Public Health 123 (2009) 689–693

Contents lists available at ScienceDirect

Public Health

journal homepage: www.elsevierhealth.com/journals/pubh

Original Research

Gender-related explanatory models of depression: A critical evaluation of medical articles

A. Hammarström [a,*], A. Lehti [a], U. Danielsson [a], C. Bengs [b], E.E. Johansson [a]

[a] Department of Public Health and Clinical Medicine, Division of Family Medicine and Umeå Centre for Gender Studies – Medicine; Research Programme Challenging Gender, Umeå University, SE-901 85 Umeå, Sweden
[b] Department of Sociology, Umeå University, SE-901 87 Umeå, Sweden

ARTICLE INFO

Article history:
Received 12 November 2008
Received in revised form
15 July 2009
Accepted 16 September 2009
Available online 23 October 2009

Keywords:
Public health
Depression
Gender
Explanatory models
Bibliometric methods
Intersectionality
Multifactoriality

SUMMARY

Objectives: Although research has consistently shown a higher prevalence of depression among women compared with men, there is a lack of consensus regarding explanatory factors for these gender-related differences. The aim of this paper was to analyse the scientific quality of different gender-related explanatory models of depression in the medical database PubMed.
Study design: Qualitative and quantitative analyses of PubMed articles.
Methods: In a database search in PubMed for 2002, 82 articles on gender and depression were selected and analysed with qualitative and quantitative content analyses. In total, 10 explanatory factors and four explanatory models were found. The ISI Web of Science database was searched in order to obtain the citation number and journal impact factor for each article.
Results: The most commonly used gender-related explanatory model for depression was the biomedical model (especially gonadal hormones), followed by the sociocultural and psychological models. Compared with the other models, the biomedical model scored highest on bibliometric measures but lowest on measures of multifactorial dimensions and differences within the group of men/women.
Conclusion: The biomedical model for explaining gender-related aspects of depression had the highest quality when bibliometric methods were used. However, the sociocultural and psychological models had higher quality than the biomedical model when multifactoriality and intersectionality were analysed. There is a need for the development of new methods in order to evaluate the scientific quality of research.

Introduction

Epidemiological research on the prevalence and incidence of depressive symptoms and unipolar depressive disorders has consistently shown a preponderance in women compared with men.[1] The female:male ratio varies with age, and the higher prevalence of depression among women has been shown from mid-puberty throughout adult life.[2] No significant gender differences have been found in relation to bipolar depressive disorders.[3]

The reasons for the gender differences in unipolar depressive disorders are still not adequately understood.[4] Medical reviews have been written about gender differences in depression[2,5–7] with the aim of analysing different explanations for the higher prevalence of depression in women compared with men. Different explanatory models such as artefact, genetic, hormonal, psychological and sociocultural factors have been suggested, but consensus is lacking regarding explanations for the higher prevalence of depression in women compared with men.[6] An increasing number of researchers acknowledge that depression must be understood from a multifactorial perspective.[7,8] In a scientific evaluation of research on depression, the Swedish Council on Technology Assessment in Health Care[9] came to the conclusion that sociocultural factors (such as adverse experiences in childhood) in combination with socialization processes and psychological factors (such as vulnerability to adverse life events and coping skills) were the most important explanatory factors for gender differences in depression. It was also concluded that genetic factors did not appear to contribute to women's increased risk for depression, while hormonal factors could have some effect but to a lesser extent than environmental factors; furthermore, there was uncertainty about neurotransmitter systems and the adrenal/thyroid axis.[6,9]

While reviews of scientific articles try to evaluate the scientific evidence for different explanations, to the authors' knowledge, no studies have tried to analyse which of the explanatory factors for

* Corresponding author. Tel.: +46 90 785 35 47; fax: +46 90 77 68 83.
E-mail address: anne.hammarstrom@fammed.umu.se (A. Hammarström).

0033-3506/$ – see front matter © 2009 The Royal Society for Public Health. Published by Elsevier Ltd. All rights reserved.
doi:10.1016/j.puhe.2009.09.010

the higher prevalence of depression in women dominate the medical discourse. The medical discourse can be analysed in articles indexed in the medical database PubMed. It is important to analyse domination in quantitative terms because the most commonly presented explanations may influence readers, which can have both scientific and practical consequences. Some years ago, Piccinelli and Wilkinson published a review in favour of sociocultural and psychological explanations.[6] A question that remains to be answered is whether domination of these explanatory models can be found in the medical literature some years after publication. In such an analysis, it is of interest to study both the prevalence of different explanatory models to gender differences in depression, and the scientific quality of the different models.

There is no agreement regarding how to measure the quality of research. One method that is increasingly used as a tool for scientific evaluation of research is bibliometric, especially citation analyses and journal impact factors.[10,11] However, criticism has been raised regarding these quantitative ways of measuring the scientific quality of research. Wallin claims that a true assessment of scientific quality cannot be obtained by analysing a publication's citation number or journal impact factor.[12] Such an assessment should also include peer review of the societal effects of research. However, Wallin gives no information about what he means by societal effects or how they could be analysed in more detail. One possible societal effect of research on gender and depression is the risk of over-simplifying and exaggerating the results.[13] If women as a group are portrayed as depressed, while men as a group are described as not depressed, there is a risk of essentialism; that is the tendency to regard differences between men and women as constant, pervasive and unchangeable.[14] Different methods can be used in order to diminish the risk for over-generalization. One way is to use an intersectional framework in making differences visible within the group of women (and within the group of men) with regard to class, race, ethnicity, age, sexual orientation, religion and other power-related dimensions.[15] Another way of decreasing the risk of essentialism is to use a multifactorial framework for understanding the complex relationship between gender and depression.

The present study measured the scientific quality of medical articles indexed in PubMed with bibliometric measures and also with two questions about intersectionality and multifactorial dimensions. In this study, the term 'gender-related model' is used for models that try to explain the higher incidence of depression in women compared with men, and models used in single-gender analyses (why depression occurs in men, why depression occurs in women).

The aim of this paper was to analyse the prevalence and the scientific quality of different gender-related explanatory models of depression in the medical database PubMed.

The following research questions were analysed with regard to the medical articles:

1. What gender-related explanatory models were given? In how many of the articles were the explanatory models used?
2. Does the scientific quality differ between the explanatory models? The quality was measured with the following questions:
   a. Is more than one possible gender-related explanatory model discussed?
   b. Are differences within the group of men and within the group of women analysed in relation to socio-economic status, ethnicity, sexual orientation, etc. (except for age)?
   c. What are the mean impact factors of the journals and the mean citation numbers of the different articles in each main explanatory model?

Methods

The database used in this study was PubMed (the US National Library of Medicine biomedical publication database, including citations from MEDLINE and other life science journals for biomedical articles). The database search took place in December 2003 and covered 2002. Articles were selected as described.

The following search criteria were used in a search in the title section, English language and the descriptors: Depress* AND (sex OR wom* OR gender OR man OR men OR female OR male OR feminis*). In this way, 167 abstracts were found; these were read in order to exclude non-relevant articles.

Reasons for exclusion of articles were: (1) other meanings of the word 'depress' (economic trade, depressed levels etc.); and (2) abstracts without focus on explanatory models for either gender differences in depression or for depression in men or in women, e.g. depression as co-morbidity in other diagnoses, no focus on gender/men/women in relation to the results, and other studies without focus on explanatory models. In the case of uncertainty, the whole article was read before the decision about inclusion was made. Finally, 82 articles were selected for the study. A list of these 82 articles can be accessed on ScienceDirect.

A qualitative content analysis was performed by the first author in the following way.[16] All articles were read with the intention of grasping the content in the text. Thereafter, the text related to the first research question (Which explanations for gender differences in depression are given in the articles?) was classified into codes, i.e. words or sentences that relate to the same central meaning.[17] The codes were brought together and classified into preliminary subcategories, which in turn were sorted and abstracted into preliminary categories. The preliminary categories and subcategories were discussed, reflected on and condensed into four categories and 10 subcategories. The codes, subcategories and categories are presented in Table 1. All articles had one, rather than two or more, main explanatory model. For the subcategories 'life circumstances' and 'cultural factors', the codes may appear similar but were clearly distinguished by the fact that the codes building up the subcategory 'Cultural factors' were always contextualized and analysed in relation to specific non-Western cultures.

After all of the article had been read, a new research question (#2) was formulated. Research questions 2a and 2b were analysed with quantitative content analyses in which the number of articles with each main explanatory factor/model were counted.[16]

The research question about citation index and impact factor was analysed as follows. In late December 2005, the 82 articles were searched in the Thomson Institute of Scientific Information (ISI) Web of Science database in order to obtain the following information:

1. the citation number, i.e. the total number of times that each article was cited; data were obtained from two ISI databases – the Science Citation Index and the Social Science Citation Index; and
2. the ISI-computed impact factor for each journal for the latest available year (2004); data were obtained from the ISI Journal Citation Report. A journal's impact factor is calculated by dividing the number of current citations to items published in a certain journal during the two previous years by the total number of articles published during that period.

Triangulation was performed in different ways in order to increase the trustworthiness of the data and its interpretation.[18] A combination of qualitative and quantitative methods was used. Aside from this, two of the investigators of the study (AH and AL) coded 20 of the articles independently, and the codes and subcategories were compared thereafter. Only minor disagreements were

found between the researchers, and in these cases, the coding was discussed until agreement was reached.

Results

The codes, the subcategories and the categories are described in Table 1.

Table 1
Codes, subcategories and categories.

Codes	Subcategories	Category
A. Explanations for depression in women		
Menarche, menopause, premenstrual syndrome, postpartum depression, female gonadal hormones, oestradiol, vasomotor symptoms, gender-specific exposure to gonadal hormones in utero	Gonadal hormones	Biomedical model
Gender-specific gene, gene CHRM2, X-linked gene, gender-specific differences in the molecular mechanisms, apolipoprotein E 4 allele, gender differences in molecular pathophysiology	Genetic factors	
Small hippocampal volume, molecular biological pathways, melatonin secretion, EEG activity. Stress model: lower plasma corticosterone levels after chronic stress	Other biological factors	
Sexual abuse, physical abuse, child abuse, parental loss, parental divorce, life events, poor partner relation, marital difficulties, low social support, stressful life events, lifetime trauma, low education, low income, poverty, female role demands, lack of control at home and at work, double exposure, multiple roles, caring burden of children, single mothers, job stress, unemployment, lack of healthcare services, reproductive complications (stillbirth, spontaneous abortion, caesarean, etc.)	Life circumstances	Sociocultural model
Extended family, devotion to husband, do not seek help because of beliefs in 'normal state' of sadness, feeling of entrapment, son preference, powerful mother in law, attitudes towards mental health problems, lack of knowledge about postnatal depression, pressure to have many children, Asian culture as a predisposing factor for women's depression (cultural expectations, arranged and forced marriages, image of women as mysterious, quiet and living in the dark, cultural conflict when emigrating to Western countries), cultural construction of illness, racism, acculturation, ethnic expressions, prejudice, homesickness, loss of support when migrating, language problems	Cultural factors	
Sexual orientation: coming out, discrimination, stress-related marginalization, homophobia, lack of social support	Sexual orientation	
Gender roles leads to limitation in women's lives, girls socialized to adopt a sick role behaviour	Behaviour	Psychological model
Functional impairment, perceptions of competence, greater self-focused attention, dissatisfaction with appearance, higher ability to cry, higher rates of anxiety and neuroticism, vulnerable, affiliative proclivities, gender roles, specific coping style, view oneself negatively	Psychological factors	
Psychological experience of bodily changes post partum	Body image	
B. Explanations for depression in men		
Decline in testosterone level, androgen deprivation therapy, testosterone imbalance, gender-specific exposure to gonadal hormones in utero	Gonadal hormones	Biomedical model
More rigid personality, cluster A personality, personality disorder, externalizing disorders, social withdrawal, repressed anger, less flexible coping, higher degree of general anxiety disorder in men, less intense style in expressing anxiety	Psychological factors	Psychological model
College men ruminate (widening copying strategies for college women), social withdrawal, diminished help-seeking, expressions of depression in aggressiveness and alcohol consumption	Behaviour	
C. Explanations for the lack of gender differences		
Men's expressions of depression are not measured in questionnaires/scales, alcohol prohibition in certain cultures may preclude the mastering of depression among men	Measurement bias	Artefact

Overall, 10 subcategories (gonadal hormones, genetic factors, other biological factors, life circumstances, cultural factors, psychological factors, behaviour, sexual orientation, body image, measurement bias) and four categories (biomedical model, sociocultural model, psychological model, artefact) were identified. The majority of codes and subcategories were found in articles on depression in women (most of them focused on explanations for the higher prevalence of depression in women compared with men). Few codes were found in articles focusing on the existence of depression among men. Only one subcategory (measurement bias) was identified in research that tried to explain the lack of gender differences in depression.

The subcategories represent the main explanatory factors, while the categories can be seen as the main explanatory models given in the 82 articles on gender differences in depression.

In Table 2, the prevalence of articles as well as the mean citation number and journal impact factor for the articles for each explanatory factor are described.

Table 2 shows that gonadal hormones dominated as explanatory factors, followed by life circumstances and cultural factors. Body image, sexual orientation and measurement bias were each based on a single article, and therefore their mean citation number and mean journal impact factor should be treated with caution.

The highest citation number and journal impact factor per explanatory factor were found for other biological factors, followed by genetics, life circumstances and gonadal hormones.

Table 3 shows how the four explanatory models (biomedical, sociocultural, psychological and artefact) were constructed from the explanatory factors. Table 3 also shows the prevalence of articles in each model, as well as the average citation number and the average journal impact factor for the articles in each model.

Table 3 shows that the biomedical model was most common and had the highest citation number and journal impact factor,

Table 2
Gender-related explanatory factors for depression.

MEF	*n*	CN mean	CN range	JIF mean	JIF range
Gonadal hormones	24	10.17	0–92	2.92	Missing–24.83
Life circumstances	17	10.47	0–61	3.83	Missing–24.83
Cultural factors	12	5.67	0–25	1.83	Missing–7.61
Genetic factors	8	18.50	5–46	6.22	2.49–11.21
Other biological factors	7	27.00	1–76	8.41	2.70–24.83
Behaviour	6	7.5	0–25	2.33	Missing–7.61
Psychological factors	5	8.80	4–22	2.79	1.94–4.23
Body image	1	3.00	3.0	0.75	0.75
Sexual orientation	1	3	–	3.24	Missing
Measurement bias	1	12	–	2.70	Missing
Sum	82	11.39	0–92	3.64	Missing–24.83

MEF, main explanatory factors; CN, citation number; JIF, journal impact factor.

followed by the sociocultural and psychological models. The artefact model had only one observation; thus, the results should be interpreted with caution.

The answers to research questions 2a and 2b (Is more than one possible explanation discussed in the articles? Are differences within the group of men/women analysed in relation to socioeconomic status, ethnicity, sexual orientation, etc.) are analysed in Table 4.

Table 4 shows that all articles in the psychological model and two-thirds of the articles in the sociocultural model discussed more than one explanatory factor; this compares with one-third of the articles in the biomedical model. Differences within the group of men or the group of women were analysed most often in the psychological model, followed by the sociocultural model, and most infrequently in the biomedical model.

Discussion

The main finding was that the most commonly used gender-related model was the biomedical model, which scored highest on bibliometric measures but lowest when multifactoriality and intersectionality were analysed.

On the results

The most commonly used gender-related model was the biomedical model, followed by the sociocultural model. The psychological model was least commonly used. The authors are not aware of any other research on the prevalence of different explanatory models for gender differences in depression. This research is important as the frequency of certain explanations may influence the dominating discourse of explanations for depression, and thus both science and practice.

The strongest impact measured with bibliometrics was for the biomedical model, especially for other biological factors and genetics. The results are in contrast to important reviews by Piccinelli and Wilkinson[6] and the Swedish Council on Technology Assessment in Health Care,[8] which conclude that the biomedical model cannot explain the increased risk of depression in women compared with men. In these reviews, gonadal hormones were only concluded to have a partial effect (although smaller than environmental factors) on the gender distribution of depression, while the present analyses showed that gonadal hormones was the most commonly used explanatory factor for gender differences in depression. However, in spite of its high prevalence, gonadal hormones scored lower than life circumstances on the bibliometric measures.

When the quality of models was analysed with new research questions (if more than one explanatory factor was discussed and if differences within the group of men and within the group of women were analysed), the opposite results were found. The articles in the psychological model most often discussed other possible explanations and analysed differences within the group of men/women. This was followed by the sociocultural model. In relation to these questions, the biomedical model had the poorest outcome. The present results indicate that the model that scored highest on bibliometric measures, the biomedical model, scored lowest in terms of the degree of multifactorial and intersectional understanding. Thus, compared with the other models, the biomedical model failed to discuss other possible explanatory models and to analyse differences within the group of men/women.

There is ongoing debate about whether scientific quality can be measured with quantitative methods alone[17] or by analysing the publication's citation reports.[12] The present study has contributed to the discussion about the need for developing and applying alternative methods to evaluate the quality of research.

The most common explanatory factor was gonadal hormones, but this explanation scored lower than many of the other explanatory factors in bibliometric, multifactorial and intersectionality measures. The results indicate the largest volume within this explanation, but a medium scientific value of articles compared with other explanations. A question that has been raised is 'What are the driving forces behind the research on gonadal hormones?'.[19] In the present study, the extent to which the pharmaceutical industry financed and stimulated the hormonal studies could not be analysed as most of the articles did not include information about funding. There is a need for more research on this topic.

On the methods

The aim of this study was to analyse the scientific quality of different gender-related explanations for depression in medical articles indexed in PubMed. A possible limitation of the study was that no methodological evaluation of the included articles was performed. However, the focus was not to make a selection of articles based on a methodological evaluation, but rather to analyse all articles that are available on PubMed. Another limitation is that the database search was done some time ago, in 2002, and more recent searches could give different results. A reason for choosing this year was that an influential medical review[6] was published some years earlier in favour of interdisciplinary explanations, and the authors wanted to see whether there was a domination of interdisciplinary explanatory models in the medical literature some years after publication of this review. However, this was not the case.

The selection of articles for these analyses was made from abstracts in PubMed over a 1-year period. Other explanatory factors may have been found in other databases. However, the selection of articles was made in order to evaluate how medicine deals with gender-related explanations for depression, and there is no reason to believe that the selection of articles for this study was not representative for that purpose. Due to the lack of adequate MESH

Table 3
Gender-related explanatory models for depression.

MEM	*n*	CN mean	CN range	JIF mean	JIF range
Biomedical model: gonadal hormones, genetic factors, other biological factors	39	14.90	0–92	4.58	Missing–24.83
Sociocultural model: life circumstances, cultural factors, sexual orientation	30	8.30	0–61	2.94	Missing–24.83
Psychological model: psychological factors, behaviour, body image	12	7.67	0–25	2.39	Missing–7.61
Artefact	1	12	–	2.7	–

MEM, main explanatory models; CN, citation number; JIF, journal impact factor.

Table 4
Multifactorial analyses of gender-related explanatory factors for depression.

MEM and *n*	More than one explanatory factor discussed		Analyses of differences within the group of men/women	
	%	*n*	%	*n*
Biomedical model *n*=39	35.9	14	15.8	6
Sociocultural model *n*=29	65.5	19	44.8	13
Psychological model *n*=12	100	12	58.3	7
Artefact *n*=1		1		1

The average existence of more than one gender-related explanatory factor for depression as well as analyses of differences within the group of men or within the group of women in the articles in each main explanatory model (MEM).

terms, the search was limited to the title section. Database searches in the title section have been made in similar bibliometric analyses.[10]

Bibliometric methods are increasingly used to evaluate scientific production, international spread of research and scientific quality,[12] despite the fact that the use of such quantitative methods has been criticized for not being able to evaluate scientific quality.[12,20] By introducing research questions about multidimensional approaches as well as intersectionality, this study evaluated the articles in a more comprehensive way. The two ways of evaluating the quality of research gave totally different results. From a societal perspective, it is claimed that it is important to analyse multifactorial models as well as differences (not only the biological-related age aspects but power-related dimensions) within the group of women and within the group of men. Although the authors believe that evaluation of multifactorial and intersectional perspectives is important in evaluation of the quality of research, it is not claimed that these questions are generally accepted or the best way of measuring the quality of medical research. The question of scientific quality is much more complex than has been possible to analyse here. Thus, more complex and more precise measures of scientific quality need to be developed in future research.

Conclusions

The biomedical model, compared with the sociocultural and psychological models, seemed to have greater prominence within the medical discourse in explaining gender-related aspects of depression. However, the biomedical model scored lower than the sociocultural and psychological models when multifactoriality and intersectionality were analysed. There is a need to develop new methods for evaluation of the scientific quality of research.

Ethical approval

None sought.

Funding

Swedish Research Council.

Competing interests

None declared.

References

1. Kuehner C. Gender differences in unipolar depression: an update of epidemiological findings and possible explanations. *Acta Psychiatr Scand* 2003;**108**:163–74.
2. Noble RE. Depression in women. *Metabolism* 2005;**54**(Suppl. 1):49–52.
3. Hendrick V, Altshuler LL, Gitlin MJ, Delrahim S, Hammen C. Gender and bipolar illness. *J Clin Psychiatry* 2000;**61**:393–6.
4. Klose M, Jacobi F. Can gender differences in the prevalence of mental disorders be explained by sociodemographic factors? *Arch Womens Ment Health* 2004;**7**:133–48.
5. Nolen-Hoeksema S, Larson J, Grayson C. Explaining the gender difference in depressive symptoms. *J Pers Soc Psychol* 1999;**77**:1061–72.
6. Piccinelli M, Wilkinson G. Gender differences in depression. Critical review. *Br J Psychiatry* 2000;**177**:486–92.
7. Kendler KS, Gardner CO, Prescott CA. Toward a comprehensive developmental model for major depression in women. *Am J Psychiatry* 2002;**159**:1133–45.
8. Kendler KS, Gardner CO, Prescott CA. Toward a comprehensive developmental model for major depression in men. *Am J Psychiatry* 2006;**163**:115–24.
9. Swedish Council on Technology Assessment in Health Care. *Treatment of depressive disorders*. Report number 166/1. Stockholm: The Swedish Council on Technology Assessment in Health Care; 2004. [in Swedish].
10. López-Munoz F, Vieta E, Rubio G, Garcia-Garcia P, Alamo C. Bipolar disorder as an emerging pathology in the scientific literature: a bibliometric approach. *J Affect Disord* 2006;**92**:161–70.
11. Galandi D, Schwarzer G, Antes G. The demise of the randomised controlled trial: bibliometric study of the German-language health care literature, 1948 to 2004. *BMC Med Res Methodol* 2006;**6**:30.
12. Wallin JA. Bibliometric methods: pitfalls and possibilities. *Basic Clin Pharmacol Toxicol* 2005;**97**:261–75.
13. Macintyre S, Hunt K, Sweeting H. Gender differences in health: are things really as simple as they seem? *Soc Sci Med* 1996;**42**:617–24.
14. Hammarström A. What could a gender perspective mean in medical and public health research? In: Wamala S, Lynch J, editors. *Gender and social inequalities in health. A public health issue*. Lund: Studentlitteratur; 2002.
15. Hammarström A. The integration of gender in medical research and education – obstacles and possibilities from a nordic perspective. *Women Health* 2003;**37**:121–33.
16. Patton MQ. *Qualitative evaluation and research methods*. London: Sage; 1990.
17. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today* 2004;**24**:105–12.
18. Halcomb EJ, Andrew S. Triangulation as a method for contemporary nursing research. *Nurse Res* 2005;**13**:71–81.
19. Conrad P, Leiter V. Medicalization, markets and consumers. *J Health Soc Behav* 2004;**45**:158–76.
20. Cheek J, Garnham B, Quan J. What's in a number? Issues in providing evidence of impact and quality of research(ers). *Qual Health Res* 2006;**16**:423–35.