible nonresponse bias should therefore be considered (12).

More research is needed to address these issues by examining patients, providers, and organizational factors that can influence access to and quality of care of women with diabetes in Spain. Meanwhile, interventions to increase screening uptake rates such as letters to patients, mailed educational materials, electronic reminder systems, and specific guidelines

for disease management must be considered and implemented (7–10,15).

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## References

1. Larsson SC, Mantzoros CS, Wolk A. Diabetes mellitus and risk of breast cancer: a meta-analysis. *Int J Cancer* 2007;121:856–862
2. Barone BB, Yeh HC, Snyder CF, Peairs KS, Stein KB, Derr RL, Wolff AC, Brancati FL. Long-term all-cause mortality in cancer patients with preexisting diabetes mellitus: a systematic review and meta-analysis. *JAMA* 2008;300:2754–2764
3. Calle E, Rodriguez C, Walker-Thurmond K, Thun M. Overweight, obesity, and mortality from cancer in a prospectively studied cohort of U.S. adults. *N Engl J Med* 2003;348:1625–1638
4. American Diabetes Association. Standards of medical care in diabetes: 2009. *Diabetes Care* 2009;32 (Suppl. 1):S13–S61
5. Luengo-Matos S, Polo-Santos M, Saz-Parkinson Z. Mammography use and factors associated with its use after the introduction of breast cancer screening programmes in Spain. *Eur J Cancer Prev* 2006;15:242–248
6. Puig-Tintoré LM, Torné A, Alonso I. Current techniques in screening for cervical cancer in Spain: updated recommendations. *Gynecol Oncol* 2008;110:S8–S10
7. McBean AM, Yu X. The underuse of screening services among elderly women with diabetes. *Diabetes Care* 2007;30:1466–1472
8. Owens MD, Beckles GL, Ho KK, Gorrell P, Brady J, Kaftarian JS. Women with diagnosed diabetes across the life stages: underuse of recommended preventive care services. *J Womens Health (Larchmt)* 2008;17:1415–1423
9. Zhao G, Ford ES, Ahluwalia IB, Li C, Mokdad AH. Prevalence and trends of receipt of cancer screenings among US women with diagnosed diabetes. *J Gen Intern Med* 2009;24:270–275
10. Lipscombe LL, Hux JE, Booth GL. Reduced screening mammography among women with diabetes. *Arch Intern Med* 2005;165:2090–2095
11. Instituto Nacional de Estadística. Encuesta Nacional de Salud de España 2006 (Spanish National Health Survey 2006). Available from <http://www.msc.es/estadEstudios/estadisticas/encuestaNacional/encuesta2006.htm>. Accessed 4 March 2009
12. Tabaei BP, Herman WH, Jabarin AF, Kim C. Does diabetes care compete with the provision of women's preventive care services? *Diabetes Care* 2005;28:2644–2649
13. Coughlin SS, Uhler RJ, Hall HI, Briss PA. Nonadherence to breast and cervical cancer screening: what are the linkages to chronic disease risk? *Prev Chronic Dis* 2004;1:A04
14. Galán I, Rodríguez-Artalejo F, Díez-Gañán L, Tobías A, Zorrilla B, Gandarillas A. Clustering of behavioural risk factors and compliance with clinical preventive recommendations in Spain. *Prev Med* 2006;42:343–347
15. Bonfill X, Marzo M, Pladevall M, Martí J, Emparanza JI. Strategies for increasing women participation in community breast cancer screening. *Cochrane Database Syst Rev* 2001;1:CD002943