Article Title: BREAST CANCER AND DEODORANTS/ANTIPERSPIRANTS: A SYSTEMATIC REVIEW

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Summary:

Background: Over the last decade, the possible association between underarm deodorants/antiperspirants use and breast cancer risk has raised important interest in the scientific community. The objective of our systematic review is to estimate the pooled risk of deodorants/antiperspirants use for breast cancer.

Methods: All observational studies that evaluated the association between breast cancer risk and deodorants/antiperspirants use were reviewed. We have only identified two case-control studies, carried out between 2002 and 2006.

Results: The first study was conducted in the USA and investigated the possible relationship between the use of products applied for underarm perspiration and the risk for breast cancer in women aged 20–74 years. This population-based case-control study gathered information by in-person interview. The second study was conducted in Iraq and investigated the possible relationship between the use of antiperspirants and the risk for breast cancer in women attending a teaching hospital. This study also gathered information by in-person interview. There was no risk of antiperspirants use in the pooled risk (odds ratio 0.40, 95% confidence interval 0.35–0.46).

Conclusion: Our comprehensive search has identified an insufficient number of studies to conduct a quantitative review and obtain reliable results. Further prospective studies are strongly needed.

Key words: cancer, antiperspirants, deodorants, breast, case-control, cohort, systematic review, meta-analysis

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INTRODUCTION

Over the last decade, the possible association between underarm deodorants/antiperspirants use and breast cancer risk has raised important interest in the scientific community. Many narrative reviews and original studies were published about that possible association without definite conclusions (1–7). Darbre found traces of parabens, preservatives used in cosmetics, food and pharmaceutical products, in breast tumors. Although there is no proof that parabens cause cancer and most deodorants no longer contain these compounds, the authors reported that the detection of parabens in human breast tumors is of concern since they have been shown to mimic the action of the female hormone estrogen, which can drive the growth of human breast tumors (6). The study of McGrath surveyed the underarm-hygiene habits of 437 women with breast cancer. Women who shaved their underarms more than twice a week and applied deodorant more than once a week were almost 15 years younger when they were diagnosed with breast cancer than those who used neither regimen. The study found no link with breast cancer diagnosis in younger age when either shaving or deodorant was used alone (7). Another study investigated why carcinoma of the breast is more frequent in the upper outer quadrant. The examined hypothesis of this study was that underarm cosmetics cause breast cancer. The result of the study rejected this hypothesis and showed clearly that the high proportion of upper outer quadrant carcinomas of the breasts is rather a reflection of the greater amount of breast tissue in this quadrant (5).

We present a quantitative review based on published studies that investigated the association between breast cancer and deodorants/antiperspirants use. The aim of the review was to estimate the combined weight of deodorants/antiperspirants use in breast cancer.

MATERIAL AND METHODS

Literature Review

Published observational studies on breast cancer risk and deodorants use were identified through a comprehensive MEDLINE/PubMed search (from 1966 to August 2016) and PsycLIT (from 1887 to August 2016) using a variety of Medical Subjects Headings and free text words (Deodorants or Parabens or Antiperspirants) and (Breast) and (Case-Control or Case-Referent or Retrospective or Cohort or Follow-up or Incident or Prospective or Epidemiology). We conducted additional searches of Current Contents, Best Evidence, previous reviews, examination of cited reference sources, and personal contact and discussion with several experts in the field. Published case reports or studies evaluating deodorants use but not stratified as exposed and no exposed women were excluded. When two or more papers were
based on an identical study, the paper that principally investigated
the relationship between breast cancer and deodorants use was
employed. We considered studies in English, French and Spanish
and no attempts were made to locate any unpublished studies.

Data Extraction
We identified two case-control studies on the basis of our
inclusion criteria. A copy of each paper identified was obtained
and relevant data were abstracted by the first author (M.F.A.) for
a quantitative overview. The odds ratio and the country where the
study was carried out were also ascertained. In case of discrepan-
cies or when the information presented in a study was unclear,
abstraction by a second reviewer (R.F.C.S.) was sought to resolve
the discrepancy.

Statistical Methods for Meta-Analysis
Data were abstracted from every study in the form of a risk
estimate and its 95% confidence interval. Pooled risk estimate
was obtained by weighing each study by the inverse variance of
the effect measure on a logarithmic scale. This approach to pool
the results assumes that the study populations being compared
are similar and hence correspond to a fixed effect analysis (8).

All statistical analyses for pooling the studies were performed
on the STATA Statistical Software, release 7.0 (StataCorp. 2001).

RESULTS
The two case-control studies, which have been identified, were
carried out between 2002 and 2006.
The first study was conducted in the USA and investigated
the possible relationship between the use of products applied for
underarm perspiration and the risk for breast cancer in women
aged 20–74 years. This population-based case-control study
gathered information by in-person interview. The authors asked
whether the respondent regularly shaved under her arms suggest-
ing that deodorants and/or antiperspirants might contain harmful
substances that could be absorbed via small nicks or abrasions
caused by hair removal. The odds ratios for those women who used
antiperspirants exclusively, ever regularly and regularly within 1
hour of shaving were 0.8 (95% CI: 0.6–1.0), 0.9 (95% CI: 0.7–1.1)
and 0.9 (95% CI: 0.7–1.1), respectively. Meanwhile, the odds
ratios for those women who used deodorants exclusively, ever
regularly and regularly within 1 hour of shaving were 1.1 (95%
CI: 0.9–1.4), 1.2 (95% CI: 0.9–1.5) and 1.2 (95% CI: 0.9–1.5),
respectively (9).
The second study was conducted in Iraq and investigated the
possible relationship between the use of antiperspirants and the
risk for breast cancer in women attending Al-Kadhimia Teaching
Hospital. The cases were women attending the oncology clinic
that were diagnosed histopathologically by excisional biopsy,
while controls were attending the general medicine clinic for
various other complaints, not including breast problems. This
hospital-based case-control study gathered information by in-
person interview. The study did not specify whether the women
were asked about the use of antiperspirants and/or deodorants.
We contacted the authors of the study and they informed us that
they asked in Arabic about the antiperspirant use of the “speed
stick” type. The unadjusted odds ratio for those women who
used antiperspirants was 0.24 (95% CI: 0.09–0.63), indicating
protective effect (10).

We pooled OR of women who used antiperspirants regularly in
the study of Mirick et al. (9) with un-adjusted OR of the study by
Fakri et al. (10). Table 1 summarizes the characteristics and results
of the pooled studies. The risk of the antiperspirants applying the
fixed effect model was 0.40 (95% CI: 0.35–0.46).

DISCUSSION
Our quantitative review aimed at evaluating the risk of deodor-
ants/antiperspirants use for breast cancer. Although many reviews
were published about this possible risk only two case-control
studies with original data were conducted and published over the
last 12 years (1–4, 9, 10).

Before reaching conclusions based on the present results,
it is necessary to consider several potential objections to our
procedures. Methodological concerns include limitations in the
quality of the primary data, as the usefulness of a quantitative
review largely depends on the quality of the studies used. Com-
bing randomized controlled trials provides more evidence, but
combining data from observational studies is sometimes desirable
(11), especially in studying the aetiology of a chronic disease as
in our case.

Our comprehensive search has identified two case-control stud-
ies with substantially different numbers of cases (683 vs. 54), an
insufficient number to conduct a quantitative review and obtain
reliable results. Since there are possible biases in the retrospec-
tive case-control studies, the studies can be, at their best, only
indicative (12). Recall bias could alter the results especially that
patients may consider deodorants use trivial. Another potential
bias is to what extent further follow-up would alter the estimates
of the association between deodorants use and breast cancer?

Another possible limitation in the Iraq study is that the con-
trols were derived from patients of an oncological department.
It could be hypothesized that in these controls deodorants might
have caused cancers other than breast cancer; in this case it
would not be logic to speak of a protective effect. Moreover, the

Table 1. Case-control studies evaluating the risk of breast cancer for use of antiperspirants

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Type of study</th>
<th>Number of cases</th>
<th>Number of controls</th>
<th>Odds ratio</th>
<th>95% Confidence interval</th>
<th>Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mirick</td>
<td>2002</td>
<td>Population-based</td>
<td>683</td>
<td>679</td>
<td>0.90</td>
<td>0.70–1.10</td>
<td>Yes</td>
</tr>
<tr>
<td>Fakri</td>
<td>2006</td>
<td>Hospital-based</td>
<td>54</td>
<td>50</td>
<td>0.24</td>
<td>0.09–0.63</td>
<td>No</td>
</tr>
<tr>
<td>Pooled risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.40</td>
<td>0.35–0.46</td>
<td></td>
</tr>
</tbody>
</table>
numbers in the Iraq study are simply too small to come up with any meaningful result.

Our systematic review shows that antiperspirants use could be a protective factor against breast cancer. Our results agree with previous narrative reviews that rejected the possible association between deodorants/antiperspirants use and breast cancer risk (2, 3). One possible explanation for the protective effect of antiperspirants use in our systematic review is that educational level and/or socioeconomic class of participating women could act as a confounding factor. It is expected that women with higher educational level and/or socioeconomic status use deodorants/antiperspirants more frequently. High educational level and socioeconomic status are well known protective factors against breast cancer, after adjustment for number of children and age of mother at birth of the first child (13–15).

The study of McGrath (2003) investigated the intensity of underarm exposure in a cohort of 437 breast cancer survivors. The study showed that frequency and earlier onset of antiperspirant/deodorant usage with underarm shaving were associated with breast cancer diagnosis at younger age. Although this study was not technically a case-control study, its results cannot be ignored. The author recommended realizing new case-control studies to investigate the association between breast cancer and deodorants use (7). However, since then only one case-control study was conducted by Fakri et al. 2006 (10).

Aluminum-based compounds are the active ingredients in antiperspirants. It has been suggested that these aluminum compounds may be absorbed by the skin and cause changes in the estrogen receptors of breast cells. Recent work on cells in culture has lent credence to the hypothesis that this metal could accumulate in the mammary gland and selectively interfere with the biological properties of breast epithelial cells, thereby promoting a cascade of alterations reminiscent of the early phases of malignant transformation (16).

Recent study investigated whether different kinds of underarm deodorants commercially available in Germany might contain substances with estrogenic potential. Twenty five deodorants produced by ten different manufacturers in the form of sprays, roll-ons and sticks were investigated using in vitro-test (E-Screen assay) for the determination of estrogenic activity based on the human breast cancer cell line MCF-7. Seven out of ten spray deodorant samples showed a quantifiable estrogenic activity. In case of the sticks and roll-ons it was only one out of six and one out of nine, respectively (17).

Recently, Darbre and Harvey reported that parabens possess oestrogenic activity and can stimulate sustained proliferation of human breast cancer cells at concentrations measurable in the breast. Parabens also can inhibit the suppression of breast cancer cell growth by hydroxytamoxifen, and through binding to the oestrogen-related receptor gamma may prevent its deactivation by growth inhibitors. The authors concluded that there is evidence that parabens could have alleged responsibility in the occurrence of breast cancer (18).

In conclusion, our systematic review did not reveal any possible association between deodorants/antiperspirants use and breast cancer risk and calls for conducting new studies about this controversial association. Future studies should be performed on large prospective cohorts to increase their internal validity.

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Conflicts of Interests
None declared

REFERENCES

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