Abstract

Aim

To evaluate and summarize the current evidence base in relation to the gender specific presentation and assessment of coronary heart disease.

Background

Coronary heart disease (CHD) is one of the leading causes of death in both men and women worldwide. There remains a common misconception that CHD is predominantly a ‘man’s disease’ and that CHD doesn’t affect women until they are much older. Much of the evidence base is underpinned by male based population studies.

Design

A systematic review of current qualitative and quantitative primary research literature was used to establish if coronary heart disease patients would benefit from a gender specific approach.

Data Sources


Results

Selected studies reviewed in English and critiqued in accordance with the critical review framework utilized by the National Institute for Health and Care Excellence
Conclusion

There are clear differences between the genders in relation to coronary heart disease. It is imperative that nursing practice therefore acknowledges this through the greater application of gender specific care.

Keywords

Coronary heart disease, gender bias, gender specific care, health behaviour, cardiac nursing practice

Key point sentences

- Gender specific care for coronary heart disease is currently not recognized by both clinicians and patients.
- Without this recognition, women in particular, could potentially be receiving sub-standard care.
- Underpinning evidence base is founded upon male bias research studies.
- A gender discrepancy exists in the presentation of coronary heart disease.
- Health behaviour of women is different and therefore health promotion and clinical practice must reflect this.
- Clinical guidelines should reflect the need for gender specific care.
- To encourage targeted specific health promotion in relation to gender specific care.

Introduction

Cardiovascular disease (CVD) is the leading cause of death globally (World Health Organisation 2010). Although improvements have been seen in the prevention and treatment of CVD over the last decade, with a 40% reduction in mortality rates in the
under 75’s, CVD remains one of the major causes of death and disability in the UK (Department of Health Cardiovascular Disease Team 2013). Premature death (before the age of 75) from CVD accounted for 28% of deaths in men and 19% of deaths in women in 2010 (Townsend et al. 2012). Coronary heart disease (CHD) is the largest subset of CVD and the main cause of mortality in older people of both genders almost everywhere in the world (World Health Organisation 2009). It is also the single most common cause of premature death in the UK (Townsend et al. 2012)

Historically, medicine has used men as the standard frame of reference for all diseases shared by both genders (Xhyheri & Bugiardini 2010), with conclusions then extrapolated to females (Legato, et al. 2006, Matura 2010). This over exaggeration of the male template has been compounded by the under representation of women in clinical trials (Melloni et al. 2010). As with many diseases men and women experience CHD differently. Women are significantly less likely than men to present with chest pain, but more likely than men to present with fatigue, neck pain, syncope, right arm pain, dizziness and jaw pain (Coventry, Finn & Bremner 2011). The World Health Organisation (2009) acknowledged that CHD in women is unrecognised and undiagnosed, in part because, they present with differing symptoms to men, which ultimately leads to under-diagnosis.

Current treatments for CHD are equally effective between the genders (NICE 2013), yet a timely and accurate diagnosis could significantly reduce mortality within women (Mieres et al. 2005). Shirato & Swan (2010) suggest that delays in clinical assessment of women is mainly due to cardiac symptoms differing from the classic, defined and well established presentation seen in men. This is an important
consideration, as these studies form the basis upon which current guidelines are based. However, attempts to ‘mainstream’ gender into healthcare have turned out to be over-simplified reports of gender differences, without taking account of the complex life conditions of men and women (Kuhlmann & Annandale 2012). This is typified by the National Institute for Health and Clinical Excellence (NICE) clinical guideline number 95 – Chest pain of recent onset, which states: “Do not assess symptoms of an ACS differently in men and women” (NICE 2010).

The Framingham Heart Study (Haynes & Feinleib 1980) was a pivotal investigation into coronary heart disease and showed that gender has a significant effect. This landmark study highlighted that women develop heart disease about ten years later than men and that women’s CHD risks were lower. It also provided insights into the now well-established risk factors that are fundamental to the prevention of CHD, such as: the effects of tobacco use, unhealthy diet, physical inactivity, obesity, raised blood cholesterol, raised blood pressure and diabetes mellitus (Mendis 2010).

What the Framingham Heart study did not demonstrate, is why these differences exist between the genders (Wizemann & Pardue 2001). Several reasons for these differences have been posed by other studies; Sheifer et al. (2000) reported an intrinsic sex effect on coronary dimensions, with women possibly having smaller coronary artery size reflecting natural somatic variation. It has been argued by Williams, Fraser and West (2004) that the potential differences between the genders is attributable to age of presentation rather than gender differences directly. Fransoo et al. (2010) agreed with this potential difference, as their study confirmed that age was the main predictor, rather than gender. In contrast, Bösner et al. (2011)
concluded that the observed gender differences could not be explained by differences in age and underlying risk factors.

Diabetes is a known coronary heart disease risk factor and is thought to accelerate atherosclerosis through multiple mechanisms, especially in women (Worrall-Carter et al. 2011). This acceleratory effect could lead to exacerbation of other known CHD risk factors, such as hyperlipidaemia and hypertension which results in increased risk profile (Juutilainen et al. 2004). In the RIACE study (Penno et al. 2013) a significant proportion of the female diabetic patients studied did not achieve the recommended targets for CHD prevention. Thus, it is plausible that the observed gender differences could be at least partly explained by poorer diabetes control in women, however, there is little primary research data to support this.

The belief that women suffer with CHD in the same way as men, is deeply ingrained in society (Shirato & Swan 2010). This belief inadvertently prevents effective recognition of cardiac signs and symptoms in women, leading to women not knowing when to seek medical advice or treatment for coronary heart disease (O'Keefe-McCarthy 2008). This has been frequently experienced within the author's own clinical practice, providing the impetus underpinning this review

**Aim**

To evaluate and summarize the current evidence base for gender specific care in relation to coronary heart disease
Design

A systematic review of current qualitative and quantitative primary research literature was used to establish if coronary heart disease patients would benefit from gender specific care.

Search methods

The following electronic databases were searched in January 2014 with the full list of keywords and Boolean combinations listed in Table 1:

- Cumulative Index to Nursing and Allied Health Literature, via EBSCO host
- Medical Literature Analysis and Retrieval System Online, via EBSCO host
- The Allied and Complementary Medicine Database, via EBSCO host
- PsycINFO, via EBSCO host
- Embase, via OVID
- British Nursing Index,
- Wiley Online Library and
- The Cochrane Library.

A web based search utilising Google Scholar and review of the national and international organisations publications and cardiology professional organisations websites, such as: the British Heart Foundation, European Society of Cardiology, American Heart Association and the National Institute for Health and Care
Excellence, were also reviewed.

**Inclusion Criteria**

- must substantially focus on gender similarities or differences in relation to coronary heart disease
- should be primary research (including meta-analysis)
- must be written and published in English
- published within the period January 2010 to February 2014, providing current credibility.

**Exclusion Criteria**

- Primarily comprise of non-cardiac issues relating to gender e.g. depression.
- Have a patient population 18 years old or younger.
- Are not relevant to current clinical practice.
- Are non-primary research / literature review.

**Search Outcome**

This strategy and the inclusion/exclusion criteria identified a large number of articles listed in figure 1; these were then hand searched for relevancy. A manual search
was conducted by the first author of the bibliographies and references from excluded systematic reviews. If the article, on initial reading of the title and abstract, did not substantially address the theme of the review, then it was removed from the list of articles. This list of articles was then thoroughly assessed to determine their individual eligibility, by reviewing the full text of the article. This electronic and manual searching resulted in 150 articles that appeared relevant for reviewing. This was then refined to 35 articles. The list was reviewed and agreed by the second author and this formed the basis of the literature review.

Quality appraisal

To assess study quality, the critical review framework design, utilised by the National Institute for Health and Care Excellence, (NICE 2004) was used to review strengths and limitations. There is no NICE approved check list for cross sectional studies, therefore the checklist designed by Mann. (2003) was additionally utilised. The results of the search strategy are outlined in table 2.

In reviewing the 35 selected articles, the following themes were identified and provide the basis for this narrative systematic review;

- Clinical presentation between the genders

- Diabetes Mellitus as a confounding factor
• Differing health behaviours between the genders

• Delay in seeking medical assistance
**Similarities and differences in the clinical presentation of acute and chronic CHD between the genders**

Typical symptoms of acute CHD presentation are defined as: central crushing chest pain, pain radiating to the arm, jaw, back, neck or shoulder and collapse (Farquharson, Johnston & Bugge 2012). Khan _et al._ (2013) reported that chest pain was the most common symptom in men and women presenting with Acute Coronary Syndrome (in studies totalling 2054 patients), and despite women reporting a greater number of symptoms, there was no difference in their clinical presentation (Lansky _et al._ 2012, Golden, Chang & Hollander 2013, Pickett _et al._ 2013). There is however disagreement within the reviewed literature in relation to the clinical presentation of CHD between the genders.

**Chest Pain**

O’Donnell _et al._ (2012), Khan _et al._ (2013), Pickett _et al._ (2013), Tamura _et al._ (2013) all reported that there were no differences in gender presentation with regards to chest pain. However Hess _et al._ (2010), Matura (2010), Napoli & Choo (2012) reported that men presented with chest pain more frequently than women. These studies, however, only included patients reporting chest pain and patients with atypical symptoms were either not included (Hess _et al._ 2010) or only limited symptoms were included (Matura 2010, Napoli & Choo 2012).

The study by Ghezeljeh _et al._ (2010) was a cross sectional, multi-centre study undertaken in Iran, consisting of a stratified sample of 500 participants and it
concluded that there were gender differences in symptom characteristics. Women were more likely than men to report pain in the left arm and hand (p=0.006), left scapula (p<0.001), jaw (p=0.006) and neck (p<0.001); whereas, men were more likely to complain of pain in the left lower chest (p=0.007). Women were significantly older, 62.1 years compared to 59 years in men (p<0.001) and more likely to be diagnosed with diabetes mellitus (p=0.03). However an identified weakness with this study was, it focused solely upon pain as a symptom of angina utilising a characteristics questionnaire and did not allow the patients to fully describe their experience of angina. The Chest Pain of Recent Onset Guidelines (NICE 2010) state that practitioners should not assess symptoms of ACS differently in different ethnic groups, making the Ghezeljeh study results applicable to western populations.

Another study by Hess et al. (2010) asserts that women presented less frequently with typical chest pain and had a lower rate of significant CHD. The sample women were statistically older than men (p=0.006), but the diagnosis of diabetes mellitus was equivocal between the genders (p=0.99). This study excluded patients with non-chest pain symptoms such as shortness of breath, nausea, back pain, palpitations or generalised fatigue.

In a single-centre prospective cohort study by Tamura et al. (2013) of 124 Japanese patients with chest pain, women were typically older than men, 74.3 years compared to 69.8 years (p=0.01). This study was undertaken in a relatively small population and although the relative incidence of chest pain was not ‘statistically significant’ between men and women, the occurrence of non-chest pain symptoms was more common in women (31% vs 14%, p=0.02), particularly right shoulder/upper arm pain.
and neck/throat pain. This dichotomy of symptoms was also reported by Ghezeljeh et al. (2010) who concluded that there were gender specific variations in the description, intensity and location of the angina symptoms. They offered a different interpretation of the findings, hypothesising that women were better than men at communicating and verbalising their symptoms.

A study by Kreatsoulas et al. (2010) reported differing intensity of angina symptoms between the genders. Women with class IV angina were more likely than men to have severe CHD (p < 0.01); in comparison, men with severe CHD were more likely to have class 0 to II angina (p < 0.01). This was a large registry study from South Canada with 23,757 consecutive patients referred for coronary angiography (38.4% women and 61.6% men) over a four year period and can be extrapolated to the general population. Women were significantly older than men (65.2 years vs 62.3 years, p<0.01), and more likely to be hypertensive (p<0.01), but there was no significance in diabetes diagnosis (p=0.15). There are several limitations to this study. Patients with previously confirmed CHD were excluded and no follow up data was collected. The decision to refer patients for angiography was based upon physician decision rather than protocol driven; meaning referral bias may have been present. Matura (2010) did note that women had a higher absolute and percentage value of CHD mortality compared with men (85%:79%) and a preponderance in history of previous CHD diagnosis.

**Atypical symptoms**

Women have been shown to have a higher prevalence of atypical symptoms
compared to men (Ghezeljeh et al. 2010, O’Donnell et al. 2012, Newman, et al. 2013, Tamura et al. 2013). In contrast, the studies by O’Donnell et al. (2012) and Khan et al. (2013) were the only studies in the review articles to include patient populations with both typical and an unrestricted number of atypical symptoms reported in clinical practice. The large multi-centre Genesis Praxy study (Khan et al. 2013) demonstrated that women were more likely to present without chest pain than men (19.0% vs 13.7%, p=0.03). Those presenting without chest pain reported at least one non-chest pain symptom with women having more overall symptoms than men. This led to the conclusion that non chest pain symptoms, particularly in women, should be given credence in the assessment of possible acute coronary syndrome.

An observational cohort study of 206 patients by Golden, Chang and Hollander (2013) demonstrated that women were less likely to be told that their symptoms could be a result of heart disease and where more likely to be given the diagnoses of reflux disease (p = 0.03), or ‘unknown aetiology’. This was despite the fact that an ACS diagnosis was considered in all the patients included and the similarity of the presenting symptoms between the genders.

Age

Canto et al. (2012) conducted an observational study of 1,143,513 patients from the National Registry of Myocardial Infarction and concluded that gender differences diminished with increasing age in patients presenting without chest pain. They also reported differences in plaque composition related to age and pathology. Younger women presented with plaque erosions, but relatively little coronary narrowing, and
older women with plaque ruptures and relatively severe coronary narrowing. This study also showed that younger women had greater hospital mortality despite the lack of obstructive coronary disease demonstrated in previous studies (Burke, et al. 1998). Despite women being older at time of referral, in females with normal coronary arteries, the angina symptoms could be due to vasospasm or non-obstructive disease (Kreatsoulas et al. 2010).

Carotid intima-media thickness increases with advancing coronary artery disease and is widely established as a marker of coronary atherosclerosis (Lansky 2012). A prospective multi-centre study of 788 healthy subjects showed that healthy women between 30 and 50 years of age had thinner intima-media thickness in all carotid segments compared to men of the same age (p<0.0001), but the differences between the genders disappeared as the women reached their sixties (p=0.29), and also possibly with the onset of menopause (Kozàkovà et al. 2013). This might explain the findings of the study conducted by Mega, et al. (2010) who showed that women were less likely than men to have obstructive CHD, but more likely to report angina and to have ischaemia on electrocardiogram. Conversely, the prospective multi-centre Providing Regional Observations to Study Predictors of Events in the Coronary Tree (PROSPECT) study highlighted that women had fewer non-culprit lesions (p=0.005), but there was no difference in culprit lumen diameter between the genders (men, 2.79mm: women, 2.72mm, p=0.06), emphasising that males have more extensive atherosclerotic burden (Lansky et al. 2012). This study indicated that female atherosclerotic lesions as severe as those in men, manifested seven to eight years later, possibly accounting for the different presentation in ages seen by Kreatsoulas et al. (2010).
Diabetes Mellitus as a confounding factor

Khan et al. (2013) showed significant difference (p<0.001) in the clinical diagnosis of diabetes mellitus between the genders, although there was no significance (p=0.13) in relation to the absence or presence of chest pain. Mega et al. (2010) reported higher rates of diabetes mellitus among women (p<0.001), their study showed higher rates of ischaemic symptoms and less coronary narrowing in women relating to micro-vascular disease. What is not apparent however, is the cause of the micro-vascular disease and whether the increased diagnosis of diabetes mellitus is a significant finding.

Differing health behaviours between the genders

Several studies (Galdas et al. 2010, Mochari-Greenberger, et al 2010, Villablanca et al. 2010, Herning et al. 2011, Bangalore et al. 2012) have suggested that patients lack knowledge of the various symptoms of CHD, especially females and that opportunities for effective interventions are missed by clinicians and patients alike (Leifheit-Limson et al. 2013). Kavanagh et al. (2010) suggested that education shapes an individual’s health through its influence on people’s capacity to assess and interpret health information.

A qualitative study by Herning et al. (2011) explored 14 women’s experiences and behaviour surrounding their myocardial infarction. They reported that the women had false expectations about the location and intensity of chest pain. They expected heart attacks to be more dramatic and sudden; they did not see themselves as being
at risk as they were female and believed themselves to have healthy lifestyles, despite evidence to the contrary. They further delayed seeking medical attention by denying the severity or by being ambivalent to the situation, not wanting to inconvenience other people. Another qualitative study utilising in-depth semi-structured interviews of 20 individuals, by Galdas et al. (2010) explored health-seeking behaviours by gender. The female patients in their study reported employing delaying techniques, a reticence around accessing treatment and an overall sense of ambiguity about the severity of their condition. The authors concluded that gender-specific health promotion was needed and that culturally-dominant gender ideals were misguided.

The detrimental effect of gender roles was also recorded in the questionnaire-based prospective cohort from the Alberta Provincial Project for Outcome Assessment (Norris et al. 2010), where gender discrepancies were seen with health-related quality of life outcomes. The authors surveyed their cohort of 2403 patients one year after their preliminary angiography; females presented with more anxiety (p<0.001) and increased angina symptoms (p<0.001) when compared with the men. Their analysis showed that improvement in angina symptoms and physical limitations had a direct correlation with an improvement in quality of life perceptions. This study was limited by way of concomitant medications not being recorded. This means the reported differences could be due to under-prescribing.

**Delay in seeking medical assistance**

Delaying behaviour of women has been widely reported (Herning et al. 2011, Galdas

Farquharson, Johnston and Bugge (2012) in their retrospective questionnaire based study clarified delay behaviour into two categories: ‘appraisal delay’, being the time taken to decide symptoms are of concern, and ‘illness delay’, recognising the symptoms and calling for medical assistance. They found that ‘illness delay’ was the same for both genders, with a median illness delay of 75 minutes, but ‘appraisal delay’ was longer in women (>2 hours) 57% vs 43% in men (p=0.047). The authors suggested that this difference between the genders was because females experience particular difficulties in evaluating multiple or ambiguous symptoms. This study was limited by a low participation rate. As a retrospective trial it could be subject to bias through the participants’ experiences and patients may have revised their answers due to their experiences post event. In contrast to these results the study by Newman et al. (2013) reported that women under 65 were significantly more likely (p<0.01) than men to call for medical assistance. However, this sub-study has been selected from participants in a single-centre study, analysing the prognostic risk conferred by depressive symptoms and clinical depressive disorders at the time of ACS. The calls for medical assistance were self-reported during an in-hospital interview; only 100 out of the 500 participants were verified, with 24 participants being excluded as data was not available on their call.

**Discussion**

The literature reports that women present later on average than men with their
symptoms and with more advanced disease (Kreatsoulas et al. 2010, Matura 2010, Mega et al. 2010, Aguilar et al. 2012, Sheppard et al. 2012, Shehab et al. 2013), particularly in those aged over 65 years. In studies where age was not identified as a factor these gender differences were still reported (Napoli & Choo 2012).

Women are less likely than men to seek medical help and, therefore, may not get appropriate care until it is too late (World Health Organisation 2009). This may result in the increase in morbidity and poorer quality of life seen in women following a cardiac event (Mosca et al. 2011).

There is a lack of awareness in both clinicians and patients of the differences in CHD presentation between men and women. Women delay seeking medical assistance for cardiac symptoms and when women do present the diagnostic tests utilised may not diagnose the true cause of their symptoms. This is compounded by the stoicism displayed by women in relation to their CHD symptoms and the belief that they should conform to the gender ideals assigned by society. Delaying behaviour until their attempts to self-treat have been exhausted (Galdas et al. 2010) results in poorer quality of life scores compared to men and increased morbidity.

Clearly women are at an increased risk of CHD, this is not currently acknowledged by the existing risk scores utilised in practice, the Framingham risk score underestimates this risk within women as it relies on endpoints of MI and coronary death, with >90% of women classed as low risk and very few assigned high risk status before the age of 70 (Wenger, 2011; Stock & Redberg 2012). The quick reference guide for chest pain of recent onset (NICE 2010) sets out the pathways
that clinicians should follow and gives percentages of people estimated to have coronary heart disease according to typical symptoms, age, gender and risk factors. The consequence is that women with subclinical atherosclerosis are categorised as low risk and the increased mortality risk for younger women with symptoms is not recognised. There is a case for younger women with CHD to be considered high risk and treated aggressively. Additionally this information is adapted from data acquired from 1983 to 1985, so how relevant is 30 year old data to the current population? A good example of this is in female patients with suspected CHD; if the estimated likelihood of CHD is between 61-90%, the guideline suggests offering invasive coronary angiography as the first-line diagnostic investigation. The only women that would qualify (for what is considered the gold standard of care) are high-risk women with typical anginal symptoms, and the criteria for high-risk is any one of the following: diabetes, smoking or cholesterol above 6.47mmol/L. According to these NICE guidelines, women with non-anginal chest pain or atypical angina, regardless of risk category, should not be offered coronary angiography. Whereas, coronary angiography should be offered to over 55 year old high-risk men with non-anginal chest pain, high-risk men with atypical angina regardless of age, and over 60 year old low-risk men with atypical angina. This disparity in treatment means that women do not get equal treatment with men until they present with AMI where the criteria is based upon blood test results and ECG changes. Until guidelines reflect the need for more gender specific care, recognition and implementation by the majority of the health care profession will not happen.

**Implications for nursing practice**
Findings from this literature review have implications for nursing practice, especially within clinical assessment, health education and health promotion. It has been shown that women present older than men, are significantly less likely to present with typical CHD symptoms and more likely to experience generalised chest discomfort/pain, fatigue, syncope, nausea/vomiting, back pain, palpitations, shortness of breath or sense of dread. Clinicians and nurses must be aware of these differences and the need for a thorough and all-encompassing assessment to identify those at risk of CHD. This has implications therefore for the training and practice of nurses working in Emergency Departments and Primary Care who are most likely to have the initial contact with patients with CHD. Assessment should be based upon the individual’s risk factors and gender issues should be considered when diagnostic test are ordered. There is evidence of clear differences between the genders in the presentation of CHD, with the aetiology of CHD in women appearing more complex with obstructive disease and micro-vascular disease playing differing roles. As a consequence the imaging of these vessels needs to detect sub-clinical levels of atherosclerosis and emerging technologies need to be utilised for these at-risk women (Vavas et al. 2012). The increased risk of CHD predominately occurs at an older age in women, although younger women’s risk of increased mortality from CHD should be acknowledged and addressed. This is not currently being translated into nursing practice, either through clinical assessment or the risk scores utilised by nurses.

According to The World Heart Federation (2014), if patient’s have diabetes, their risk of cardiovascular disease is increased for a number of reasons: hypertension, dyslipidaemia and obesity. These are all risk factors in their own right for
cardiovascular disease and occur more frequently in people with diabetes. Educating women on their risk factors and assisting them to achieve the recommended NICE targets through increased education and increased prescribing, means that the gender differences seen within the RIACE study (Penno et al. 2013) could be minimised in clinical practice. Nurses are in a prime position to challenge these beliefs as they are involved in the assessment, diagnosis, treatment and rehabilitation of these patients and their families.

There is a need for improved health education around women’s risk of CHD. It has been shown that national and international health campaigns can make a large difference and are needed to increase the level of knowledge in the population, as some women continue to have a poor understanding of the symptoms of CHD. The underlying theme of the heath campaigns should be educating the population of the range of symptoms that can be experienced, especially by women.

**Implications for research**

Women remain under-represented in clinical trials, as shown in this literature review, with a participation rate of 30% (excluding the sole women trials). Tsang et al. (2011) suggests this low representation is due to ‘age recruitment bias’ and strategies to recruit older populations will translate into improved representation. More studies are needed that positively include women to ensure diverse representation and increase understanding of how CHD impacts females.
Women’s awareness of the symptoms and presentation of cardiac disease warrants further investigation. This should be done with future prospective study designs and explore progression of symptoms over a sustained period of time, to give a true representation of the gender similarities and differences for CHD. Further research is needed to confirm or refute the possible hypothesis, that a delay in the treatment of women due to a lack of symptom recognition in the emergency department/pre-hospital could explain the disparities between genders. Comparative research into educational interventional strategies is also important as it is necessary to understand which approach is most effective in changing the views of society and make people more aware of the risk to members of their families.

Conclusion

Evidence from this literature review indicates there are clear gender specific differences in the presentation of CHD. However there does not appear to be a consensus in relation to the experience of chest pain between the genders. The studies reviewed, show that using chest pain as the key descriptor for CHD disadvantages women for several different reasons. Primarily, women appear to experience CHD differently from men, implying that there may be a possibility of clinicians and patients confusing the warning signs and symptoms of ischaemic cardiac pain.

The presentation of CHD in women may include vague signs and symptoms, for
example: shortness of breath, fatigue, and back pain (O’Donnell et al. 2012). This suggests that chest pain should not necessarily be the primary symptom considered when assessing patients or, more specifically, women for ACS. Secondly, CHD may be overlooked entirely and inaccurate diagnoses given to patients, which could potentially delay further investigations and treatment (Napoli & Choo 2012, Golden, Chang & Hollander 2013). Ghezeljeh et al. (2010) suggested women were better at communicating their symptoms, yet this variety of potential symptoms for CHD (up to 87 different symptoms (O’Donnell et al. 2012)) has not been grasped as significant by clinicians generally, or women are under-playing the severity of the symptoms, or are not aware that the symptoms are significant.

Coronary heart disease is a major cause of death and disability in women, yet the recognition of coronary heart disease symptoms by patients and health professionals is limited by teaching based upon classic literature and male-based populations (Collins 2012). Overall there is a plausible case for gender-specific care, but there is a definite necessity for a better awareness of the differences in CHD presentation between the genders in both health professionals and patients alike.

References


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*Journal of Women's Health*, 22, 659-666.


*Emergency Medicine Journal*, 20, 54-60.

*Clinical Nursing Research*, 19, 55-70.

*Circulation*, 121, 1809-1817.


Wenger NK (2011) Coronary Heart Disease in Men and Women: Does 1 Size Fit All? No! *Clinical Cardiology*, 34, 663–667.


<table>
<thead>
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<th>Table 1 – Search strategy</th>
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<tr>
<td>Cardiovascular Diseases OR Cardiovascular Risk Factors OR Cardiovascular Care OR Diagnosis, Cardiovascular OR Cardiovascular Agents OR Myocardial Ischemia OR Coronary Disease OR Coronary Arteriosclerosis OR Cardiovascular System Physiology OR Cardiovascular System OR Myocardial Diseases OR Acute Disease OR Cardiovascular Nursing OR Heart Diseases OR Myocardial Ischemia OR Coronary Disease OR Cardiac Patients OR Angina, Stable OR Angina, Unstable OR Angina Pectoris OR Chest Pain OR Cardiac Patients OR Acute Coronary Syndrome OR Acute Chest Syndrome</td>
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Figure 1 – Flow chart of the review process

1. EBSCO host
   1689 articles
   112 articles included

2. Embase
   392 articles
   374 did not meet inclusion criteria
   1 duplicate
   7 articles included
   8 conference articles included

3. Wiley Online Library
   496 articles
   404 did not meet inclusion criteria
   72 duplicates
   20 articles included

4. Cochrane Library
   197 articles
   192 did not meet inclusion criteria
   2 duplicates
   3 included

5. British Nursing Index
   28 articles
   25 did not meet inclusion criteria
   3 duplicates
   0 included

150 articles remaining for full review

Excluded
41 not substantially focused on gender similarities/differences
26 comprising of non-cardiac issues
12 not relevant to current clinical practice or relevant to time period
35 not primary research

36 articles included as per Appendix 1
Table 2. Characteristics of included studies

<table>
<thead>
<tr>
<th>Number</th>
<th>Authors</th>
<th>Study Period</th>
<th>Study Design</th>
<th>Sample size</th>
<th>Female, %</th>
<th>Study Location/Setting</th>
<th>Patient Population</th>
<th>Comments</th>
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<td>Aguilar, et al.</td>
<td>2003-2008</td>
<td>Retrospective cohort study</td>
<td>21,742</td>
<td>46</td>
<td>United States. 1 local hospital</td>
<td>Pre-hospital use of ECG in patients with complaints of chest pain</td>
<td>Several limitations to the trial, older females</td>
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<tr>
<td></td>
<td>Authors</td>
<td>Year(s)</td>
<td>Study Type</td>
<td>Participants</td>
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<td>3</td>
<td>Canto, et al. (2012)</td>
<td>1994-2006</td>
<td>Cross-sectional study</td>
<td>1,143,513</td>
<td>42</td>
<td>United States. Multi-centers</td>
<td>Diagnosis of acute STEMI, &lt;12 h after onset of symptoms, and received reperfusion therapy</td>
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of how patients derived.
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