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Invited State-Of-The-Art Review

Research in women - Women in research

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ABSTRACT

Women remain underrepresented in research, and this lack of representativeness leads to bias in how healthcare systems and solutions are designed, measured, implemented and evaluated. Women-specific health conditions and those that disproportionately affect women remain under-researched, and a considerable funding gap persists. Addressing the research gap in women's health may yield evidence to support more effective diagnostics, treatments and preventive strategies, ultimately improving outcomes and reducing costs for half the population.

KEY POINTS

- Women's health remains under-researched, with conditions unique to women, such as endometriosis or polycystic ovary syndrome, receiving limited attention relative to their prevalence and impact.
- Lack of inclusion of women in research and clinical trials perpetuates sex- and gender-based bias, leading to misdiagnosis, unequal access to care and poorer health outcomes.
- Globally, less than 1% of research funding goes specifically to women-specific health conditions beyond cancer, and women remain underrepresented in research leadership and funding bodies. Closing the gaps in women's health research will reduce inequities, improve outcomes across the lifespan, break intergenerational cycles of disease and benefit society.

Historically, women's contributions to science and medicine have been overlooked, while research on women's health has often been underfunded and underprioritised. These dual gaps have shaped both knowledge creation and clinical practice. Despite progress, sex and gender disparities persist in healthcare, and conditions that disproportionately affect or are unique to women, such as autoimmune disorders, endometriosis, pregnancy-related complications and cardiovascular disease, remain insufficiently studied. According to the World Health Organization, gender medicine is defined as the study of how sex-based biological and gender-based socioeconomic and cultural differences influence health. It emphasises that advancing women's health research requires attention to both biology and broader social determinants [1].

Closing the gender gap in healthcare research has far-reaching economic implications, and global estimates suggest that better health outcomes for women could lead to a 50% increase in gross domestic product, driven by higher productivity, reduced disease burden and lower mortality [2]. High-impact conditions include menopause, premenstrual syndrome (PMS), depression and migraine [2]. Addressing these inequities is not only a matter of fairness but of scientific rigour, clinical safety and economic sustainability.

Women in research

In 1874, Nielsine requested permission to take the Upper Secondary School Exam to study medicine at the University of Copenhagen. Doctors and professors debated the consequences of admitting women to university, and the arguments against included claims that women could distract male students and prevent them from their “natural duty” of caring for family life. Those in favour emphasised that female doctors could support the treatment of women, children and prostitutes, and that Denmark should follow global trends in admitting women to universities. Nielsine Nielsen was eventually allowed to study, graduating in 1885 as Denmark's first female doctor [3]. The Danish scientist and seismologist Inge Lehmann is known as the woman who found Earth's inner core. In 1936, she proposed the theory that the Earth has a solid inner core surrounded by a molten outer core, and in 1938, her theory gained international recognition. Despite her global recognition, her scientific contribution was not recognised in Denmark until after her death [3, 4]. These cases are historic examples from Denmark. However, many other examples can be drawn from women around the world who have faced similar challenges in pursuing careers in science [5].

The gender gap in research is a prominent concern that has received increasing attention in recent years. In Denmark, a 2022 report from the Danish Agency for Higher Education and Science showed an inverse trend in academia between men and women [6]. While more women than men obtain a master's degree, and an almost equal number complete a PhD, the proportion of women who become assistant, associate and full professors declines at each career level, whereas the opposite is true for men. This trend was apparent for all universities and academic disciplines in Denmark [6]. However, overall, the number of women in research who are assistant, associate or full professors has increased over time, from 30% (2010) to 35% (2020). Similarly, the lack of women in top management at universities is apparent. In Denmark, 28% of top-level university management are women, which is below the Scandinavian and European averages. In the EU, 26.2% of professors are women, whereas the corresponding number for Denmark is 22.6%

[6]. In Sweden, Norway, Finland and Iceland, the corresponding numbers are 28.2%; 30.9%; 26.3%; 30.3%, respectively [6]. On a global scale, we see the same trends. Organisation for Economic Co-operation and Development (OECD) figures show that globally, more women than men have a tertiary education – the OECD averages for women and men are approximately 54% and 42%, respectively. However, women remain underrepresented in the global research workforce [7]. Globally, sex-aggregated data are missing, and large data gaps remain – especially in low- and middle-income countries – which makes it challenging to draw conclusions for many regions [8].

Research in women

Why is representativeness important in research? Not only regarding gender but also concerning race, ethnicity, sexuality, disability and other aspects. It matters because a lack of diversity leads to bias in how our healthcare systems and healthcare solutions are designed, measured, implemented and evaluated. Sex and gender shape the research questions asked, the research methods used and the health areas researched, and when research lacks diversity, clinical guidelines, diagnostic tools and treatment protocols may fail to reflect the needs of underrepresented groups. This may lead to misdiagnosis, unequal access to care and poorer health outcomes [9]. Historically, men have been seen as the default in society, meaning that societal structures are designed around this standard. What might seem objective may actually be male-biased [9]. Medical textbooks generally use the white, heterosexual male body as the universal standard [10], and clinical trial scandals, such as the thalidomide scandal, have caused medication to primarily be tested on men. Likewise, diagnostic biomarkers like troponin thresholds are calibrated to male physiology, making them less sensitive in women, which may lead to misdiagnosis [9].

Historic data show that as the proportion of women in academic medical research increased, more research was conducted on health issues that disproportionally affected women, such as breast cancer and urology [11]. Despite progress, many conditions disproportionately affecting women remain under-researched, and male physiology continues to dominate reference values and diagnostic criteria [12]. Cardiovascular disease, for example, is the leading cause of death among women in Europe; yet for decades, it has been regarded primarily as a “male disease” [13]. Cardiovascular disease in women remains understudied, under-recognised, underdiagnosed and undertreated [14]. Since women have historically been excluded from cardiovascular trials, much of the knowledge base, diagnostic tools and treatment guidelines have been derived from male participants. Although women may have a more favourable biological profile, gender-related factors are associated with poorer outcomes, including increased mortality in women with coronary heart disease or heart failure, than in men [15]. Recent European data show persistently higher case fatality from ischaemic heart disease among women, highlighting the need for sex-specific prevention strategies [16]. Early warning signs of heart disease in women — such as fatigue, nausea or shortness of breath — have long been under-recognised, leading to delayed diagnosis and insufficient treatment [17]. Additionally, a 2025 review of 80 studies that included over 16 million patients found that women were less likely to receive recommended pharmacological therapies, invasive procedures and rehabilitation programmes [18]. More than 80% of studies reported under-treatment in women, and almost all studies of invasive therapies showed lower provision of care [18]. These disparities highlight a persistent gender bias in cardiovascular medicine — often called the “Yentl syndrome” – where women only receive guideline-based treatment if their symptoms and disease presentation resemble those of men, leading to poorer outcomes and survival rates among women [19].

Similarly, autoimmune diseases such as lupus and multiple sclerosis, which disproportionately affect women, have historically received less research attention, slowing progress in understanding their causes, treatments and prevention strategies [20]. Furthermore, conditions unique to women, such as endometriosis or polycystic ovary syndrome (PCOS), remain under-researched relative to their prevalence and impact. Endometriosis affects an estimated 10% of reproductive-age women; however, diagnosis is delayed for up to 10 years after symptom onset [21], reflecting both biological complexity and under-prioritisation [22, 23]. Polycystic ovary syndrome, one of the most common endocrine disorders in women, has long been investigated primarily in relation to fertility, despite strong links to cardiometabolic risks [24].

Moreover, gender differences in healthcare utilisation are notable. Danish data indicate that women make greater use of general practitioners and medical specialists – excluding contacts related to pregnancy and childbirth. In contrast, fewer women than men are referred to and admitted to hospitals [25]. The underlying reasons for these differences remain unclear. It has been suggested that women may experience a higher degree of bodily discomfort than men, that men and women may perceive and report bothersome symptoms differently, and that social norms influence healthcare-seeking behaviour [25, 26]. Further research is needed to understand these patterns and incorporate gender considerations into health system planning.

Additionally, pregnancy itself has often been viewed as a temporary condition rather than a critical determinant of long-term health. This has led to insufficient attention to complications such as gestational diabetes mellitus (GDM), pre-eclampsia and preterm birth, which are now recognised as strong predictors of subsequent chronic disease in women. Women with a history of GDM face a markedly increased risk of type 2 diabetes and cardiovascular disease [24, 27]. Similarly, systematic reviews consistently demonstrate that women with a history of pre-eclampsia have about a two-fold increased risk of subsequent cardiovascular disease, including hypertension, ischaemic heart disease, heart failure and stroke, along with elevated cardiovascular mortality, with risks emerging within a few years postpartum and persisting for decades [28]. Despite this knowledge, follow-up strategies and preventive care for women after complicated pregnancies remain limited, creating a major gap in both clinical practice and research. Ensuring robust research into women’s future health after adverse pregnancy outcomes is a crucial next step — not only to improve maternal health, but also to break intergenerational cycles of risk that affect children and families.

Current research focuses disproportionately on diseases with a high mortality (e.g., breast cancer). In contrast, chronic and disabling conditions that primarily affect women - such as PMS, PCOS, endometriosis and menopause - remain underexplored, and less than 2% of the current healthcare pipeline addresses women’s conditions outside cancer [2]. A strategic shift from mortality-driven endpoints to those emphasising quality of life may align research priorities with the actual burden of disease, thereby improving funding opportunities. Conditions associated with pregnancy and childbirth also merit greater attention. For instance, postpartum haemorrhage remains a leading cause of maternal mortality in low- and middle-income countries, on a par with female cancers in terms of mortality burden - yet it receives minimal research focus [2].

Economic aspects of research in women’s health

Economy is a central driving force behind research, influencing both the availability of funding and the broader impact of research outcomes on public health. Current health policy initiatives, such as the "Choosing Wisely" campaign, emphasise the reduction of low-value healthcare services.

Analysis by the McKinsey Institute [2] suggests that women’s increased use of healthcare services is not only associated with pregnancy and childbirth; rather, a substantial portion is attributable to less efficient diagnostic and treatment pathways. While specific national funding data for women’s health research may be sparse, there is no doubt that a considerable funding gap persists. Globally, data indicate that less than 1% of health research and innovation funding was allocated to the 64 conditions driving most of the gender-specific gap in women’s health between 2019 and 2023. This primarily concerns research and development investments in healthcare and pharmaceuticals, not all public research funding [2, 29]. In the United States, approximately 11% of public research funding is directed towards women-specific health conditions, whereas only 5% of all funded studies in cardiovascular diseases address outcomes specific to women [30]. In Denmark, a growing number of funding calls mention women’s health or areas like infertility, but dedicated funding streams remain limited. The documented gender imbalance among applicants, grant recipients and review committee members in major funding bodies - such as the Independent Research Fund Denmark - is currently being addressed as part of broader efforts to accelerate gender equality in funding [31].

The rising momentum in women’s health research

The international momentum around women’s health research presents a critical window of opportunity. In Denmark, this is exemplified by the engagement of major stakeholders such as the Danish Women’s Council and the Danish Women’s Society. Their involvement, alongside that of political actors, healthcare organisations (e.g., the Danish Society for Obstetrics and Gynaecology) and industry partners, is essential to establishing a coordinated and impactful research agenda.

Proposals for a national centre for women's health research have been raised. Still, the impact of such an institution requires strategic discussions about priorities, the involvement of traditional research infrastructures and the integration of emerging technologies. Given the urgent need for evidence, Denmark's robust national registries and experience with innovative trial designs offer a promising foundation. The Danish Obstetric and Gynaecological Care Platform Trials (DOCEPT) initiative, under the Danish Society for Obstetrics and Gynaecology, aims to facilitate national platform trials and should be integral to future research strategies in women's health.

Conclusion

Closing the gaps in women's health research is both a scientific necessity and a moral imperative. Greater diversity in research leadership, funding bodies and councils is essential to ensure that priorities reflect women's needs. Investing in women as researchers and prioritising research in women will generate stronger evidence, better diagnostics and more effective treatments. Such efforts will reduce inequities, improve outcomes across the lifespan and break intergenerational cycles of disease.

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