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Low levels of breast cancer risk awareness in young women: An international survey

Victoria Peacey[a], Andrew Steptoe[b], Sigurlína Davídsdóttir[c], Adriana Baban[d], Jane Wardle[a,*]

[a]Cancer Research UK Health Behaviour Unit, Department of Epidemiology and Public Health, University College London, Gower Street, London WC1E 6BT, UK
[b]Department of Epidemiology and Public Health, University College London, London WC1E 6BT, UK
[c]Department of Education, Oddi v/Sturlugata, University of Iceland, 101 Reykjavik, Iceland
[d]Department of Psychology, Babes-Bolyai University, 37 Republicii, Cluj 400015, Romania

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ABSTRACT

At least a fifth of breast cancer cases in Western countries are likely to be due to modifiable lifestyle factors. Previous work has found that while women in Western countries are aware that breast cancer can be hereditary, their knowledge of the influence of lifestyle is poor. This survey investigated on the awareness of breast cancer risk factors in university students from 23 countries between 1999 and 2001. Data were collected on awareness of links with heredity, alcohol use, exercise, obesity, stress, smoking and diet. Almost a third of women were not aware that any of these factors influenced breast cancer. Just 57% were aware of the genetic link and fewer than 1 in 20 women correctly identified alcohol, exercise or obesity as factors influencing breast cancer. Stress and smoking were the most commonly chosen lifestyle risk factors although current data suggest that they have little actual impact on breast cancer risk. There was considerable international variation, with highest levels of awareness in students in the United States of America (USA). Knowledge of risk in this sample was poorer than previously observed in older women. Health messages concerning cancer in general may be more relevant for this age group, because of the lower salience of breast cancer for younger women.

1. Introduction

Women wishing to reduce their personal risk of breast cancer need to be aware of potential risk factors in order to make informed lifestyle choices. Recent data from population surveys in Ireland and Great Britain[1,2] suggest that knowledge about breast cancer is poor. In the Irish survey, women over-estimated the prevalence of breast cancer and under-estimated the average age of onset. In both surveys, they showed little discrimination about risk factors, with many more nominating stress and smoking as risk factors than recognising the well-established risk factors. The highest awareness of any risk factor was for 'family history', which was endorsed by over 90% of respondents in both countries. Other studies have also found poor knowledge of breast cancer risk factors other than hereditary risk.[3]

In terms of actual risk factors, several breast cancer genes have been identified, but these 'high-penetrance' mutations cause no more than 5–10% of breast cancer cases.[4] The major causes are believed to be lifetime exposures to environmental and lifestyle factors, acting either alone or in combination with susceptibility genes of lower penetrance. Age at menarche, age at menopause and parity have all been implicated in breast cancer risk,[5] and evidence that exogenous hormones

* *Corresponding author:* Tel.: +44 20 76796642; fax: +44 20 78132848.
E-mail address: j.wardle@ucl.ac.uk (J. Wardle).
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play a role is increasingly strong.[6] In terms of lifestyle, the most important factors are alcohol intake,[7,8] weight and physical activity.[9] In contrast, smoking and stress, which were perceived as relatively important by the respondents in the Irish survey, are not thought to play a significant aetiological role. Higher alcohol consumption is related to risk in a linear fashion, with a 7% increase in relative risk for each additional ten grams of alcohol per day,[10] and it has been estimated that between 2% and 4% of breast cancer cases in the developed world are attributable to alcohol.[10,11] It has also been estimated that in industrialised countries, at least 11% of breast cancer incidence can be attributed to physical inactivity and at least 9% to obesity.[9] Therefore, a fifth or more of all cases of breast cancer in industrialised countries are likely to be attributable to modifiable lifestyle factors – considerably more than the proportion of cases caused directly by high-penetrance breast cancer genes.

The aim of this survey was to assess knowledge of breast cancer risk factors in a large sample of young people from 23 countries. Female university students are likely to have an elevated risk of breast cancer later in life, because higher socio-economic status (SES) is linked to higher breast cancer incidence. Over 19000 male and female university students from 23 countries were surveyed to explore variation in awareness of breast cancer risk factors as part of the International Health Behaviour Survey. To date, most studies on breast cancer risk factor awareness have been limited to single countries and an all-female sample. Male students are included in this analysis as a comparison group to provide insight into whether women have additional knowledge about a condition to which they are much more susceptible.

2. Method

2.1. Study design and sample

The International Health Behaviour Survey (IHBS) was carried out in 23 countries between 1999 and 2001.[12] Data collection was done by a questionnaire, using measures developed for a very similar survey in 1990.[13] The questionnaire items were developed in English, then translated into the language of each participating country. Collaborators working in universities asked classes of students studying for non-health-related courses to complete the questionnaire at the end of a teaching class. Although completing the questionnaire was voluntary, participation rates in most countries were over 90%. Students were told that the survey concerned activities related to health and that an international comparison was

Table 1 – Percentage of female students believing that each factor has an influence on breast cancer (age-adjusted)

	n	Heredity	Alcohol	Exercise	Overweight	Stress	Smoking	Dietary fat	Fibre
USA	1120	93.7	10.1	17.9	15.9	19.5	26.6	13.0	11.2
Northern Europe									
Belgium	277	70.7	1.2	2.8	4.1	9.3	13.8	6.0	4.0
Great Britain	382	72.6	4.0	3.5	6.6	9.5	23.6	5.2	6.0
France	368	52.5	3.0	0.9	1.4	8.3	13.0	2.5	2.7
Germany	391	75.2	3.8	1.6	2.7	13.4	26.9	2.5	2.8
Iceland	361	63.5	1.9	11.0	3.8	13.3	48.4	2.2	3.6
Ireland	360	78.7	2.2	5.0	4.0	19.8	28.9	4.0	3.9
Netherlands	408	91.3	1.7	3.9	2.4	6.6	17.8	5.4	8.8
Eastern Europe									
Bulgaria	417	25.4	2.9	1.9	1.7	20.4	19.2	4.3	5.5
Hungary	352	54.3	3.1	3.9	1.9	11.1	21.4	5.4	5.2
Poland	424	73.1	3.1	0.9	1.4	9.9	17.3	2.4	2.2
Romania	393	47.9	3.8	2.8	5.1	13.2	6.8	6.3	3.6
Slovak Rep	699	49.9	2.1	1.7	4.0	11.7	17.4	3.7	11.5
Southern Europe									
Greece	395	75.8	5.0	4.7	4.5	19.2	40.7	5.8	14.7
Italy	1245	57.7	2.1	0.7	2.0	6.4	15.9	3.6	7.1
Portugal	468	53.0	1.1	0.2	1.9	3.8	10.6	2.3	4.5
Spain	264	67.1	6.8	3.0	6.4	6.0	30.3	10.6	3.4
Asia									
Japan	264	63.3	1.6	2.1	6.6	11.9	7.4	9.9	13.3
Korea	468	24.2	1.1	0.4	3.6	1.7	0.2	4.9	4.3
Thailand	523	35.1	3.1	3.4	4.3	6.4	5.0	10.6	3.6
Africa and South America									
Colombia	387	13.3	6.0	4.7	5.7	8.1	14.6	9.1	*
South Africa	413	18.4	3.4	5.3	1.3	1.9	5.8	4.6	17.2
Venezuela	345	55.7	2.9	4.2	7.9	15.2	11.8	14.0	6.1
Total	10724	57.1	3.3	3.8	4.3	10.7	18.4	6.0	6.6

* Not asked. USA, United States of America.

being carried out. Students between the age group of 17 and 30 were included in these analyses, and 95% of the respondents were under 25. The numbers in each country can be seen in Table 1.

2.2. Measures

Awareness of risk factors was assessed by means of a grid. Five columns across the page listed the following health problems: heart disease, lung cancer, mental illness, breast cancer and high blood pressure. The eight rows listed seven lifestyle factors that might affect health (smoking, alcohol, exercise, stress, dietary fat, dietary fibre and overweight), as well as heredity. The participants were instructed as follows: 'For each health problem, put a cross in the box if you believe that it is influenced by the factor shown. For example, if you believe that heart disease is influenced by smoking, you should put a cross in the first box on the first line.'

Two hundred and one respondents (1%) were excluded from the analysis because they either selected all the boxes available or did not select any boxes at all. Although data were collected on five diseases, only the findings relating to breast cancer are reported here.

2.3. Statistical analysis

Data were analysed using Statistical Package for the Social Sciences (SPSS) version 10.1 to obtain the age-adjusted percentage of students believing in each risk factor in each country. Odds ratios (ORs), 95% confidence intervals (CIs) for ORs, and p values were obtained from logistic regression conducted using STATA svylogit. Country was entered as the primary sampling unit for survey analysis in STATA version 8 in order to achieve accurate CIs, given the clustered nature of the data.

3. Results

Table 1 shows the age-adjusted proportion of female students in each country believing that each of the listed causes had an influence on risk. Nearly one third of the respondents were not aware that any of the factors influenced breast cancer. The respondents were more likely to be aware of heredity as a risk factor than to be aware of any of the lifestyle factors. Overall, 57% of women were aware of genetic causes, but there was a wide variation between countries with 94% of female students from the United States of America (USA) being aware of the influence of heredity, compared with just 13% of Colombians. Among respondents from Northern Europe, relatively low levels of awareness were reported by French women.

Only 34% of women believed that any of the lifestyle factors were relevant. After heredity, the most commonly endorsed risk factor was smoking (18% of women). Again, there was considerable variation between countries; nearly half (48%) of women in Iceland believed in a link with smoking compared with virtually no women in Korea. The next most common belief was that breast cancer is influenced by stress, held by 11% of respondents. The other five lifestyle factors (alcohol, exercise, dietary fat, dietary fibre and being overweight) were endorsed by fewer than 8% of respondents.

The proportion of women agreeing that any particular factor was linked to breast cancer was always higher than the proportion of men, but the sex difference only reached significance for three factors. Women were significantly more likely than men to believe that breast cancer is influenced by heredity (OR 1.78, CI 1.52–2.07), stress (OR 1.27, CI 1.11–1.46) and smoking (OR 1.17, CI 1.04–1.32). Women also were more likely to endorse one or more lifestyle factors (OR 1.16, CI 1.05–1.29). However, proportions of men and women believing in each risk factor were highly correlated across countries (range from $r = 0.68$ to $r = 0.96$, $p < 0.001$), indicating broader cultural influence on knowledge.

4. Discussion

The aim of this survey was to assess awareness of breast cancer risk factors in a sample of educated young people across many parts of the world. The results showed that awareness of the influence of lifestyle on the disease was much less common than awareness of the influence of heredity. Even in this well-educated population, awareness of the genetic link was not particularly high, with nearly half (43%) of women surveyed being unaware of it. Women in the USA and most of Western Europe were generally aware of the influence of heritability (comparable with the 90% awareness found in the British and Irish population surveys[1,2]), but very low levels of awareness were found in some countries in Eastern Europe, Asia, Africa and Latin America.

Awareness of other risk factors for breast cancer was low throughout all the countries studied. The influence of alcohol on the risk of developing breast cancer is well-established,[7,8] but in our sample only 3% of women were aware of alcohol as a risk factor and of all the listed factors it was the least likely to be selected as influencing breast cancer. Female students were five times more likely to believe in an (unsupported) link between smoking and breast cancer than they were to be aware of the well-established link between breast cancer and alcohol.

The link between obesity and breast cancer is also well-established. However, the relationship is not as straightforward as the link with alcohol, because excess weight appears to confer some protection against pre-menopausal breast cancer while increasing the risk of breast cancer after the menopause.[9,14,15] Although the wording of the question in our study was designed to elicit knowledge of positive as well as negative effects of lifestyle and genetic factors, only 4% of female respondents believed that being overweight can influence breast cancer. The Asian and South American countries in the study tended to have a slightly higher proportion of female students believing in a link than the European countries, but the highest awareness was in the USA (16%).

Cohort studies have also found a significant protective effect of physical activity for breast cancer risk, with the recent review from the International Agency for Research on Cancer (IARC) concluding that most studies observed between 20% and 40% reduction in risk for physically active compared with inactive women.[9] In our survey, just 4% of women were aware

that exercise could influence breast cancer. Interestingly, although students from the USA were the most likely to be aware of this link, women in the developing countries in our survey tended to have higher awareness than women in developed countries.

The influence of dietary factors other than alcohol on breast cancer risk is not well-established. There is limited evidence that a high intake of certain types of fat may slightly increase risk,[16–18] and also mixed evidence that high fruit and vegetable consumption may confer a small protective effect.[4,14] Dietary fibre does not appear to affect breast cancer risk.[19,20] In our survey, 6% of female respondents thought that dietary fat influenced breast cancer, and 7% believed that breast cancer was influenced by fibre consumption.

Stress and smoking were the two most commonly endorsed lifestyle factors, a finding similar to the other surveys in Great Britain and Ireland. Nearly a fifth (18%) of women in our survey believed that smoking could influence breast cancer, which was the most commonly endorsed of any of the lifestyle factors in the survey. Although the picture is still somewhat unclear, smoking seems to have minimal impact, if any, on breast cancer risk.[21] Women's belief in smoking as a cause of breast cancer was highest in the USA, Northern Europe and Southern Europe, but extremely low in the Asian countries surveyed. Rates of belief in the link between stress and breast cancer varied from over 20% of Bulgarian women to less than 2% of Korean and South African women. In fact, the evidence supporting a link between stress or major life events and breast cancer is not clear and there is presently no expert consensus.

British and Irish women's awareness of heredity, alcohol and overweight as risk factors was lower in our survey than in previous surveys of Irish and British women.[1,2] The lower awareness found in our survey is likely to be related to the youth of our respondents. Awareness of heredity and many other lifestyle factors was also strikingly low among French respondents compared with women from other Northern European countries. Women attending genetic cancer risk clinics in France have lower expectations of receiving advice about lifestyle than women in the Great Britain or Canada,[22] and a more negative attitude to preventive surgery.[23] French clinical geneticists are less likely to make recommendations concerning diet and other lifestyle factors than those in other countries,[22] and the result may be a lower level of awareness among French women.

In most cases, female students' awareness of breast cancer risk factors was not significantly different from their male counterparts. Women were more likely to know about the link between heredity and breast cancer, but also more likely to believe in an unsupported link between smoking and stress and breast cancer. As breast cancer is a predominantly female disease, it is surprising that women do not know more than men about its causes.

4.1. *Limitations*

The respondents were not representative of the population in each country and therefore we cannot draw conclusions about awareness of breast cancer risk factors in the general population. The inferences that can be drawn from this study are also limited by the cross-sectional design. Single-time measures of awareness of cancer risk factors are likely to be vulnerable to 'scare stories' in the media at the time of the survey. When respondents are asked about cancer risk factors, surveys using prompted recall questions tend to find higher levels of awareness than surveys using unprompted recall.[3] Although the levels of awareness in this survey were very low for some factors, they may still have been inflated by the question format but we are not able to assess any inflation effect. The data were collected between 1999 and 2001, so the pattern of awareness may differ from the current situation, since expert consensus is likely to take some time to trickle down through the media to the public.

5. Conclusions

It is worrying to know that the two modifiable lifestyle factors most commonly chosen by women as influencing breast cancer, smoking and stress, are probably not very influential in either the development or progression of the disease, while the important risk factors of alcohol, obesity and physical activity are not recognised. However, the misconception that smoking is linked to breast cancer is not particularly surprising as the general theme of 'smoking causes cancer' is repeated so often in public health messages. The information that being overweight, having a high alcohol intake and taking little physical exercise increase breast cancer risk has so far evidently not been communicated effectively to young women in any country. Female students in the USA were the most likely to correctly identify these as influential factors, but even in this group fewer than 20% were aware of each link. Future work needs to assess the extent of the perceived contribution of heritable *versus* lifestyle factors. It is possible that the impact of genetic factors could be over-estimated, leading women without a relative with breast cancer to believe themselves to be at low risk, whereas their true risk is only a little lower than the general population risk.

In most European countries, there has been no decline in breast cancer incidence over the last few decades and indeed many countries are experiencing increasing incidence rates, even in the younger age groups.[24] Better awareness of risk factors is desirable and could reduce incidence, but accurate awareness of disease-specific risk factors may be too much to expect of young adults who probably do not perceive themselves to be at imminent risk of disease. Simpler universal health messages are likely to be easier to assimilate at this age. Weight control, exercise and low alcohol consumption will reduce the risk of many cancers and other diseases, as will refraining from smoking. Simplified messages that promote all of these steps as part of a disease-reducing lifestyle may be more effective in reducing breast cancer risk than attempts to raise awareness of risk factors that are specific to breast cancer.

Conflict of interest statement

The authors are not aware of any relationships with other people or organisations that could have inappropriately influenced this work.

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