Adherence to breast and cervical cancer screening in Spanish women with diabetes: Associated factors and trend between 2006 and 2010

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Received 17 June 2011; received in revised form 28 September 2011; accepted 29 September 2011

Abstract

Aim. – This study aimed to assess the adherence to breast and cervical cancer screening of women with diabetes mellitus (DM), and the associated factors and trend of use over time of these preventative services between 2006 and 2010 in Spain.

Methods. – The study used data from a population of women aged greater or equal to 18 years (n = 11,957) who participated in the European Health Interview Survey in Spain (EHISS, 2009). Diabetes status was self-reported and included those with type 2 DM. Adherence to screening for cancer prevention was assessed by asking women aged greater or equal to 40 years whether they had undergone mammography and a Papanicolaou (Pap) cervical smear (in those aged 18–69 years) within the previous 2 and 3 years, respectively. Independent variables included sociodemographic and health-related characteristics. Also, the age-standardized prevalences of mammography and Pap smear uptake were compared in women with diabetes between 2006 and 2010.

Results. – Among the diabetic women, 37.9% underwent mammography and 49.1% had a Pap smear vs 53.8% and 64%, respectively, in women without diabetes, with corresponding adjusted odds ratios of 0.81 (95% CI: 0.68–0.97) and 0.74 (95% CI: 0.60–0.91). Among diabetic women, attending more “physician visits” was a positive predictor of having both screening tests. Also, a higher monthly income level was associated with mammography uptake, and a higher educational level with Pap smear uptake. There was also a significant decrease in mammography screening uptake between 2006 and 2010 compared with a stable rate of uptake of cervical cancer screening.

Conclusion. – Spanish women with diabetes consistently underuse breast and cervical cancer screening tests compared with non-diabetic women. The decline in mammography uptake rates needs to be carefully monitored and may even call for intervention.

Keywords: Cancer screening; Adherence; Diabetes; Surveys

Résumé


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doi:10.1016/j.diabet.2011.09.007

**Résultats.** — Une mammographie et un frottis utérin ont été réalisés chez respectivement 37,9 % et 49,1 % des femmes diabétiques, les pourcentages correspondant étant respectivement 53,8 % (OR 0,81 ; IC à 95 % 0,68–0,97) et 64 % (OR 0,74 ; IC à 95 % 0,60–0,91) chez les femmes non diabétiques. Par rapport aux femmes diabétiques, une fréquence plus importante des consultations médicales s’est avérée être un facteur prédicteur positif de réalisation des tests de détection. Un niveau de revenus plus élevé était associé à une réalisation plus fréquente de mammographies, un niveau éducatif plus élevé à une réalisation plus fréquente de frottis utérins. Une diminution significative de l’adhésion aux tests de dépistage du cancer du sein a été observée entre les années 2006 et 2010, alors que la participation aux tests de dépistage du cancer du col utérin restait stable.

**Conclusions.** — La participation des femmes diabétiques espagnoles aux programmes de dépistage du cancer de sein et du col utérin est plus faible que celle des femmes non diabétiques. La diminution des mammographies réalisées entre 2006 et 2010 doit faire l’objet d’une surveillance étroite et pourrait conduire à mener une intervention pour relancer les programmes de dépistage.

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**Mots clés** : Dépistage du cancer de sein ; Dépistage du cancer du col utérin ; Adhésion ; Diabète ; Enquête

1. **Introduction**

   The worldwide incidence of breast cancer and related mortality has been stable or decreasing over the past few years [1,2]; yet, despite this, it is still the primary cause of death among women in the developed and developing countries [1]. This decrease-over-time trend can be explained by improved treatment and early detection by systematic screening programmes [1,3]. Regarding the incidence of cervical cancer, this has also been found to be decreasing in the developed countries. In Spain, which has a lower incidence rate than other European countries, the incidence of cervical cancer has increased by greater than 1% per year over the past decade [4].

   At the same time, cancer patients with diabetes have been associated with a higher risk of mortality compared with cancer patients without diabetes, with a reported increased risk in those with breast cancer (hazard ratio [HR]: 1.61, 95% confidence interval [CI]: 1.46–1.78) [5] as well as an increased risk of death due to cervical cancer [6]. Furthermore, diabetes has been found to be an independent risk factor for developing cancer and, specifically, breast and cervical cancer [6–9].

   Screening activities have proved effective in reducing mortality in some types of cancer [10] and are widely recommended [3,11]. In Spain, breast cancer screening has been established since 1990. All women aged 50–69 years, or all of those aged greater than 40 years if they have any previous risk factor for breast cancer (genetic risk factors, family or personal history of breast cancer), are systematically invited to participate in the programme every 2 years [12]. Studies conducted on the coverage of mammography screenings have reported an uptake of 30 to 48% [12,13] in those aged greater than 40 years, and reached 72% in women aged 50 to 59 years [13]. Cervical cancer screening recommendations include a Papanicolaou (Pap) smear every year for 2 years, starting 3 years after becoming sexually active; if both tests yield normal results, it is then repeated every 3 years [14] as opportunistic screening. Coverage of Pap smear studies has reported uptakes of 54% up to 75.6% [13,14].

   However, the use of these preventative services by women with diabetes has been lower compared with that of non-diabetic women [15–20]. Reported risk factors for such underuse of mammography and Pap smears have included, among others, fear of the results, administrative problems, older age and lower educational levels [15,16,18,21]. Only one study of diabetic Spanish women showed results in line with those previously reported [22]. As patients with diabetes have been proven to have a higher risk of developing cancer and yet are less likely to use the preventative services, it is important to know the rate of screening uptake in this vulnerable population.

   The present study aimed to assess adherence to breast and cervical cancer screening among women with diabetes, as well as the associated factors and trend of use over time of these preventative services between 2006 and 2010.

2. **Methods**

   The present study was based on data from a population of women (n = 11,957) who participated in the European Health Interview Survey (EHIS) in Spain (EHISS, 2009). The EHIS was proposed by the European Commission of the European Union (EU) Member States to create a health information system through a comprehensive and coordinated set of surveys performed within the European Statistical System under the auspices of Eurostat. This meant that all EU States would share common guidelines for the modules (health determinants, health status, healthcare, background variables) and survey design and, therefore, be based on a shared questionnaire. The EHISS was implemented every 5 years, the first wave of which was completed between 2007 and 2009 [23].

   In Spain, the EHISS was conducted by the National Statistics Institute (Instituto Nacional de Estadística, INE), under the aegis of the Spanish Ministry of Health and Social Affairs. This home-based, computer-assisted, personal interview programme examined a nationwide representative sample of the civilian, non-institutionalized population aged 16 years or over and residing in main family dwellings (households) across Spain. Study subjects were selected by probabilistic multistage sampling, with the first-stage units being census divisions and the second-stage units being main family dwellings. Details of the EHISS methodology are described elsewhere [24]. The data-collection period started in April 2009 and ended in March 2010.

   For the present study, two dependent variables were selected. The first, mammography as a preventative practice, was assessed by asking the participants whether they had undergone mammography within the previous 2 years. The targeted age range considered eligible for mammography was age 40 years or older. The second variable, uptake of Pap smear screening, was...
assessed by asking participants whether they had undergone cervical cytology within the previous 3 years. Women aged 18 to 69 years were considered eligible for the Pap smear.

Women were classified as having diabetes if they answered affirmatively to the following question, ‘have you ever been diagnosed by a physician with diabetes?’, including type 2 diabetes. The other independent variables also analyzed were sociodemographic characteristics, including age, educational level and monthly income. Level of education was categorized according to the level of schooling completed—namely, primary, secondary or university—whereas monthly income was based on three options: less than 1200 euros; 1200 to 1800 euros; and greater than 1800 euros. Lifestyle risk factors such as smoking habits (current smoker, ex-smoker and non-smoker) and physical activity (‘Yes’ or ‘No’ to engaging in any leisure-time physical activity in the last month), and healthcare-related variables, including visits to the gynaecologist and/or general practitioner within the previous 4 weeks, were also considered. The presence of any self-reported chronic diseases, including hypertension, heart attack, chronic heart disease, asthma and chronic bronchitis, were classified as having a concomitant co-morbidity. These variables were derived from answering either ‘Yes’ or ‘No’ to the following question: ‘have you ever been diagnosed by a physician with these diseases?’. Obesity was assessed from the body mass index (BMI) score calculated from self-reported body weight and height, with a score greater or equal to 30 kg/m² classified as obese.

To analyze the time trend (2006 to 2010) in the prevalence of adherence to mammography and Pap smears among diabetic women, the database of the Spanish National Health Survey (NHS) conducted in 2006 and 2007 was used. The methods and results of the survey in 2006 have been published by our group elsewhere [22].

2.1. Statistical analysis

A descriptive analysis of all study variables was performed, followed by the prevalence of the uptake of both screening tests according to the study variables, stratified by diabetes status and calculated along with the 95% CI. The age-standardized prevalences of both screening tests were also estimated and compared according to study variables. In addition, logistic-regression analyses were conducted to estimate the differences between diabetic and non-diabetic women who had undergone the screening tests. Then, to determine which variables were independent predictors of mammography use among women with diabetes, the diabetic women eligible for the test were selected and, using those who underwent mammography as the dependent variable, multivariate logistic regression was applied. The adjusted odds ratio (OR) and 95% CI were calculated to measure the strength of association. This procedure was repeated for the Pap smears.

In addition, the 2006 NHS and 2009 EHISS databases were combined to estimate the time trends for uptake of the two screening tests among diabetic women. For this, two multivariate logistic-regression models were constructed, using each year (2006 and 2009) as the main independent variable, and adjusted by age. Multivariate logistic regressions were conducted using the variables that, in the two-variable analysis, were statistically significant and those that, although not statistically significant, were of interest from a healthcare and epidemiological standpoint. Variables were eliminated, one at each step, according to their significance in the model used (Wald statistic) and considering the model’s goodness of fit with the previous step (likelihood ratio test). The effects of interaction among the variables included in the final model were also examined. All estimates were made using the statistical software package Stata 9.1 (StataCorp LP, College Station, TX, USA).

As this investigation was conducted using de-identified public-use databases, it was not necessary to have the approval of an ethics committee according to Spanish legislation. Informed consent, however, was obtained by the INE from all participants included in the 2009 EHISS [24].

3. Results

3.1. Baseline characteristics

Comparing the demographic and clinical characteristics of the women with diabetes (n = 978) with those without diabetes (n = 10,979) revealed that the mean age of diabetic women was 69.4 years vs 51.8 years of women without diabetes (P < 0.001), and that diabetic women were more likely to have only a primary-school education or less compared with non-diabetic women (80.6% vs 42.4%, respectively; P < 0.001) and a monthly income less than 1200 € (50.5% vs 29%, respectively; P < 0.001). Co-morbidity, obesity and the prevalence of visiting a physician in the previous 4 weeks showed significantly higher percentages among diabetic vs non-diabetic women (76% co-morbidity, 35.5% obesity and 58.7% visited a physician among diabetic women vs 33%, 14.4% and 35.3%, respectively, among those without diabetes). On the other hand, diabetic women were less likely to report a smoking habit than non-diabetics (8.8% vs 24%, respectively; P < 0.001).

3.2. Uptake of mammography

The prevalence among Spanish women with and without diabetes who underwent screening for breast and cervical cancer are presented in Table 1 according to selected characteristics. The mammography rate was lower among women with diabetes than without diabetes (37.9% vs 53.8%, respectively). On comparing women with and without diabetes, the percentages of screening by mammography increased with age to a maximum percentage in women aged 50 to 59 years (77% with diabetes, 81.4% without), whereas women aged 70 years or over showed the minimum uptake rate, regardless of diabetes status. Prevalence of mammography screening also increased with higher educational levels and higher monthly incomes. Indeed, diabetic women who completed secondary education showed the highest rate (59.8%) whereas, in non-diabetic women, the highest percentage (69.8%) was found in those with a university education. Also, the group with a monthly income greater than 1800 € had the highest uptake rate among diabetic and non-diabetic women.
The prevalence of Pap smears over the last 3 years in women with diabetes was 49.1% vs 64% in those without diabetes ($P < 0.05$). Pap smear screening uptake was higher among younger women than older ones. Women aged 40 to 49 years were more likely to undergo a Pap smear with and without diabetes (76.3% and 73.6%, respectively) whereas, in women aged greater than 60 years, the rate of mammography fell to 36% in those with diagnosed diabetes and to 48% in those without diabetes. The prevalence of screening increased with higher educational levels and monthly incomes among women with and without diabetes, and non-obese women had higher rates of screening compared with obese women, regardless of diabetes status. In both diabetic and non-diabetic women, ex-smokers had higher rates of screening than did non-smokers. In addition, the adjusted OR for Pap smears among diabetic women was 0.74 (95% CI: 0.60–0.91) compared with non-diabetic women.

The results of multivariate logistic regression to analyze the predictors of having a mammogram in diabetic women are shown in Table 2. Having a mammogram within the previous 2 years was positively associated with being aged 50 to 59 years (OR: 2.4, 95% CI: 1.1–5.5) and 60 to 69 years (OR: 2.1, 95% CI: 1.2–5.6), higher monthly income levels (OR: 1.9, 95% CI: 1.2–3.2) and visiting a physician in the previous 4 weeks (OR: 1.5, 95% CI: 1.1–2.3).

Table 3 shows the predictors associated with having a Pap smear in the previous 3 years; higher educational levels, being an ex-smoker, and visiting a physician in the last 4 weeks were all positively associated with higher screening uptakes. Being obese (OR: 0.6, 95% CI: 0.4–0.8) and aged 60 to 69 years (OR: 0.3, 95% CI: 0.1–0.7) were associated with being less likely to undergo a Pap smear.
Table 2
Predictors of adherence to mammography screening in diabetic women participating in the European Health Interview Survey in Spain (EHISS), 2009.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40–49</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>50–59</td>
<td>2.4 (1.1–5.5)</td>
<td></td>
</tr>
<tr>
<td>60–69</td>
<td>2.1 (1.2–5.6)</td>
<td></td>
</tr>
<tr>
<td>≥ 70</td>
<td>0.2 (0.1–0.3)</td>
<td></td>
</tr>
<tr>
<td>Monthly income level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1200 €</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1200–1800 €</td>
<td>1.1 (0.7–1.7)</td>
<td></td>
</tr>
<tr>
<td>&gt; 1800 €</td>
<td>1.9 (1.2–3.2)</td>
<td></td>
</tr>
<tr>
<td>Physician visit in last 4 weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.5 (1.1–2.3)</td>
<td></td>
</tr>
</tbody>
</table>

NB: only variables with a significant association are presented here.

Time-trend analysis of the age-standardized prevalence of mammography screening in diabetic women between 2006 and 2010 showed a significant overall decrease: the age-standardized prevalence in 2006 was 57.6% vs 51.9% in 2010 (OR: 0.75, 95% CI: 0.64–0.90; P = 0.003). As for Pap smears, despite a slight increment in screening uptake, there were no significant differences over time (61.5% and 64.0%, respectively; OR: 1.1, 95% CI: 0.85–1.43; P = 0.44). Indeed, no significant interactions were found in any regression model.

4. Discussion

Our present study confirms that women with diabetes have significantly lower rates of adherence to breast and cervical cancer screening, after adjusting for age, than women without diabetes. Another important finding was that, in women with diabetes, there was a significant decrease in uptake of mammography screening uptake between 2006 and 2010, but a stable rate of uptake of cervical cancer screening.

Lack of a mammogram or Pap smear may have been due to two factors: women were either not invited by their healthcare physician to have these tests or they were invited, but did not undergo the test. In Spain, women are recruited to undergo mammography with a letter of invitation if they are aged 50 to 69 years; however, the physician must follow-up the patient’s compliance and takes action if the test is not done. Underuse of cancer screening among diabetic women has been found in previous observational studies in Spain [22] and in other countries as well [15,16,18,19,27]. The authors have suggested that diabetes management may compete with women’s preventative healthcare because of their focus on clinical control of their diabetes and the perception that long-term disease prevention is less important [16,18,19]. Physicians and patients tend to prioritize demands and to only deal with the most pressing or symptomatic problems, thus leading to clinical inertia. Competing demands have also been shown to interfere with depression care, mammography screening and counseling to stop tobacco use [25].

In our present study, the predictor of mammography and Pap smear uptake being ‘having visited a physician in the last 4 weeks’ is in line with other reports [16–18,22]. Although diabetic women make more frequent visits to a physician than women without diabetes, they are less likely to have performed any preventative screening service, a result that was explained above as the control of diabetes taking precedence over cancer screening. Nevertheless, the present study authors agree with the other authors who suggest that better diabetes-related procedures of care are associated with greater adherence to breast and cervical cancer screening [17]. In line with this suggestion, our present study showed that diabetic women with healthy behavioural risk factors, such as a non- or ex-smoking habit, and non-obese women were more likely to have a Pap smear test, a finding also described in other studies [15,22]. In effect, patients who adhere to preventative therapies may be more likely to engage in a wide spectrum of behaviours consistent with a healthy lifestyle [26]. However, as many of these behaviours cannot be measured easily, observational studies of outcomes associated with the long-term use of preventative therapies are subject to the so-called ‘healthy-user bias’.

In addition, as described above, higher economic status was positively associated with having a mammogram [19]. This is noteworthy as, in Spain, free mammography is offered to all women. Nevertheless, private health insurance is more common among higher-economic-status women, and having private health insurance has been associated with higher rates of mammography uptake [13]. Regarding Pap smear tests, higher educational levels are positively associated with Pap smear uptake, as other studies have shown [13,14,22]. Also, the youngest diabetic women showed the highest odds of cervical cancer screening, which might be related to the recent introduction of human papillomavirus (HPV) vaccination in Spain that may have acted as a ‘pull’ factor for younger women, as other authors have previously described [28].

Furthermore, our present study found a significant decrease in adherence to mammography screening between 2006 and 2010, which agrees with some studies [29,30], but differs from other, observational studies, which report an increasing time trend [31,32]. Although Spanish studies have reported a rate of mammography screening adherence of 90% among the general population [33], our present results suggest that, in women with
diabetes, the rate of adherence is considerably lower. Factors that might be related to lower adherence are false-positive results in previous screenings [34,35] and administrative problems or an unwillingness to take the test [12].

In contrast, we found a stable trend, or even a slight increase, for Pap smear uptake, which contradicts other studies carried out in the general population [36] that found a decrease in Pap smear uptake.

Our present study has several limitations. The wide difference in age between the diabetic and non-diabetic women (69.4 years and 51.8 years, respectively) made direct comparisons of the prevalences between the two groups unreliable, as age would be a confounding factor. For this reason, to control the confounding effect of age, we estimated and compared the age-standardized prevalences in women with and without diabetes of both screening tests according to study variables, and constructed multivariate logistic-regression models. In addition, self-reported measures of diabetes status and uptake of cancer screenings were used in our analyzes and are therefore subject to recall bias. Nevertheless, some studies suggest that, despite the fact that overestimation of adherence to cancer screening may occur, self-reporting may be the only effective and feasible way to gather data on preventative services uptake among large samples of the population [37]. Furthermore, studies conducted in Spain have reported high sensitivity, specificity and concordance between self-reported diabetes and medical records used as a reference [38]. Moreover, the EHISS did not collect information on the characteristics of diabetes (insulin use, duration) that might have influenced adherence to cancer-screening guidelines. Given the low prevalence of type 1 diabetes (compared with type 2) among the adult Spanish population, we assumed that greater than 95% of women were type 2, although a small number of women with type 1 may have been included in the study population [39]. However, in the opinion of the present study authors, such a misclassification bias would have an insignificant effect on the validity of our results. Finally, the initial EHISS response rate was 64%, so a possible non-response bias needs to be considered [24].

5. Conclusion

Women with diabetes continue to be a vulnerable population that underuses cancer preventative services on examination according to sociodemographic characteristics, such as educational and economic levels, and behavioural risk factors. Educational programmes targeted at the general population and healthcare professionals, as well as diabetic women, to increase awareness of the importance of these preventative services need to be developed. In addition, interventions to increase screening uptake such as electronic reminders and active recruitment strategies, including follow-up telephone calls and/or a second letter of invitation, should be considered and implemented [40].

Author’s contributions

M.A. M.-H. researched the data, contributed to the discussion, wrote the manuscript and reviewed/edited the manuscript. A.L.A. contributed to the discussion, and reviewed/edited the manuscript. V.H.-B. researched the data, and reviewed/edited the manuscript. D.P.C. contributed to the discussion, and reviewed/edited the manuscript. P.C.-G. contributed to the discussion, and reviewed/edited the manuscript. D.M.H. contributed to the discussion, and reviewed/edited the manuscript. R.J.-G researched the data, contributed to the discussion, wrote the manuscript and reviewed/edited the manuscript. All authors reviewed and gave their final approval of the submitted manuscript.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

Acknowledgements

The present work was supported by a grant from the Instituto de Salud Carlos III (ISCIII; Carlos III Institute of Health) (ETES: PI09/90515).

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