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Review Article

Artificial Intelligence (AI) in Maternal and Neonatal: Bibliometrics Analysis

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Abstract

Background: Artificial intelligence (AI) is a branch of computer science that focuses on creating devices and models that replicate human insights. As the global community strives to ensure maternal and neonatal health and well-being, AI offers insights that can shape the future of maternal and neonatal healthcare and bring us closer to reviewing the current state of maternal and neonatal health with bibliometric analysis.
Methods: This study aims to determine the citation trends, quantity of artificial intelligence articles in the maternal and neonatal field, and future directions for the research theme. This study uses the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) research method. The reviewed articles were analyzed using the VOS viewer application.
Results: This study yielded the following findings. First, the number of publications and the number of citations on the topic of AI in maternal and neonatal has increased exponentially from year to year. Second, there are 104 items, 4 clusters on the topic of AI in maternal and neonatal. Third, the trend of research related to AI in maternal and neonatal focuses on infection, association, review, development. Fourth, research topics related to AI in maternal and neonatal suggested are topics that have a low density category, namely pandemic, artificial intelligence, parents and safety.
Conclusion: The integration of AI holds immense potential to revolutionize maternal and neonatal health. Research findings can help related researchers to identify trends and novelties AI in maternal and neonatal and recommend directions for further research.

Keywords: *AI, Bibliometric, Maternal, Neonatal*

Introduction

Artificial intelligence (AI) (Hassani *et al.*, 2020) is a branch of computer science that focuses on creating devices (Mapari *et al.*, 2024) and models that replicate various human insights (McAdams & Green, 2024). These models can perform different assignments (Chen *et al.*, 2020), counting learning (Cope *et al.*, 2021), considering (Garvey *et al.*, 2022), and arranging (Hussain & Al-Turjman, 2021), among others (McAdams *et al.*, 2022). AI-based techniques for creating approaches to move forward maternal and neonatal wellbeing (Owusu-Adjei *et al.*, 2024).

Maternal health relates to women's health during pregnancy (Bodunde *et al.*, 2023), childbirth (Silva Rocha *et al.*, 2022), and postpartum (Damayanti *et al.*, 2020). Good perinatal health complements and helps neonatal progress within the first month of life after birth (Ramakrishnan *et al.*, 2021). Perinatal health is defined as the state of well-being during the twenty-second week of pregnancy (or development) (Henry *et al.*, 2022) and the seventh day after birth (Maulana *et al.*, 2023). Appropriate care amid this period is basic to construct a sound establishment for the child (Pammi *et al.*, 2022),

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which is related to a sound childhood and adulthood (Shrivastava *et al.*, 2023). The first few weeks of a baby's life following perinatal care are referred to as the neonatal period (Tzitiridou-Chatzopoulou *et al.*, 2024).

As the global community strives (Fuller *et al.*, 2023) to ensure maternal and neonatal health and well-being (Medjedovic *et al.*, 2023), AI is emerging (Alkhodari *et al.*, 2023) as a powerful ally in this noble endeavor (Damayanti et al, 2020). AI-driven mortality prediction status (Adegboro *et al.*, 2022), offers insights that can shape the future of maternal and neonatal healthcare (Aninanya *et al.*, 2022) and bring us closer to the goal of ensuring maternal and neonatal health (Yasrebinia & Rezaei, 2024). By bibliometric analysis reviewing the current state of the evolution (Zyoud *et al.*, 2022) and structure of artificial intelligence technology (Ahmad *et al.*, 2022) in maternal and neonatal health care (Berg *et al.*, 2022) , the technology can be used to optimize operational processes (Sibanda *et al.*, 2024).

Over time, there has been a lack of interest in the topic of artificial intelligence (AI) in maternal and neonatal worldwide. As in (Akhmad Fauzy & Supandi, 2022) And (Prabowo *et al.*, 2023), this intriguing information can be looked through Google Patterns by writing the catchphrase: manufactured insights in maternal and neonatal. For illustration, a look from By choosing a web search, January 2004 to Eminent 2024 was covered, and all categories yielded the data shown in Figure 1. The data was collected on December 13, 2024.

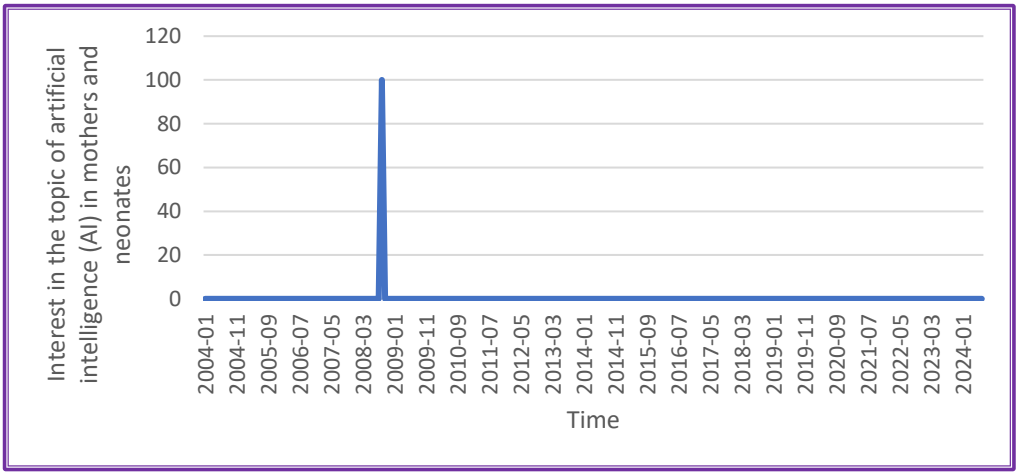

Figure 1. Interest in the subject of artificial intelligence in maternal and neonatal (Data source: Google Trends)

The information outlines the common intrigued in fake insights in maternal and neonatal. On the other hand, analysts who need to investigate artificial insights in maternal and newborns need more information particularly, for illustration of logical distributions within the frame of logical articles and scientific seminar procedures on the subject of manufactured insights in maternal and neonatal. Therefore, data on the topic of artificial insights into maternal and newborns within the shape of logical articles is exceptionally essential.

Researchers need to know about new developments and trends in artificial intelligence for mothers and newborns in the future. This is an issue that comes up with researchers. Nevertheless, there is currently no bibliometric analysis of articles on artificial intelligence in the fields of maternal and neonatal to identify trends and innovations. The present study aims to address two key research questions: (1) What is the trend of publications on the subject of artificial intelligence in mothers and newborns and (2) What is the pattern of citations on the subject? artificial intelligence in expectant mothers and babies, (6) How does the subject of artificial intelligence in mothers and newborns relate to network visualization, (7) how the publication clusters on the topic of artificial intelligence in maternal and newborn reviewed from the co-occurrence, (8) how the overlay visualization on the topic artificial intelligence in maternal and newborn, (9) how is the density visualization on artificial intelligence in maternal and newborn.

The bibliometric investigation may be a measurably based approach to inquiry that visualizes the commitments of scholastic education and changes in inquiries about hotspots (Fu *et al.*, 2023). Bibliometric examination makes a difference in analysts to recognize developing ranges and future headings of the inquiry about space with the assistance of visualization devices (Lam *et al.*, 2022). Bibliometric investigation has been utilized by different creators to assess information hypotheses recorded within the Scopus database (Lam *et al.*, 2022), to evaluate immigration and environmental degradation(Anuar *et al.*, 2022), and to investigate trends in artificial intelligence research in maternal and neonatal (Zhang *et al.*, 2022). In this way, the bibliometric examination may be a logical and quantitative strategy for evaluating distributed articles, which can offer assistance analysts to in discovering improvement patterns, overhauls, and hotspots of certain inquiries about, giving an improvement in future investigations for analysts (Soytas, 2021).

This study aims to ascertain the trend of citations, the quantity of artificial intelligence articles in the field of maternal and neonatal, and the future directions for research themes. Topics related to artificial intelligence in maternal and neonatal are still rare so it is necessary to find novelty artificial intelligence in maternal and neonatal through bibliometric analysis.

Method

Bibliometric analysis is more suitable for quantitative analysis that spreads research papers, terms, and keywords in determining research trends (Syros *et al.*, 2022). In addition, bibliometric analysis is a research method used in knowledge and information libraries. To evaluate research performance (Pahwa *et al.*, 2022). Bibliometric analysis is very important in evaluating the impact of studies where studies are ranked based on the citations received (Page *et al.*, 2021).

The collection database was searched for publications on AI in maternal and neonatal. The search strategy involved the following keywords: “AI” OR “maternal” OR “neonatal” OR “AI in maternal” OR “AI in neonatal” OR “AI in maternal and neonatal” in the title. The type of language and literature were not limited during the retrieval process.

On August 13, 2024, information was retrieved from https://app.dimensions.ai/. The Preferred Reporting Items for Meta-Analyses and Systematic Reviews (Page *et al.*, 2021) method was used to extract articles from the database using PRISMA, with "app.dimensions.ai."

The stages in PRISMA include identification, screening, and inclusion. During Stage 1 (Identification), 84,626 records were detected from dimensions.ai, considering each key term search for obstetrics policy, specifying “document type: articles and proceedings,” and including “all data published in the years 2010 to 2023.” In Stage 2 (Filtering), the “title, abstract” option was selected for each term search. Finally, in Stage 3 (Inclusion), the sample was refined, resulting in 41,538 records accessible for further analysis.

The ris records were imported into VOS viewer. After that, co-authorship investigation, citation investigation, co-citation investigation, and keyword co-occurrence examination were carried out to reveal the relationship between the most analysts, what sources are usually cited by researchers, and the most themes of world (or global) issues, compared to other bibliometric reflections in the fields of natural science and social obligations. The strategy for co-occurrence investigation is as follows. (1) The type of information is selected with the option to create an outline based on the test information. This alternative is chosen to form an outline of co-occurrence based on content information. (2) The information source is chosen with the information alternative learned from the reference supervisor notes. The supported note types are RIS, EndNote, and RefWorks. (3) The note type is chosen as RIS. (4) The area from which the terms will be extracted is chosen with the unique title and area options, ignoring the organized unique name and copyright articulation. (5) The calculation strategy is chosen with the full count alternative. (6) The limit chosen for the least number of occurrences of a term is 10. Out of 9194 terms, there are 244 terms that meet the limit. (7) The number of terms is as follows. For every 173 terms, a relevance score will be calculated. Based on this score, the most relevant terms will be selected. The default option is to select 60% of the important terms. The number of terms to be

selected is 104 terms.

Results

The search from 2010 to 2023 yielded 41,538 scientific article publications. Number of publications artificial intelligence in maternal and neonatal per year is presented in Figure 2.

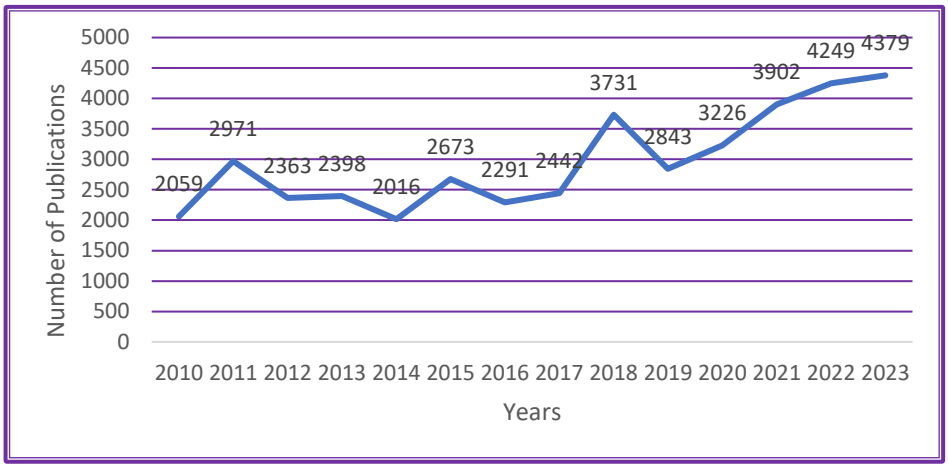

Figure 2. Number of publications on artificial intelligence in maternal and neonatal from 2010 to 2023 (source: https://app.dimensions.ai/)

Number of citations artificial intelligence in maternal and neonatal from 2010 to 2023 as many as 1,444,089. The number of citations per year is presented in Figure 3. The highest improvement happened in 2023, with an increase of 237062 published articles. Meanwhile, the lowest increase happened in 2010 with an increase of only 1558 article.

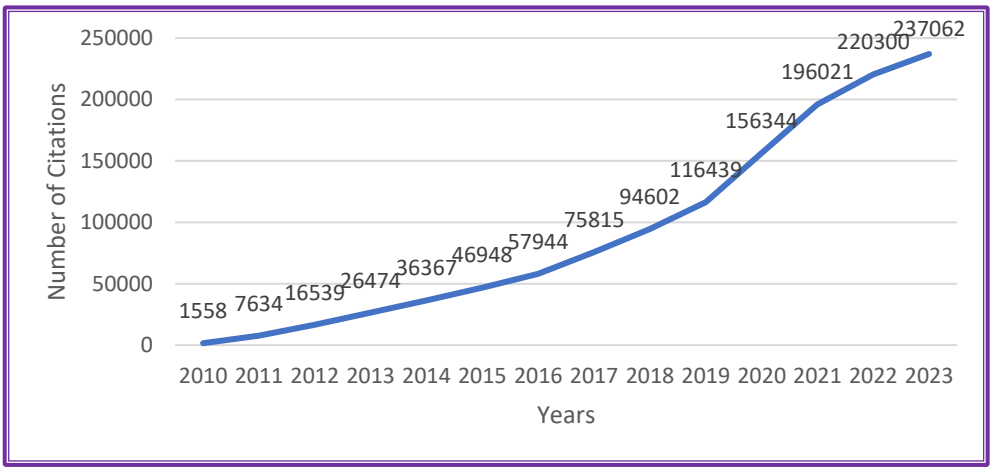

Figure 3. Number of citations for the topic of artificial intelligence in maternal and neonatal from 2010 to 2023 (source: https://app.dimensions.ai/)

The network visualization is a line connecting two items indicates that they appear together in the Title and Abstract of a given article. Conversely, the absence of a connecting line signifies that the two items do not co-occur in the Title and Abstract.

As shown in Figure 4, the visualization includes 104 terms, grouped into 4 clusters, with 4553 connections and a total link strength of 29331.

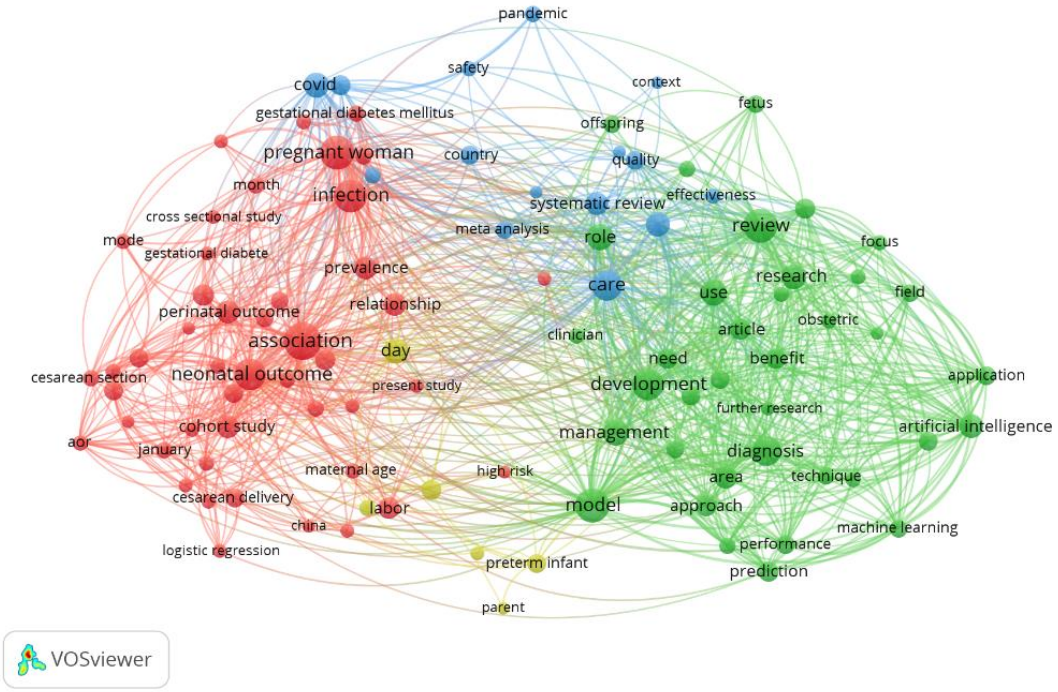

Figure 4. Network visualization (source: VOS viewer andhttps://app.dimensions.ai/)

VOS viewer also provides map overlay visualization. Figure 5 presents the overlay visualization of 104 terms. VOS viewer provides an overlay map visualization to analyse trends based on keywords like “AI in maternal and neonatal” from 2010 to 2023 publications, focusing on studies related to AI maternal and neonatal aspects. In the overlay visualization shown in Figure 5, the yellow nodes indicate keywords that are currently of significant research interest. For instance, recent studies emphasize trends in AI maternal and neonatal topics, highlighting their relationships and areas of focus in research. There are two clusters formed out of the 4 clusters.

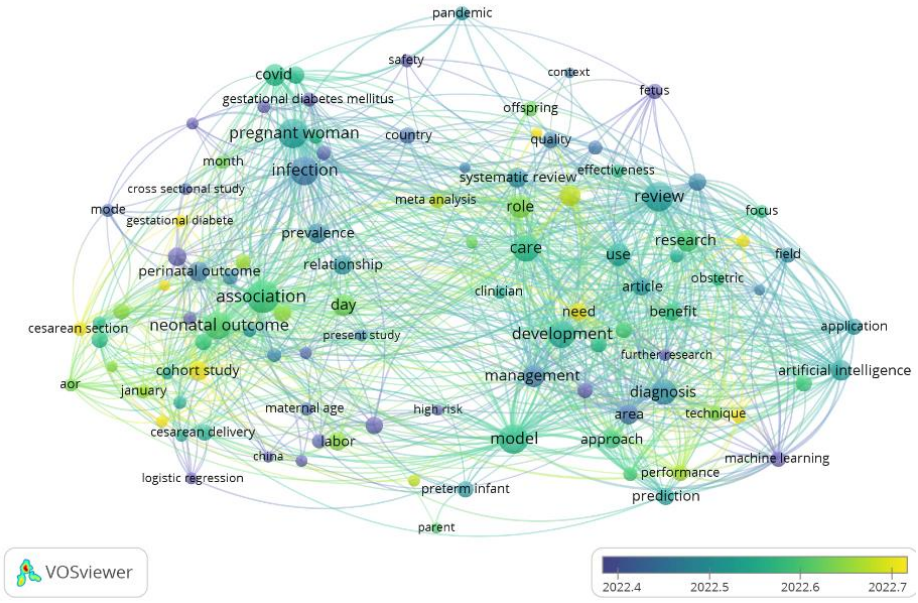

Figure 5. Overlay visualization (source: VOS viewer and https://app.dimensions.ai/)

Density visualization of these 104 terms are presented in Figure 6. Visualization density with lots of items there are several items, among other things infection, association, review, development. Some items with colored knots yellow means have lots made a topic in publication journals before. So, the

topic study related to AI in maternal and neonatal is a topic that has visualization density in category low for example pandemic, AI, parents and safety.

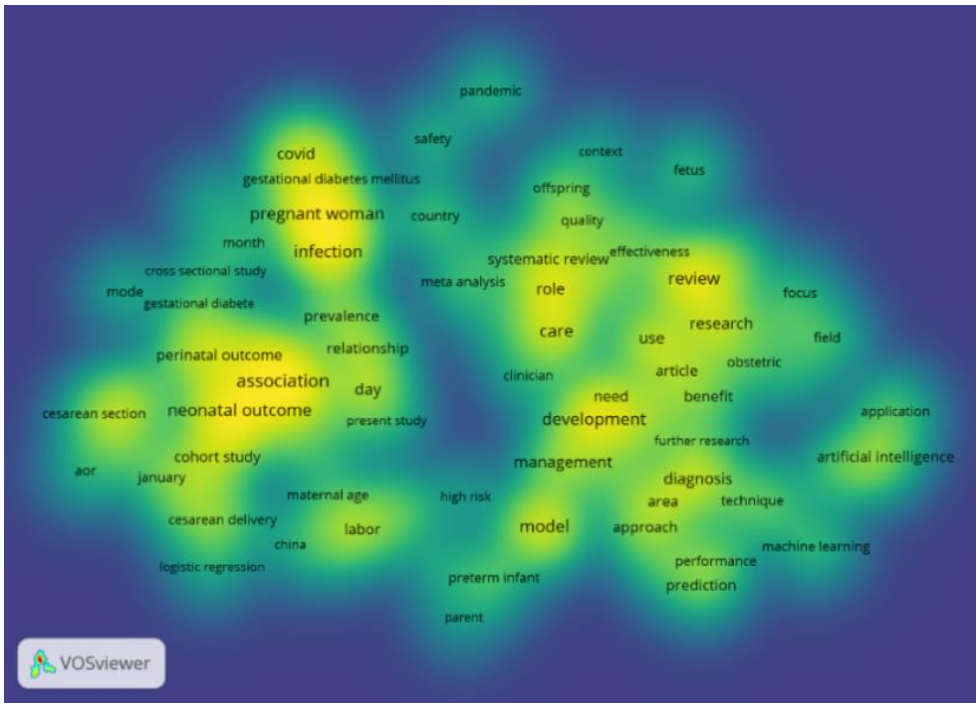

Figure 6. Density visualization (source: VOS viewer and https://app.dimensions.ai/)

Discussion

The analysis is bibliometric and has been used in studies on the topic of AI in maternal and neonatal. Based figure 2. appears that number of publications increasing exponentially from year to year. The littlest distribution happened in 2010 with 2023 distributions. In the interim, the biggest distribution happened in 2023 with 4379 distributions. The normal distribution was 2967. These insights are displayed in Figure 3. Of the 41,538 distributions, the distribution entitled "On AI Approaches for Promoting Maternal and Neonatal Health in Low Resource Settings: A Review"(Khan *et al.*, 2022)is the most relevant. This trend of increasing interest is in line with previous studies (Chang, Jen, & Su, 2022; Shi *et al.*, 2023), which also observed a rise in research on artificial intelligence in nursing between 2017 and 2022. Rapid technological advances and their applications in the healthcare sector likely contributed to this increase, reflecting a shift in focus towards AI research in nursing (Özkaya & Körükcü, 2024). Artificial Intelligence (AI) is a fast-emerging field (Dehraj & Hussain, 2024) that holds promise for improving mother and newborn health as well as obstetric diagnosis, treatment, prevention, and management (Khosravi *et al.*, 2024). Within the space of AI applications in healthcare, inquiries are scattered and divided, making it troublesome to get a clear and comprehensive picture of the current state and future bearings of this developing field, therefore it is important to review recent articles on artificial intelligence in maternal and neonatal.

The smallest number of citations occurred in 2010 with 1,558. Meanwhile, the largest citation occurred in 2023 with 237,062. Meanwhile, the average citation was. The research data reveals that, out of 41,538 publications, the publication entitled "Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019" (Collaborators *et al.*, 2020) is the most cited. Journals indexed by reputable indexers will be highly cited by other authors. As a result, this article might be consulted when researching the subject of synthetic intelligence in mothers and babies.

Two terms connected by a line in an in-network visualization (Figure 4) indicate that the two terms appear together in a title and are distinct. Alternatively, two terms that aren't connected by a line indicate that they are distinct and don't occur together in the title. The inquiry about information uncovered that

there were 104 terms, 4 clusters, 3,479 joins, and an interface quality of 9,119. Much research has been done on artificial intelligence in maternal and neonatal. Therefore, the novelty for researchers on the topic of artificial intelligence in maternal and newborn further research can be obtained through research on terms that are not directly connected, for example, preterm infant and parent.
Artificial intelligence (Sitek *et al.*, 2022), profound learning, chance forecast, computerized well-being, telemedicine, wearables, versatile healthcare, and cloud computing stay prevailing inquiries about subjects in 2016-2022 (Ahmad *et al.*, 2022).

Of the 104 terms grouped into 4 clusters, cluster 1 (46 terms), cluster 2 (37 terms), cluster 3 (15 terms), and cluster 4 (6 terms). In more detail, these clusters are presented in Table 1Table 1 Clusters for artificial intelligence in maternal and neonatal topics (Source: Vos viewer)

Cluster	Number of items	Cluster member items
1	46	Admission, adverse neonatal outcome, adverse outcome, adverse pregnancy outcome, AOR, association, BMI, cesarean delivery, cesarean section, China, chorioamnionitis, cohort, cohort study, confidence interval, control, cross sectional study, December, GDM, gestational diabetes, gestational diabetes mellitus, high risk, higher risk, incidence, infection, January, labor, live birth, logistic regression, maternal age, membrane, mode, month, neonatal outcome, odds ratio, perinatal outcome, preeclampsia, pregnancy outcome, pregnant woman, pregnant women, present study, prevalence, relationship, retrospective cohort study, retrospective study, vaginal delivery, weeks gestation.
2	37	Accuracy, application, approach, area, article, artificial intelligence, benefit, clinician, detection, development, diagnosis, fetus, field, focus, further research, importance, limitation, literature, machine, machine learning, management, mechanism, model, need , obstetrics, offspring, paper, performance, prediction, prevention, PubMed, research, review, role, screening, technique, use.
3	15	Care, child health, context, country, covid, effectiveness, intervention, meta analysis, middle income country, pandemic, quality, safety, SARS CoV, still birth, systematic review.
4	6	Day, low birth weight, neonatal intensive care unit, NICU, parent, preterm infant.

To track the progress of research titles about artificial intelligence in maternal and neonatal settings, an overlay visualization (Figure 5.) offers an analysis based on the keyword artificial intelligence in maternal and neonatal from 2010 to 2023. The yellow phrase indicates that the keyword is of current research interest based on Figure 5 overlay visualization map (Lam *et al.*, 2022). Therefore, the research trend on artificial intelligence in maternal and new born currently focusing on terms in yellow, such as infection, association, review, and development.

AI and robotic technologies in healthcare (De Togni *et al.*, 2024) are used for early diagnosis (Zhou *et al.*, 2023), decision-making (Kermani *et al.*, 2023), research (Pedró, 2019), treatment (Wang *et al.*, 2019), education (Sapci & Sapci, 2020), and health maintenance (Li *et al.*, 2023). The utilization of AI to screen and make strides in maternal well-being amid different stages of pregnancy, labor, and postpartum. Opportune administration of different maternal well-being issues, including preterm birth, premature delivery, gestational diabetes, heart infection, and postpartum sadness, can offer assistance in diminishing maternal mortality rates (Khan *et al.*, 2022).

Density visualization (Figure 6.) appears a visualization of the term thickness level demonstrated by color. Blue color demonstrates tall thickness whereas yellow color shows moo thickness. Tall thickness implies that the subject has been broadly utilized in past considers whereas low density implies that the subject is still seldom utilized in past studies. Therefore, the subject inquiry is related to artificial insights in maternal and neonatal. The prescribed subjects are those that have a moo visualization thickness.

Conclusion

This bibliometric analysis explored the trends and advancements in AI applications in maternal and neonatal health using the Dimensions.ai database from 2010 to 2023. Findings revealed a steady increase in publications and citations, reflecting growing interest in this field. Using VOS viewer, thematic relationships were identified, highlighting key topics such as infection, review, technological development, and midwifery policies. Emerging areas with significant potential include pandemic preparedness, artificial intelligence applications in maternal safety, and parental roles in neonatal care. The study also identified leading authors, influential journals, collaborative networks, and the contributions of countries and institutions to the field, offering a comprehensive understanding of current research directions.

The integration of AI holds immense potential to revolutionize maternal and neonatal health. Predictive analytics can anticipate preterm births and neonatal infections, enabling early interventions, while AI-driven decision support systems assist healthcare providers in labor management and neonatal care. Practical applications include optimizing NICU resources, improving maternal-fetal monitoring through wearable devices, and supporting pandemic preparedness. Future research should focus on addressing ethical concerns, ensuring equitable access to AI technologies, and improving data privacy and quality. Additionally, studies exploring AI's integration into midwifery policies, its role in emergencies, and longitudinal evaluations of real-world implementation can provide actionable insights to advance maternal and neonatal healthcare globally.

Conflict of Interest

The authors declare that there is no conflict of interest.

Acknowledgment

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