

Review

Quality of pharmaceutical advertising and gender bias in medical journals (1998–2008): a review of the scientific literature

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ABSTRACT

Objective: To review the scientific literature on pharmaceutical advertising aimed at health professionals in order to determine whether gender bias has decreased and the quality of information in pharmaceutical advertising has improved over time.

Methods: We performed a content analysis of original articles dealing with medical drug promotion (1998–2008), according to quality criteria such as (a) the number, validity and accessibility of bibliographic references provided in pharmaceutical advertising and (b) the extent to which gender representations were consistent with the prevalence of the diseases. Databases: PUBMED, Medline, Scopus, Sociological Abstract, Eric and LILACS.

Results: We reviewed 31 articles that analyzed advertising in medical journals from 1975–2005 and were published between 1998 and 2008. We found that the number of references used to support pharmaceutical advertising claims increased from 1975 but that 50% of these references were not valid. There was a tendency to depict men in paid productive roles, while women appeared inside the home or in non-occupational social contexts. Advertisements for psychotropic and cardiovascular drugs overrepresented women and men respectively.

Conclusions: The use of bibliographic references increased between 1998 and 2008. However, representation of traditional male-female roles was similar in 1975 and 2005. Pharmaceutical advertisements may contribute to reinforcing the perception that certain diseases are associated with the most frequently portrayed sex.

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Calidad de la publicidad de fármacos y sesgos de género en las revistas de medicina (1998–2008): revisión de la literatura científica

RESUMEN

Palabras clave:

Publicidad

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Objetivo: Revisar la literatura científica sobre publicidad farmacéutica dirigida a los profesionales sanitarios para determinar si han disminuido los sesgos de género y ha mejorado la calidad de la información a lo largo del tiempo.

Metodología: Análisis de contenido de artículos originales sobre publicidad farmacéutica en revistas médicas (1998–2008), en relación con criterios de calidad como: a) número, validez y accesibilidad de las referencias bibliográficas utilizadas; b) consistencia entre los sexos representados en la publicidad de fármacos y la prevalencia de la enfermedad. Bases de datos: PUBMED, Medline, Scopus, Sociological Abstract, Eric y LILACS.

Resultados: Los 31 artículos revisados, publicados entre 1998 y 2008, analizan la publicidad en revistas médicas en el periodo 1975–2005. El número de referencias bibliográficas aumentó desde 1975, pero el 50% no eran válidas. Hay una tendencia a la representación de los hombres desempeñando roles productivos remunerados, mientras que las mujeres aparecen dentro del ámbito doméstico o en contextos no laborales. La publicidad para tratamientos psicótopos sobrerrepresenta a las mujeres, y la de tratamientos cardiovasculares a los hombres.

Conclusión: La frecuencia de referencias bibliográficas aumenta entre 1998 y 2008, pero los roles de género representados en 2005 son similares a los de 1975. La publicidad farmacéutica puede contribuir a reforzar la percepción de que ciertas enfermedades se asocian con el sexo más frecuentemente representado.

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Introduction

Due to the increasingly global and fragmented context in which they work, physicians are partially dependent on the flow of information conveyed through advertising. Marketing strategies work in two ways: on the one hand, pharmaceutical advertising simplifies

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messages and thus facilitates understanding of information usually requiring specialized knowledge; on the other hand, pharmaceutical advertising is both an authority figure and a stakeholder, as it is currently the most important source of financial support for medical journals as well as their main form of publicity. Although all advertisements have a commercial purpose and thus generally low credibility, medicinal drug promotion is an important filter of medical knowledge due to its indirect control over the media.¹

Marketing strategies target the medical community and, to increase sales, do not always offer neutral information.^{2–4} To influence the perceptions and decisions of the physicians at whom such publicity is directed, reality is redefined through the use of partial and/or biased images of the target and is related to data on the benefits derived from certain properties of the drug.⁵ This redefinition is sometimes further accentuated by the use of information in the advertisement which is not always supported by bibliographic references.⁶

To provide a basis for a code of conduct in advertising, the World Health Organization (WHO) established their Ethical Criteria for Medicinal Drug Promotion.⁷ The pharmaceutical advertisement validity indicators used refer to the inclusion of approved scientific data, the number of bibliographic references and the accessibility of these references to physicians, as well as coherence between the epidemiological data presented in the advertising claims and the research findings.⁷ A tendency to increase the amount of scientific data included in medicinal drug promotion according to the WHO criteria has been observed over time.^{8,9}

However, another marketing strategy used to achieve greater impact is the incorporation into advertising of images that segment the consumer according to socio-demographic characteristics,¹⁰ which may represent a further problem for validity^{11,12} when inconsistent with research findings.¹³ Specifically, the estimated prevalence of a disease among groups at risk occasionally seems exaggerated and thus misleading. Furthermore, the potential population base that could benefit from the medication is broadened through the use of inappropriate frames that include non-risk groups, to whom the therapeutic indications do not apply. This phenomenon is known as disease mongering.^{1,14}

As a field of innovative research focused on the biological, physiological and sociological differences between women and men and how such differences affect diseases and their diagnoses and treatments, gender-based medicine shares with evidence-based medicine the hypothesis that inaccuracies exist in the production and dissemination of knowledge, as well as in medical practice, as regards rigor, transparency and subjective judgement.^{15,16} The media act as socialising agents and transmit messages that contribute to the social construction of disease. The quantitative and/or qualitative representation of both sexes in pharmaceutical advertisements is a focal point of interest in research on gender bias,^{11,12} since if such representations are inconsistent with reality they may reinforce the perception that certain illnesses are associated with the most frequently portrayed sex. Such is the case with advertisements for migraine treatments, in which images of women predominate.¹⁷

Despite the social changes experienced by women and men since the 1970s, the view of medicine as a gendered organization and male-dominated culture has had a powerful effect on gender imagery for women. This perspective has served to point to medicine as a cultural system tending to reinforce a gender identity based on traditional sex roles of women in society.¹¹ The accuracy of knowledge transfer through pharmaceutical advertising is essential to avoid gender bias in medical practice and to achieve quality drug prescription according to knowledge-based evidence.¹⁸

The aim of this study was to review the scientific literature available on pharmaceutical advertising directed at health professionals (1998–2008) in order to determine whether gender bias

has decreased and the quality of information in pharmaceutical advertising has improved over time. Clarification of these questions would allow health professionals to determine the current credibility of this information. As quality information criteria, we considered the findings of articles published on (a) the number, validity and accessibility of bibliographic references provided in pharmaceutical advertisements, and (b) the relationship between the sexes portrayed in the advertisements and the sex-prevalence of the diseases treated by the drugs advertised.

Methods

Original articles analyzing pharmaceutical advertising in medical journals and published between 1998 and 2008 were located using Boolean search techniques in the bibliographic databases PUBMED, Medline, Scopus, Sociological Abstracts, ERIC and LILACS. The key words differed depending on the thesaurus of the bibliographic source consulted. Thus, in PUBMED, Medline and Scopus, the key words “Advertising and Medical Journals” and “Advertising and Drug Industry” were used, while in Sociological Abstracts and ERIC, the key words were “Advertising and Medical Journals”, and “Advertising and Medication”. The search terms used in LILACS were “*Publicidad y Revistas Médicas*” (“Advertising and Medical Journals”) and “*Publicidad de medicamentos e Industria farmacéutica*” (“Medicinal drug advertising and the Pharmaceutical industry”). We selected all articles containing these key words both in their titles and in their abstracts. Articles without an abstract were excluded since they are not usually original studies and tend to be editorials, letters, practice guidelines or comments.

All original articles written in Spanish, English and Italian concerning pharmaceutical advertising aimed at health professionals and published in medical journals between 1998 and 2008 were included.

Excluded from the study were those articles focusing on advertising aimed directly at the consumer, advertising carried by media other than medical journals or popular science magazines, advertising ethics, or other marketing techniques used by the pharmaceutical industry as tools for ongoing medical training through sponsorship of courses and congresses.

A total of 1,715 articles were obtained, of which 552 did not provide an abstract. Of the remaining 1,163 articles, 1,132 were omitted in accordance with the exclusion criteria described in the preceding paragraph (fig. 1).

A content analysis was carried out of the 31 original articles finally selected, for which an information compilation protocol was established and applied, comprising the following variables:

- 1) Scientific evidence in support of the advertising claims:
 - Number of bibliographic references.
 - Availability of the references in scientific bibliographic databases.
 - Consistency between the contents of the claims and the scientific evidence published, measured through the agreement between the content of the message and knowledge of the drugs supported by scientific papers.
- 2) Sex-gender representation variables used in the analysis of advertising images developed in the original articles:
 - Number of women and men portrayed.
 - Occupational roles represented at work by sex.
 - Family roles represented in the domestic environment by sex.
- 3) Medicinal drugs advertised.
- 4) Journals from which advertising was analyzed by the articles reviewed.
- 5) Specialty of the medical journal containing the advertising.
- 6) Date of publication of the articles analyzed.
- 7) Country of origin of the journals analyzed.

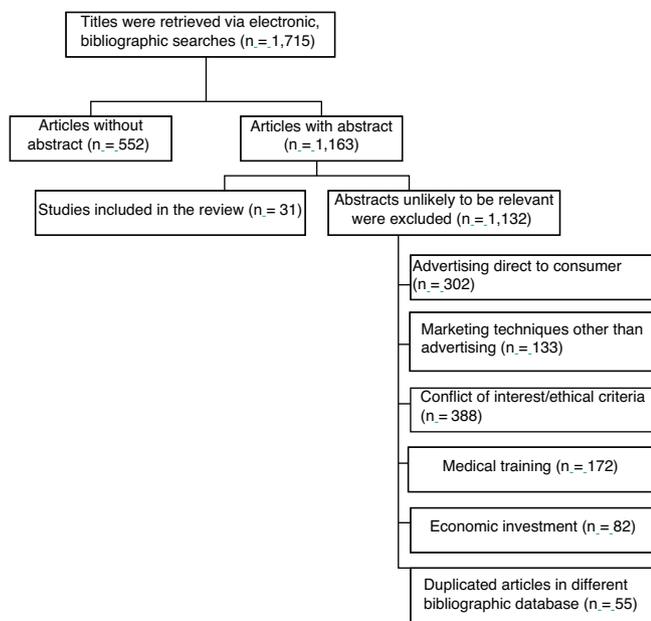


Figure 1. Selection process for assessing the quality and gender equity of pharmaceutical advertising in medical journals (1998–2008).

- 8) Type of research design used in the articles analyzed: quantitative and/or qualitative.
- 9) Period researched by the articles analyzed.

A content analysis of the above-mentioned variables was carried out.

Results

Between 1998 and 2008, 31 original articles^{8,9,19–47} analyzed the pharmaceutical advertising published in medical journals over a period of 30 years (1975–2005) (Table 1). The number of advertisements analyzed per article ranged from 26 to 4,157.

Most of the advertising analyzed was of European origin,^{19–23,27,29,32–35,38–45} particularly northern Europe^{22,26,34,35} and England.^{29,33,34,38–40,45} Other advertising came from the USA,^{24–31,33,36,38–42,44–46} Brazil,^{9,36} and Canada.^{27,33,39,40} By comparing results from different articles, we noticed that the percentage of advertisements decreased from 50% in 1975 to approximately 30% in 2000.^{19,21,24,39,41} However, these differences varied according to the journal and country of origin.^{19,21,24,28,29,35,39,41,44} British journals carried significantly fewer advertisements^{9,39} than those from the USA, which displayed the highest levels of advertising pressure.^{9,39}

Two varying approaches were used in advertising analysis. On the one hand, an analysis of all pharmaceutical advertisements published in medical journals and science magazines was carried out,^{20,29,33,36,38,39,43} while on the other, the analysis focused exclusively on medicinal drugs used within specific specialities, such as antihypertensives and antilipids for cardiovascular problems, corticosteroids to treat respiratory problems, medication for erectile dysfunction, psychotropics, analgesics and antibiotics.^{9,19,21–28,30–32,34,35,37,40,41,44–47}

The most frequently made claim was that of the effectiveness of the drug,^{16–18,24,26} followed by claims related to drug safety.^{19,20,27}

Only eight articles (25.8%) presented longitudinal comparisons of advertising over a specified period.^{9,20,33,36,38,39,41,43} The remaining articles presented cross-sectional studies that reviewed advertising published at a particular moment in time^{8,19,21–32,34,35,37,40,42,44–47} (Table 1).

The bibliographic references provided in pharmaceutical advertising were easily accessible for consultation.^{26,46} In 2005, 65% of bibliographic references were found in Medline, PsycInfo and Google⁴⁶ while in 1999 approximately 84% were found in databases such as Medline, PubMed, WorldCat, California Digital Library and Google.²⁶

Fifteen articles^{9,19–21,25–27,29,32,36–38,41,42,46} examined the number of references provided in pharmaceutical advertising (Table 2). There seems to be a temporal pattern, with an increasing tendency to include references. Nevertheless, reference frequency varied according to the journal's country of origin and medical speciality. For instance, articles analyzing advertising in Russian,⁴² Italian¹⁶ and Spanish²¹ journals included fewer references than those analyzing advertising in countries such as the UK, Netherlands, or the USA.

However, in 50% of pharmaceutical advertisements, the references provided as scientific support for the claims lacked validity^{19,20,25,29,32,37} (Table 2) as these claims were insufficiently supported by recorded scientific data, prescribing information, randomized controlled trials or other research.²⁵ Neither were they supported by scientific evidence,^{19,20,37,44} as 44.4% of unsupported claims recommended the drug for a patient group different to that studied in the trial²⁹ or were classified as ambiguous (vague: 54.3%; emotive: 14.2%; non-clinical: 12.4%).³²

Nine articles provided information on the sex of the people appearing in the advertisements and the gender dimension analysis categories used^{22,23,30,31,33,36,41,43,44} (Table 3). There was a tendency to depict men in paid productive roles, while women appeared inside the home or in nonoccupational social contexts.^{23,33,36,43,44} Moreover, while the articles that analyzed advertising for cardiovascular disease medication coincided in their findings that men were given higher visibility,^{22,23,31} those that focused on psychotropic pharmaceutical advertising concluded that women were over-represented.^{23,33,36,43,44} The longitudinal studies revealed that the closer the study period to the present day, the greater the number of advertisements for antidepressant treatments and the higher the percentage of women portrayed.^{33,43}

The type of information used to promote medicinal drugs varied among countries. An article that compared advertising in psychiatric journals in Brazil, the USA and the UK observed that journals in the USA and the UK contained more scientific data about the drug.⁹ More specifically, advertising in Brazilian psychiatric, pediatric and general medicine journals lacked information on drug interactions and adverse effects.^{9,36} Advertising carried by Russian journals on surgery, general medicine and cardiology also contained scant data on drug interactions, adverse effects and contraindications.⁴²

Discussion

The articles that employed forward-specific longitudinal analysis showed that from 1975 to 2005 the number of bibliographic references used to support pharmaceutical advertising claims increased.^{9,36,38,41} However, the accessibility,^{26,46} as well as the validity of the scientific references was limited.^{19,20,25,29,32,37} No improvement was observed in advertising quality in developing countries or when quality was examined from a gender perspective. Articles carrying out a longitudinal analysis provided evidence that the same traditional male-female roles were represented in the first years studied (1975, 1981, 1985) as well as in the later years (1995, 2001).^{33,36,43} Gender bias was also identified in the studies analyzing specific years during the same period^{30,31,44} and in the following years (2001–2002, 2005).^{22,23}

One of the limitations of this study is the small number of articles found. Although the review period spanned 10 years,

Table 1
Objective and main characteristics of the reviewed articles on pharmaceutical advertising in medical journals (1998-2008).

Author and year of the article	Period of study	Field and (number) of medical journals	Objective of the study
Ahmed et al., 2004 ³⁰	1996-1998	Family/Internal Medicine (20) Cardiology (14)	To determine if female and male physicians are equally represented in cardiovascular advertising.
Ahmed et al., 2004 ³¹	1996-1998	Family/Internal Medicine (20) Cardiology (14)	To determine if female and male patients are equally likely to be featured in cardiovascular advertising.
Cabral de Barros, 2004 ⁸	2000-2001	Family/Internal Medicine (3)	To evaluate advertising using the WHO criteria for drug information as parameters.
Carvalho et al., 2003 ³⁶	1985-1987 1987-1989 1999-2001	Psychiatry (4)	To evaluate the influence of three regulations ("Export act", "WHO criteria", "ANVISA" ^a) on drug advertisements.
Carvalho et al., 2005 ⁹	1985-1989 1999-2001	Psychiatry (6)	To compare the information contained in advertisements for psychoactive drugs published in psychiatric journals in Brazil, USA and UK before the "Export act", "WHO criteria", "ANVISA" ^a regulations.
Cooper and Schriger, 2003 ²⁶	1999	Psychiatry (1) Neurology (1) Surgery (1) Emergency (1) Obst/Gyn (1) Pediatrics (1) Family/Internal Medicine (3)	To characterize the quantity and quality of graphic information in all pharmaceutical advertising.
Cooper et al., 2005 ³⁵	1999	Psychiatry (1) Neurology (1) Surgery (1) Emergency (1) Obst/Gyn (1) Pediatrics (1) Family/Internal Medicine (3)	To determinate the kinds of documents cited in support of claims made in pharmaceutical advertising, and to assess the availability of these documents to healthcare practitioners.
Curry and O'Brien, 2006 ²³	2001-2002	Family/Internal Medicine (3)	To examine the gendered representations used to identify patients prone to depression and heart disease.
Fortinguerra et al., 2007 ¹⁹	2005	Pediatric (5)	To evaluate whether the references cited in pharmaceutical advertisements were evidence-based.
Friedman and Richter, 2006 ²⁴	2001	Family/Internal Medicine (2)	To evaluate the influence of ethical guidelines by the International Committee of Medical Journal Editors on the frequency of advertisements in peer-reviewed journals.
Gilad et al., 2005 ²⁷	2000	Family/Internal Medicine (6) Surgery (6) Pediatric (6) Obst/Gyn (6)	To evaluate the quality of information on antibiotic drugs in medical journals.
Greving et al., 2007 ²⁰	1996-2004	Family/Internal Medicine (1)	To determine how the pharmaceutical industry deals with evolving clinical evidence in advertising claims for antihypertensive drugs.
Gutknecht, 2001 ⁴⁰	1999	Family/Internal Medicine (4)	To evaluate whether the references in pharmaceutical advertisement were evidence-based.
Jones et al., 1999 ⁴⁵	1995-1997	Family/Internal Medicine (13)	To determine whether the level of drug advertising is related to uptake of new drugs by general practitioners.
Lankinen et al., 2004 ³²	2002	Family/Internal Medicine (4)	To document the quality of the evidence base for marketing claims in prescription drug advertising.
Lohiya, 2005 ²⁸	2004	Unspecified research journal (28)	To quantify the amount and nature of pharmaceutical advertising in medical journals.
Loke et al., 2002 ³⁷	2000	Family/Internal Medicine (6)	To evaluate whether the references in pharmaceutical advertisements were evidence-based.
Lövdahl et al., 1999 ⁴⁴	1995	Psychiatry (4)	To examine the gender display in Scandinavian and American advertising for antidepressants.
Lövdahl and Riska, 2000 ⁴³	1975/1985/1995	Psychiatry (4)	To examine the construction of the relationship between gender identity and mental disorders in Nordic psychotropic drug advertising.
Montgomery et al., 2008 ⁴⁷	2004	Family/Internal Medicine (4)	To determine whether print advertisements for antihypertensive medications promote quality prescribing.
Munce et al., 2004 ³³	1981/1991/2001	Psychiatry (3)	To determine who is portrayed in psychotropic drug advertising over time.
Nelson and Bloom, 2001 ⁴¹	1975/2000	Urology (3)	To compare advertising characteristics in 1975 with those in 2000.
Neumann et al., 2002 ³⁸	1990-1999	Family/Internal Medicine (6)	To examine the frequency of economic messages in drug advertising in medical journals.
Riera et al., 2007 ²¹	2001	Family/Internal Medicine (3)	To analyze the advertising message in drug advertisements.
Riska and Heikell, 2007 ²²	2005	Family/Internal Medicine (4)	To examine the construction of heart disease candidates in advertising for cardiovascular drugs.
Scott et al., 2004 ³⁴	1999-2001	Unspecified research journal (1)	To examine the use of images to construct misleading associations between diseases and drugs.
Spielmann et al., 2008 ⁴⁶	2005	Family/Internal Medicine (2) Psychiatry (2)	To examine the accuracy and availability of sources cited in advertising for psychiatric drugs.
Winkelen et al., 2006 ²⁵	2003-2004	Rheumatology (4)	To evaluate whether the references in pharmaceutical advertisements were evidence-based.
Villanueva et al., 2003 ²⁹	1997	Cardiology (2) Family/Internal Medicine (4)	To evaluate whether the references cited in pharmaceutical advertisements were evidence-based.
Vlassov et al., 2001 ⁴²	1998	Family/Internal Medicine (3) Surgery (1) Cardiology (1)	To examine the adequacy of information in pharmaceutical advertising.
Weeks et al., 2002 ³⁹	1985/1990/1995/2000	Family/Internal Medicine (3)	To quantify the frequency of advertising in peer-reviewed journals.

^a Brazilian Health Surveillance Agency.

Table 2

Frequency and quality of the information in advertisements and claims according to scientific references on drugs in the articles on pharmaceutical advertising reviewed (1998–2008).

Authors	Drugs advertised	Country of journals analyzed	N° of advertisements analyzed	Claims or advertisements with scientific references (%)	Claims not supported by evidence-based medicine ^a
Spielmans et al. ⁴⁶	Psychotropic	USA & Britain	69	45%	-
Greving et al. ²⁰	Antihypertensives	Holland	50	66%	35% not supported
Fontinguerra et al. ¹⁹	All drugs	Italy	70	26.1%	50% not supported
Riera et al. ²¹	All drugs	Spain	609	21.2%	-
Van Winkelen et al. ²⁵	All drugs	USA & Britain	84	-	49% poorly supported
Gilad et al. ²⁷	Antibiotics vs. other drugs	British, USA & Canada	779	Antibiotic drugs: 56.2% Other drugs: 51.1%	-
Carvalho et al. ⁹	Psychotropic	Brazil USA & Britain	56	Brazil: 22.2% to 60% USA: 28.5% to 70% UK: 66.6% to 41.6%	-
Cooper and Schriger ²⁶	All drugs	USA	484	71%	-
Lankinen et al. ³²	All drugs	Finland	245	38%	81% ambiguous
Carvalho et al. ³⁶	Psychotropic	Brazil	199	1986: 15.4% to 22.6% 1988: 42.1% to 47.4% 2000: 55% to 58.8%	-
Villanueva et al. ²⁹	Antihypertensives	Spain	287	13.2%	44.1% not supported.
Neumann et al. ³⁸	All drugs	Britain & USA	237	56% to 70%.	-
Loke et al. ³⁷	All drugs	Australia	174	56.8%	45% not supported
Nelson and Bloom ⁴¹	Antibiotics, erectile dysfunction & analgesics	Britain & USA	574	USA: 15.1% to 25.8% Europe: 25.9% to 58.7%	-
Vlassov et al. ⁴²	All drugs	Russia	207	2%	-

^a Claims or advertisements not supported by bibliographic references, not supported by scientific evidence or poorly supported by data on file, prescribing information or randomized controlled trials.

few articles presented an empirical analysis of the information contained in pharmaceutical advertisements. Nevertheless, the articles analyzed cover 30 years of advertising (1975–2005). A further limitation is the diversity of the approaches used by the different authors in the analyses, with less than a third of the articles reporting a gender analysis or presenting results providing information on the sex of the consumer or the physicians portrayed in the advertisements. Moreover, most of the pharmaceutical advertisements analyzed were related to cardiovascular or psychotropic drugs and thus the possible existence of bias in pharmaceutical advertising for other medicinal drugs was not determined.

The advertising strategies erroneously over-represented one sex without taking into account the sex-prevalence of the disease, which contributed to maintaining a gender bias in medical knowledge and diagnostic and therapeutic decisions.^{22,23,31,33} This imbalance in therapeutic targets depicted in pharmaceutical advertising was observed in advertising for both mental health^{23,33,36,43,44} and cardiovascular disease medication.^{22,23,30,31} Accordingly, health professionals should maintain a critical approach when evaluating the credibility of the information contained in pharmaceutical advertising. Likewise, health authorities should actively monitor the consequences of this type of advertising strategy, which could be converting a private commercial objective into a social problem.

While a drug's effectiveness is one of the main arguments used in pharmaceutical advertising, some authors highlighted the lack of epidemiological evidence, such as data on risk reduction in absolute terms or on the number of patients treated, which could be used to support such claims.^{38,47} Indeed, as regards representations of male and female identity, Goffman claimed that these were

commonly represented through stereotyped images of what it means to be a man or a woman.⁴⁸ Such representations may reflect the sexist construction of scientific knowledge⁴⁹ which, in terms of public health, has been criticized since the 1980s in the form of the Gendering the Medicalization Thesis.¹¹

The availability of scientific data is explicitly recommended in the WHO ethical criteria for medicinal drug promotion. However, Carvalho showed that availability varied according to the country of publication of the journal carrying the advertising. Specifically, less information concerning interactions, adverse effects, precautions or contraindications was provided in developing countries than in developed countries.⁹

The longitudinal studies included in this review, accounting for 25.8% of the total, showed that from 1975 to 2005, pharmaceutical advertising validity increased in terms of providing scientific data and references in support of the advertising claims made. However, validity depended on the stage of development of the journal's country of origin.^{8,9,39,41} According to many authors, such a lack of data can contribute to the medicalization of the population's health and encourage disease mongering,^{1,4,50–52} both of which would occur more readily in developing countries.

The WHO medicinal drug promotion validity criteria basically refer to scientific and epidemiological data, and to the accessibility of documents supporting advertising claims.⁷ However, as images are one of the main tools employed in advertising to transmit information and create and reflect collective perceptions, these criteria should include the graphic representation of the consumer as a further validity criterion. This would allow determination of whether the sex or age frequency represented in the advertisement is consistent with the epidemiological data, that is, the sex

Table 3
Sex-gender representation of the consumers and medical professionals portrayed in medicinal drug advertising in the journals reviewed (1998-2008).

Author	Drugs advertised	Country of journals analyzed	No of advertisements analyzed	Year and percentage of women and men at the advertisements studied	Occupational and family gender roles represented in medicinal drug advertisements
Riska and Heikell ²²	Cardiovascular drugs	Scandinavia	603	2005: Men: 50% Women: 25% Both: 25%	Men and women are shown as a restored character in their own private life. Men: Kickboxing, biking with a helmet with the name of the drug on it, walking on the beach with a dog, smiling in a pub. Women: In the kitchen. Dress and face covered with patches of whipped cream.
Curry and O'Brien ²³	Cardiovasc & psychotropic drugs	Ireland	61	2001-2002: Cardiovascular: 91.7% men Psychotropic: 85.7% women	Users of cardiovascular drugs were significantly more likely than users of antidepressants to be displayed in active rather than passive roles ($p < 0.001$).
Ahmed et al. ³⁰	Cardiovascular drugs	USA	919	1996-1998: Male physician: 83% Female physician: 17%	Female physicians appearing in a top position were less frequent than male physicians. OR=95% CI=0.25 (0.09-0.68)
Ahmed et al. ³¹	Cardiovascular drugs	USA	919	1996-1998: Men: 80% Women: 20%	Female patients had fewer average appearances in advertisements than males in top positions (0.82 vs 1.99; $p = 0.02$).
Munce et al. ³³	Psychotropics drugs	USA, Britain & Canada.	161	Women (1981-1991-2001): Canada: 47% - 38% - 80% USA: 48% - 64% - 88% UK: 63% - 50% - 40%	Occupational role: 81% men vs. Family role: 90% women Patient portrayed: Women: Sleeping: 77%. At home and in the garden category: 75% Men: within the work category: 85%
Carvalho et al. ³⁶	Psychotropics drugs	Brazil	199	1985-2000: Ratio men/women: Anxiolytic drugs: 1:2 Neuroleptic drugs: 6:1	
Nelson and Bloom ⁴¹	All drugs in urologic journals	Britain & USA	574	1975 - 2000: Male urologists: 90%-76.47% Female urologists: 10% -23.5%	
Lövdahl and Riska ⁴³	Psychotropic drugs	Scandinavia	273	(Women vs. men): 1975 - 1985 - 1995 Denmark: (34%-66%) - (75%-19%)-(66%-25%) Finland: (31%-69%) - (100% - 0) - (81% - 0) Norway: (100%-0) - (31% - 61%)-(100%-0) Sweden: (70%-27%)-(38%-52%) - (0 - 0)	1970s: Men dominated the psychotropic user category in Finnish and Danish advertisements, while Norwegian and Swedish advertisements portrayed mental health problems as a female concern. 1980s: As in the 1970s, advertisements tended to show: Men overworked on account of an important position at work needing a tranquilliser or hypnotic drug to cope with the external pressure. When women are shown at work they are featured in a subordinate position and smiling. 1990s: Use of the drug by women will allow them to fulfil the expected supportive female gender behavior.
Lövdahl et al. ⁴⁴	Psychotropic drugs	Scandinavia & USA	118	1995 (Women vs men & both): Denmark: 78% - 11% - 11% Finland: 75% - 0 - 25% Norway: 100% - 0 - 0 USA: 38% - 0 - 62% Sweden: 0 - 0 - 100%	In pictures of both sexes together the man is shown as the supporter of the woman: women were depicted as the ones needing assistance, while men symbolized either the physician, the woman's male partner, or the drug (featured as a man) assisting her.

and age prevalence of the health problem for which a certain drug is commercialized.

The spectrum of diseases for which the gender analysis of pharmaceutical advertising was performed and published was limited to mental health and cardiovascular disease medicinal drug promotion.^{22,23,30,31,33,36,43,44} These analyses confirmed that women were consistently over-represented in psychotropic drug advertising,^{23,33,36,43,44} while the same was true for men in cardiovascular disease medication advertising.^{22,23,30,31} However, scant research has been published on whether this biased and partial over-representation of one sex is repeated in pharmaceutical advertising for other types of medical treatments.

The under-representation of women in pharmaceutical advertising for cardiovascular disease treatments correlates with the

generation, dissemination and application of medical knowledge on these diseases.^{15,16,49} This same tendency toward bias has been observed in some clinical drug trials which are subsequently cited in advertising, where either few women are included in the trials compared to the number who will eventually consume the drug once commercialized, or information is provided which has not been stratified by sex for efficacy and effectiveness.⁵³ Thus, when concluding that the generation of new knowledge in medicine focuses on male health and merely infers knowledge of female health, Goffman's thesis on advertising is in agreement with feminist empiricism as applied to health.¹¹

This double bias –generated by both science and advertising– could undermine medical practice⁵⁴ by helping to perpetuate a perception that is inconsistent with data on the actual prevalence and

mortality rate of the problem. For example, the higher representation of men than women in cardiovascular medication advertising is not consistent with the actual number of deaths from cardiovascular disease within the European Union (56% women compared with 43% men).¹³

Conclusions

Despite the diversification of the role of women over the last few years, the findings of the original papers reviewed reveal that parity between men and women in terms of the performance of social tasks or functions is not reflected in the pharmaceutical advertisements analyzed.^{22,23,30,31,33,36,41,43,44} There is a consistent tendency to embody stereotyped images of both sexes. Specifically, women are portrayed in submissive or passive activities, such as sleeping³³ and, in 2005, were still usually shown in traditional contexts and roles, such as cooking, shopping, or at home with clothes and face covered in patches of whipped cream.²² Also, when advertising depicts men with cardiovascular disease, the disease is attributed to external factors, such as occupation.²³ In contrast, pharmaceutical advertising for psychotropic drugs embodies women without a context, suggesting that such problems are generated by the woman herself.²³

The findings obtained from the articles reviewed shows that the quality of information on pharmaceutical advertising has improved through the increase of bibliographic references during the study period. However, some bibliographic references mentioned in the advertising could not be accessed, and there were some difficulties related to agreement between the content of the message and the knowledge of drugs supported by scientific papers.

Author contributions

B. Cambroner carried out the systematic review in the main databases, participated in the study design, performed the statistical analysis and helped to draft the manuscript. M.T. Ruiz conceived the study, participated in its design and coordination and helped to draft the manuscript. N. Papí participated in drafting of the manuscript. All authors read and approved the final manuscript.

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Conflict of interests

None.

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