

The Dichotomy of Progress: A Bibliometric Evaluation of Clinical Innovation and Structural Determinants in Female Reproductive Health

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Abstract:

Optimum female reproductive health is not just the absence of sickness; it is total physical, mental, and social well-being. But the recognition that this basic human right continues to be a huge struggle for the world. Structural impediments remain pervasive, including extreme poverty, established gender norms, and the continuing practice of child marriage, all of which significantly restrict access to vital care, especially for vulnerable people. To assess the scientific community's reaction to these ongoing inequities, this study tracked the developmental trajectory of research on female reproductive health. We conducted a large-scale bibliometric analysis of 103 PubMed publications published between 1985 and 2026. VOSviewer was used to extract the keyword network, theme clusters, and publication history. We document a definitive awakening within the discipline. After decades of modest output in scholarly publications, the volume of publications grew dramatically, reaching a marked peak in 2025. The literature so naturally fell into three linked pillars around network mapping: clinical medicine for pregnancy and infertility; public health epidemiology for risk variables across age groups; and experimental biology with animal models. Notably, the temporal overlay analysis demonstrated a sudden and violent thematic change. Whereas studies produced before 2020 were more likely to map broad epidemiological patterns and baseline illness prevalence, research has now moved drastically toward highly specialized translational medicine. The literature is currently focused on sophisticated clinical interventions, especially in vitro fertilization, and targeted therapeutic models for complex endocrine diseases, such as polycystic ovary syndrome. In the end, the evidence presents a clear contradiction. Biomedical innovation is proceeding at an unparalleled rate. Yet for these high-tech clinical achievements to actually change the course of global reproductive outcomes, the scientific community must work tirelessly to bridge the enormous distance between these breakthroughs and the ingrained socioeconomic inequities that continue to define grassroots realities.

Keywords: - Female reproductive health, bibliometric analysis, VOSviewer, PubMed.

Introduction

Health is a fundamental aspect of human life that enables individuals to actively and positively contribute to the development of their families and society (Banu, 2024). Discussions on health tend to concentrate on the whole physical condition of the body, with less emphasis paid to sexual and reproductive health.

Discussions on this topic are typically treated with embarrassment or simply neglected (Banu, 2024). Internationally, reproductive health is broadly defined as a state of complete physical, mental, and social well-being in all matters pertaining to the reproductive system, rather than merely the absence of disease or infirmity (Mushtaq, 2024; Siddiqui et al., 2020). In the end, reproductive health is not just about physical functions; it also includes the human right to healthy, respectful relationships and the right to safe, inclusive, and appropriate health services (Banu, 2024). This crucial concept implies that people are able to enjoy a fulfilling and safe sexual life, possess the physical capacity to reproduce, and have the fundamental freedom to decide whether, when, and how often to do so (Siddiqui et al., 2020).

Reproductive health spans a broad spectrum of human experiences and medical needs during the course of a person's life. It requires a good awareness of the architecture of reproductive organs, promotion of safe sexual practices, and guarantee of safe parenthood (Banu, 2024). Reproductive health care is a collection of approaches and services to avoid and cure reproductive health problems, to enhance personal relationships, and to enhance the quality of life (Siddiqui et al., 2020). Key considerations include ensuring access to appropriate prenatal care, safe institutional delivery, and postnatal care to keep women safe during pregnancy and childbirth (Siddiqui et al., 2020). Accurate information on family planning and availability of affordable, effective contraceptive methods and safe abortion services is also critical for reproductive health (Banu, 2024; Visaria et al., 1999). Two things are often overlooked: menstruation, the start of reproductive health, and menopause, the end. These are also crucial elements of reproductive health (Shakeel et al., 2022). The age of first menstruation (menstrual cycle) in women is an important marker of their reproductive health, signaling the beginning of a number of vital future physiological processes, including the capacity to conceive, fertility rates over a lifetime, and the timing of menopause (Tran et al., 2025). Further, prevention, diagnosis, and treatment of sexually transmitted diseases (STIs) and reproductive tract infections (RTIs) including HIV/AIDS, are major pillars of sustaining comprehensive reproductive health (Banu, 2024; Visaria et al., 1999).

Reproductive health is acknowledged universally as a fundamental human right, but access to it is closely linked to various social, economic, and cultural variables (Bharadwaj and Tungdim, 2010). The 'Commission on Social Determinants of Health' produced a framework that said that structural factors such as economic position, gender norms, education levels, social class, and age create inequality on a massive scale and cause serious health disparities (Sanneving et al., 2013). For instance, acute poverty constitutes a major obstacle for women to receive vital services such as institutional birth or professional prenatal care (Sanneving et al., 2013). This is not only a rural issue; the increased slum population in urban areas, a consequence of rapid urbanization and informal settlements, has left the economically disadvantaged women with untreated reproductive diseases and a lack of access to basic maternal care (Paul et al., 2011; Sanneving et al., 2013). Gender inequality in a male-dominated society results in further restrictions on women, with lack of autonomy in decision-making, limited physical mobility, and lack of control over finances making it very difficult for them to access safe sexual practices or essential health care services (Sanneving et al., 2013).

In developing countries, such as India, reproductive health problems are particularly acute for the socially disadvantaged. Scheduled Tribes are severely deprived due to their unique traditions and geographical isolation and long-term socio-economic and political exclusion (Mushtaq, 2024; Sahu & Pradhan, 2020). Tribal and rural women experience major inequalities in the utilization of maternal health care, a severe scarcity of safe menstrual hygiene products, high rates of malnutrition, and very low use of contraception (Raj et al., 2025). Since these communities generally reside in inaccessible areas with no proper basic

health facilities, and also because of the deep-rooted cultural taboos, many of the women still neglect serious problems such as unwanted pregnancies, RTIs (Reproductive Tract Infections) and nutritional disorders until it is too late (Mushtaq, 2024). Unfortunately, personal health decisions are generally handled by mothers-in-law or traditional midwives, which severely limits the autonomy and physical agency of these vulnerable women (Sahu and Pradhan, 2020).

Another significant obstacle to global reproductive health is the ongoing practice of child marriage, which pushes young women into early sexual activity and childbearing – situations often entered into without their consent and for which their bodies and minds are often ill-prepared (Prakash et al., 2011). Common reasons for early marriage include lack of understanding and information, inability to connect with their partners or voice their own views, and the need to have unprotected and frequent sexual intercourse (Banerjee et al., 2015). This results in problems like early childbirth, unplanned pregnancy, and unsafe abortion, which have a serious impact on the nutrition and physical health of the young mother (Prakash et al., 2011). Social stigma makes access to safe abortion very difficult for young women, particularly unmarried women. Therefore, they turn to unlawful treatments or services from untrained persons, which causes a significant increase in maternal mortality (Banerjee et al., 2015; Sanwing et al., 2013). Furthermore, this cycle of poor reproductive health can be passed down to the next generation; children born to young mothers with poor reproductive health have a lower chance of survival and are at a significantly higher risk of physical growth problems such as stunting (low height for age) and wasting (low weight for height) (Prakash et al., 2011).

To achieve sustained reproductive health, there is a need for a fundamental change in the approach to reproductive education. For this, there is a need for youth-oriented programs that develop decision-making skills and strengthen self-confidence (Banerjee et al., 2015). Peer education and social media have recently been found to be very efficient channels for generating awareness of reproductive health (Banu, 2024; Siddiqui et al., 2020). Social media provides an innovative and accessible means of sharing important information such as safe sex and contraceptive and menstrual hygiene. This helps to deconstruct deep-rooted misunderstandings, superstitions, and taboos (Banu, 2024). Programs that use trained peer educators in schools and communities are shown to be very effective in boosting knowledge, changing attitudes, and promoting healthy behaviors among young people (Siddiqui et al., 2020). “If policymakers connect these education initiatives with community-based advocacy, they may establish an environment in which sexual and reproductive rights for all are respected, protected, and fulfilled. Eventually, this will result in a healthier and more just society (Banu, 2024; Siddiqui et al., 2020).

Bibliometric analysis applies statistical techniques to examine and assess scholarly publications, including journal articles, research papers, books, and other academic documents published across different countries and disciplines. It enables researchers to explore publication patterns, evaluate research output, identify emerging trends, and understand how scientific knowledge has evolved over time. By providing a systematic overview of the existing literature, bibliometric analysis supports evidence-based research and helps identify influential studies, authors, institutions, and areas for future investigation. Bibliometric analysis has been used extensively in reviewing literature in particular fields of study. (Sidhu et al., 2020; Liu et al., 2025).

VOSviewer is a powerful bibliometric software that enables researchers to analyze and visualize scientific literature efficiently. Its user-friendly interface and flexible features make it easy to use, even for beginners, allowing researchers to perform bibliometric analyses with less time and effort (Kirby, 2023).

Materials and Methods

Data Collection: The data for this study was collected using the PubMed database. A total of 103 relevant research publications were identified with the keyword ‘women’s reproductive health.’ The research publications in this field from 1985 to 2026 were included, and the data-gathering process was concluded on 12th July 2026. In the identification step, articles were rated for relevance to the research topic. A carefully developed set of keywords relating to women’s reproductive health was used to search PubMed that initially identified 1,047 items.

Data Screening and Cleaning: During screening, non-research papers and non-English language publications were removed (e.g. news stories, book reviews, and meeting abstracts). Only original research articles in English were analyzed. After applying the 'Free Full-Text' filter, 654 records remained; applying the English filter left 650 records, the 'Human' filter yielded 361 records, and the 'Female' filter yielded 347 records. Finally, after applying the 'Adult: 19+ years' filter, 103 records remained for further examination.

Records for inclusion: All 103 screened records were evaluated for eligibility according to a predefined set of criteria (e.g. publication type, empirical substance, and relevance to the topic). All articles satisfying the criteria were then maintained for the final synthesis step.

Analysis of Data: The synthesis analysis used the 103 records included in the final VOS dataset. The bibliometric tools such as VOSviewer were used to evaluate these records to determine the keyword co-occurrence, total link strength, and rising research trends when considering women’s reproductive health.

Result and Discussion

Table -1: Co-occurrence of the keywords associated with female reproductive health

S. No.	Keywords	Occurance	Total Link Strength
1.	Female	103	552
2.	Humans	103	552
3.	Adult	98	534
4.	Pregnancy	44	248
5.	Young adult	34	227
6.	Middle aged	38	226
7.	Adolescent	22	155
8.	Infertility, female	23	149
9.	Risk factors	17	118
10.	Cross-sectional studies	15	100
11.	Reproductive health	14	89
12.	Case-contol studies	13	78
13.	Polycystic ovary sysdrome	13	77
14.	Prevalence	11	85
15.	Prospective studies	13	77
16.	Animals	13	69

17.	Female reproductive health	11	67
18.	Environmental exposure	12	66
19.	Obesity	9	62
20.	Age factors	9	61
21.	Fertilization in vitro	10	59
22.	Retrospective studies	10	58
23.	Mice	11	57
24.	China	9	50
Total		655	3816

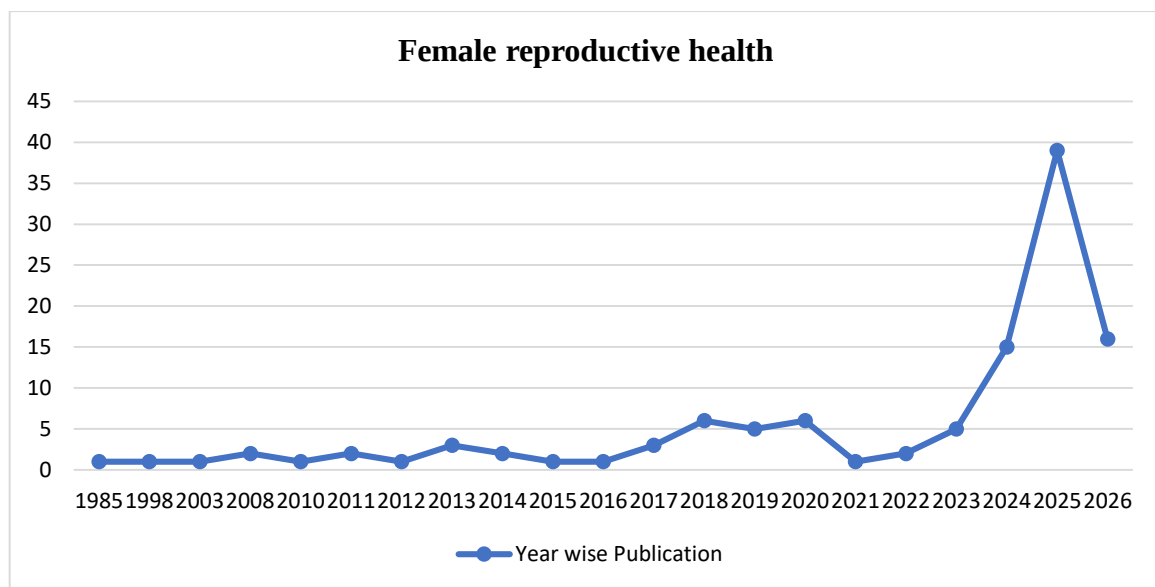


Figure No. 1: Publication frequency and citation metrics for female reproductive health

Figure 1 shows the evolution of published studies during the years from 1985 to 2026. In the first years (1985–2007) the number of publications was very low, with only one or two research papers published in most years. However, from 2008 to 2016, there was a slow increase of publications, with modest ups and downs. However, between 2017 and 2023, there was a substantially higher growth in research activities with around 3 to 6 publications. Then, the number of publications sharply increased in 2024 to around 15, and in 2025, it reached a maximum value of about 39 publications. The number of publications declined to around 15 in 2026 but was still well above the previous years. Overall, this trend shows that although the research on women’s reproductive health was restricted in the early years, the researcher interest and research activities have been steadily increasing throughout the years, and a remarkable increase in research in this subject was seen in the recent years.

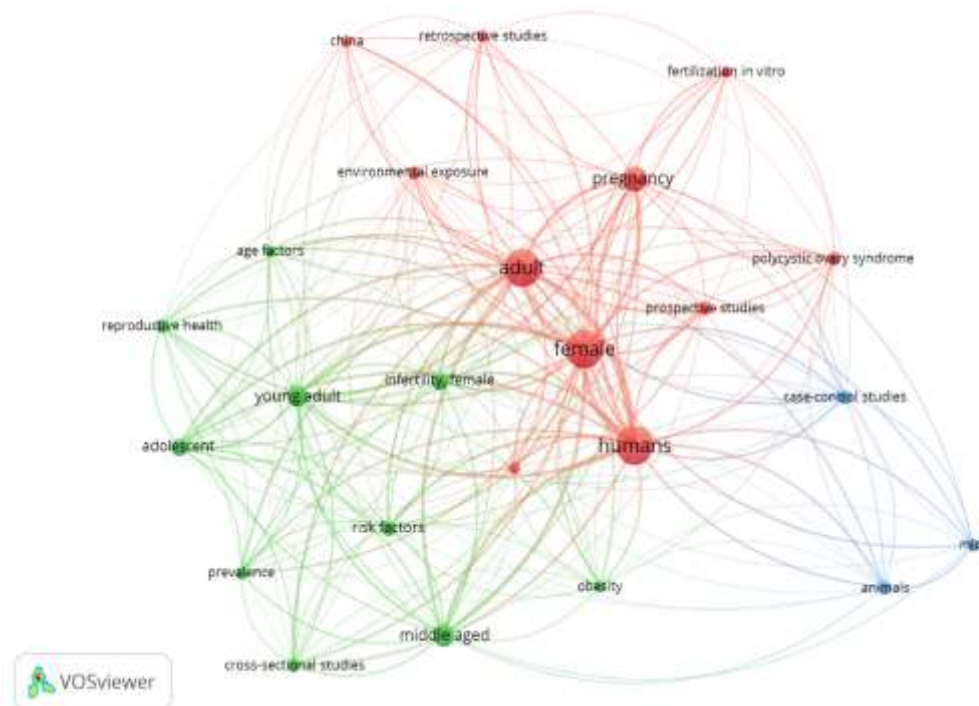


Figure No. 2: Network visualization of female reproductive health research: A network analysis of co-occurring keywords (Source: Prepared by author using VOSviewer 1.6.19 software).

Figure 2. Network visualization of term co-occurrence in women's reproductive health research. The network was constructed using VOSviewer (version 1.6.19). This visualization represents each node as a keyword extracted from the PubMed database, with the size of the node indicating the frequency of the keyword in the literature, lines (links) connecting nodes indicating co-occurrence relationships between keywords, and different colors indicating clusters of related research topics. Visualization demonstrates that "humans," "female," and "adult" were the largest and most densely connected nodes in the network, suggesting that these terms are crucial to research on female reproductive health. The key position shows that the majority of studies are performed in adult women and are closely related to human health and reproductive outcomes. The network clearly displays three main topic clusters. The red cluster is mostly associated with clinical and reproductive health subjects such as pregnancy, infertility (in women), environmental exposure, in vitro fertilization, polycystic ovary syndrome (PCOS), retrospective research, and China. This cluster represents research on the effect of environmental and clinical factors on fertility treatments, pregnancy outcomes, reproductive disorders, and women's reproductive health. The green cluster is mostly epidemiology and public health research. The occurrence of terms like "young adults," "adolescents," "middle-aged," "reproductive health," "prevalence," "risk factors," "obesity," and "cross-sectional studies" in this cluster shows that this cluster is about population-based studies that examine reproductive health in different age groups. The existence of terminology linked to prevalence and risk factors implies that much research tries to find the causes and patterns of reproductive health problems in the community. The blue cluster is predominantly composed of experimental and comparative biomedical research, including keywords of animals, rats, and case-control studies. This cluster underscores the continued major contributions of laboratory-based studies and animal models to our knowledge of reproductive physiology, causes of disease, and therapeutic efficacy. The substantial links among the

clusters indicate that women's reproductive health is a multidisciplinary field that connects clinical medicine, epidemiology, environmental health, reproductive biology, and experimental research. The significant correlations between pregnancy, infertility, PCOS and environmental exposures illustrate the increasing interest in comprehending the complicated biological and environmental factors affecting women's reproductive health. Collectively, the network encompasses a highly integrated research landscape in which clinical investigations, community health studies, and laboratory research complement each other to increase knowledge in women's reproductive health.

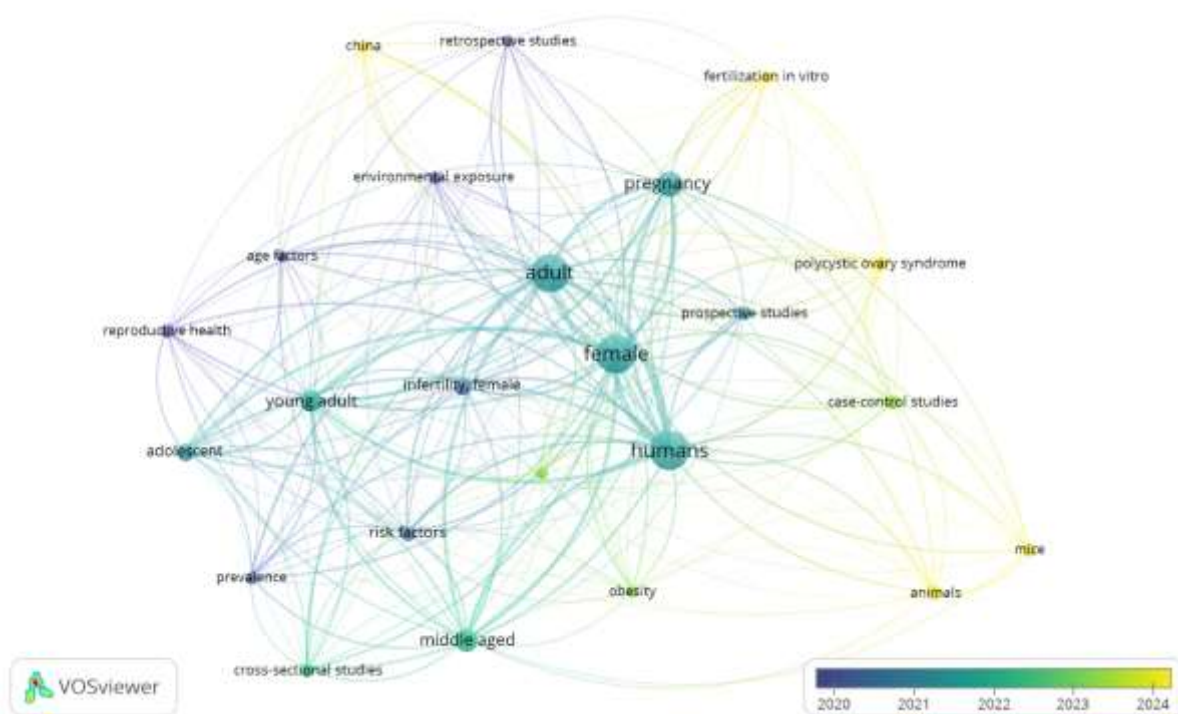


Figure No. 3: Overlay visualization of female reproductive health research: A Network Analysis of Co-Occurring Keywords (Source: Prepared by Author using VOSviewer 1.6.19 software)

To show the changing nature of research topics on women's reproductive health from 2020 to 2024, an overlay visualization of the co-occurrence of keywords is presented in Figure 3. In this map, the colors represent the average publication year for each phrase. Dark blue keywords are older research topics (about 2020–2021), whereas green and yellow are fresh and emerging research topics (2023–2024). This visualization indicates that the key subjects studied throughout the research period were “humans,” “female,” and “adult.” The green hue connecting them means these phrases have been important in recent years and are not exclusive to a certain period. Dark blue indicates previous research topics: reproductive health, retrospective studies, age, prevalence, environmental exposures, risk factors, and cross-sectional studies. These subjects mainly focused on the burden of disease, demographic characteristics, epidemiological trends, and variables influencing women's reproductive health. The research produced between these two publications (2021–2022) was mostly dedicated to pregnancy, female infertility, obesity, and middle-aged women, showing the increasing interest in maternal health, fertility issues, and lifestyle-related reproductive problems. The latest research trends (2023–2024) are shown in yellow and include in vitro fertilization (IVF), polycystic ovarian syndrome (PCOS), animal and rat studies, case-

control studies, and studies in China. The subjects presuppose a continuation of studies related to reproductive technology, endocrinological illnesses and their influence on reproduction, experimental biomedical research, and regional studies. That they have only recently appeared shows that these topics are gathering steam in the scientific community. To summarize, overlay visualization reveals a slow transition from descriptive epidemiological studies towards more specialized and translational research. Clinical therapies, assisted reproductive technologies, experimental models, and sophisticated analytical approaches are some of the ongoing research. This improvement reflects the change in focus of research on women's reproductive health, where the advances in reproductive medicine and the biomedical sciences are being merged with traditional public health approaches.

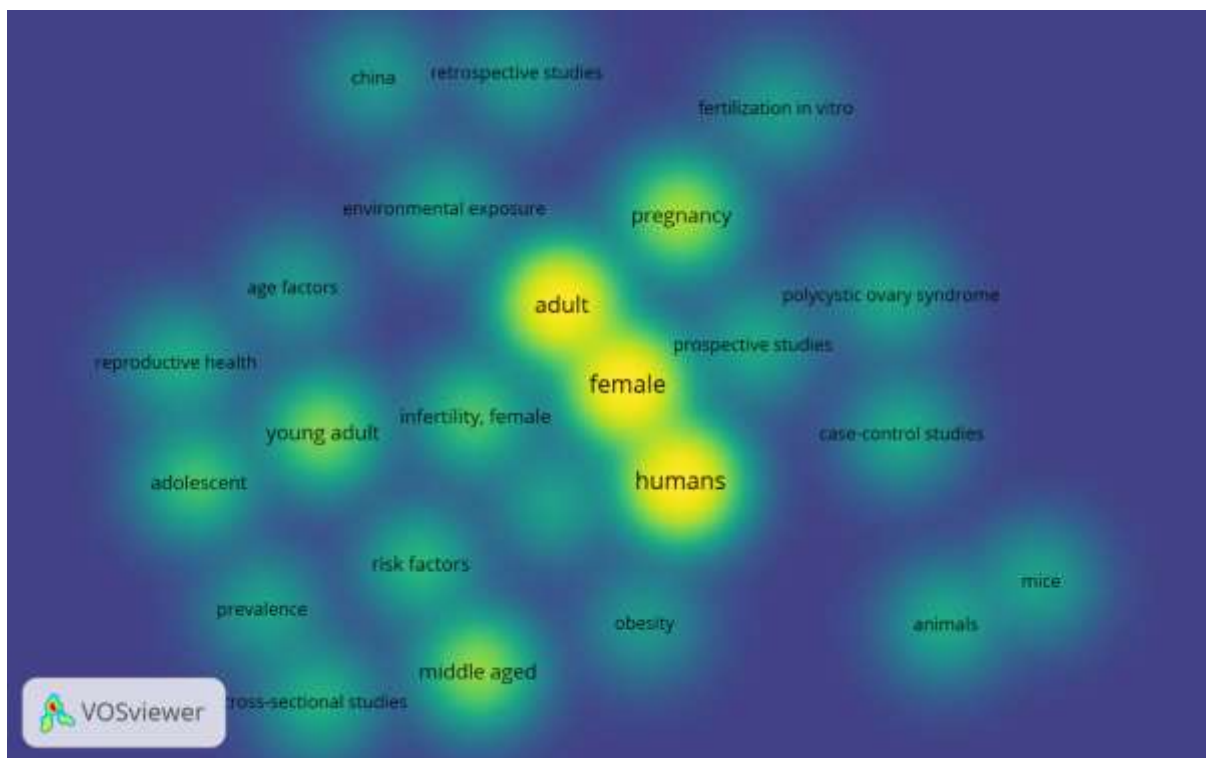


Figure No. 4: Density Visualization of Female Reproductive Health Research: A Network Analysis of Co-Occurring Keywords (Source: Prepared by Author using VOSviewer 1.6.19 software)

Figure 4 shows the density of co-occurrence of keywords in women's reproductive health research. In this image, the intensity of colors is proportional to the concentration and frequency of terms in the literature. The bright yellow areas reflect the keywords with the most frequent appearances and the strongest links. Green and blue fields represent less common subjects or topics with weaker connections with other study issues. In this figure, the most salient keywords are "humans," "female," and "adult," which constitute the brightest region in the center of the map. The great density of these concepts implies that they are the main focus of female reproductive health research and provide the basis for linking several relevant study topics. Around these dense keywords, there are medium-density themes such as pregnancy, young adulthood, middle age, female infertility, obesity, and risk factors. These terms show a lot of research activity and imply that studies usually look at reproductive health at different times in women's lives, as well as factors that affect fertility, maternal health, and reproductive illnesses. Keywords: Animals, low density, reproductive health, reproductive prevalence, environmental exposure, in vitro fertilization, polycystic

ovary syndrome, adolescents, cross-sectional research, China Less prominent than key themes, they are important parts of the research landscape, supplying specific understanding of disease mechanisms, assisted reproductive technologies, environmental implications, and regional perspectives. The gradual transition from a bright yellow center to green and blue at the outer corners suggests that the study on women's reproductive health is largely focused on human clinical studies but also includes epidemiological studies, laboratory trials, and public health research. The density map thus illustrates a balanced and integrated research landscape, in which fundamental clinical issues are supported by numerous specialized fields, jointly improving our knowledge of women's reproductive health.

Discussion

Over the past four decades, scholars have shown remarkable interest in female reproductive health. Historically, this crucial topic has generally been ignored by the academic community, sometimes seen as a minor concern or avoided owing to cultural discomfort (Banu, 2024). This hesitancy is clearly visible in our bibliometric data with a significant scarcity of publications between 1985 and 2007. But the scientific story has changed more recently. We saw an exponential rise in research effort, which peaked substantially in 2025. It is a paradigm change that acceleration is vital. The global health community is now seeing reproductive health not merely as the absence of sickness but as a holistic condition of physical, mental, and social well-being that every woman deserves (Siddiqui et al., 2020).

The analysis of the term “networks” shows a very diverse world. Such basic concepts as “humans,” “female,” and “adult” are at the very heart of this research ecosystem that anchors the entire discipline in clinical reality. From this inner core, scientific investigation spreads off into three different but overlapping areas. The first is very clinically intervention-focused, with a strong emphasis on studies around pregnancy, female infertility, and polycystic ovary syndrome. The other cluster is clearly epidemiological and monitors the prevalence of disease and of risk factors associated with lifestyle in various age groups. Meanwhile, a specialized biomedical group uses animal models to decode complex illness mechanisms at the physiological level. Collectively, these varied strands of work illustrate how today's investigators are integrating clinical practice, population health, and experimental biology to address problems of reproduction.

But the most persuasive revelation of all may come from the overlay analysis: the speed at which this scientific concentration is changing. Only a few years ago, investigators were mostly concerned with descriptive epidemiology. They emphasized descriptions of broad demographic trends, risk variables, and baseline illness prevalence. But the literature took an abrupt turn in 2023 and 2024. Scientists have begun to focus more on advanced, translational medicine. Current research includes advanced therapeutic treatments such as in vitro fertilization and tailored therapy for complex endocrine problems. This rapid change is a field moving away decisively from recognizing problems and toward actively designing highly specialized medical solutions.

However, a worrying gap becomes apparent when we weigh this incredible scientific advancement against the daily circumstances of women everywhere. While lab scientists may be busy refining new fertility technologies, millions of women still lack access to basic maternal care. Extreme poverty, rigid gender stereotypes, and badly planned urban expansion continue to drive large health gaps (Paul et al., 2011; Saneving et al., 2013). For example, take the case of marginalized populations in the developing world. Historical exclusion and extreme geographic isolation have resulted in the terrible deprivation of the Scheduled Tribes (Mushtaq, 2024; Sahu & Pradhan, 2020). For these vulnerable groups, high malnutrition

rates, the unavailability of menstrual hygiene items, and hazardous reproductive tract infections are a daily battle, completely removed from the high-tech solutions dominating recent literature (Raj et al., 2025; Shakeel et al., 2022).

Deep patriarchal origins systematically dispossess young women of bodily autonomy as well. Take child marriage, which remains a crisis. This practice leads numerous young girls to early pregnancies long before their bodies or minds are ready, leading to increased rates of maternal death and childhood stunting (Banerjee et al., 2015; Prakash et al., 2011). These young ladies possess minimal physical agency. For the most part, women are silenced as decision-makers in their healthcare, often with the influence of traditional community figures or mothers-in-law (Sahu & Pradhan, 2020). Young women who want abortions are often separated by overwhelming social shame and turn to unsafe, unskilled providers, often with disastrous outcomes (Banerjee et al., 2015; Visaria et al., 1999). What is required is intensive social action to bridge this enormous divide between biomedical progress and grassroots realities. The global reproductive health picture will only change with advanced clinical knowledge if governments simultaneously struggle to ensure the social, economic, and physical empowerment of women worldwide (Banu, 2024; Bharadwaj & Tungdim, 2010).

Conclusion

At its essence, a female's reproductive health is far more than simply avoiding disease. It is a profound and basic human right. Women's complete physical, mental, and social well-being allows them to make safe, informed choices about their bodies and futures. Full-spectrum reproductive care is critically important across a woman's life, from safe parenting to inexpensive contraception to protection from infection. The statistics from our analysis of 103 research articles paint an uplifting picture of scientific development. For many years, few studies addressed women's reproductive health. But this tendency has now entirely changed, and in 2025 we see a huge rush of publications. But what is more intriguing is the shift in the focus of this research. A few years ago, scientists were examining the overall landscape, mapping demographic patterns, prevalence, and general risk factors. Fast forward to now, and the scientific community is going deep into highly specialized, translational medicine. We're witnessing a giant push towards advanced clinical solutions like in vitro fertilization and focused therapies for difficult illnesses such as polycystic ovary syndrome. But here's the cold, hard truth we have to face: no matter how many discoveries we have in the lab, it won't matter if the women who need them can't get them. Today, entrenched gender stereotypes and cultural taboos remain monumental hurdles to caring. Without physical autonomy, vulnerable populations such as young girls forced into early marriage or marginalized rural communities can face terrible repercussions such as starvation, unplanned pregnancies, and risky health practices. If we are serious about improving global reproductive health, then we cannot rely on medical science alone. We need to match these great clinical advances with enthusiastic community action. By making youth the focus of education, engaging peer advocates and leveraging social media to safely dismantle damaging taboos, together we can build an equitable society where the reproductive rights of every woman are passionately safeguarded and cherished.

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