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Determining factors in maternal neonatal health: an analysis of the state of the art

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ABSTRACT

Objective: the objective of this study is to analyze the state of the art regarding maternal and neonatal health in the national and international spheres.

Methodology: SCOPUS and PubMed databases were consulted in order to extract more updated information as required. The study used articles published between the years 1990 and 2022 (July).

Results: As a result of the bibliometric analysis, a set of statistical evidence was obtained, which helped visualize the production, type, profusion and authorship of the selected studies.

Discussion: It is discussed that, of the indicators identified, mortality, both maternal and neonatal, represents the most significant indicator and that all the studies consulted. One of the main coincidences perceived is that there is evidence that demonstrates the independent relationship between maternal health and neonatal health, so studying them separately does not seem to be the most advisable thing to do. Some discrepancies have also been detected regarding strategies to reverse negative indicators.

Conclusion: From the indicators identified, mortality of both maternal and neonatal is the most significant indicator and also the one to which all the studies consulted point as an objective to be reduced with the application of various programs, starting with those established by the WHO.

Keywords: *maternal, neonatal, health, public policies, bibliometrics*

INTRODUCTION

The level of indicators of reproductive health allows state agencies to know the real situation in the maternal and child care field, in order to take timely measures to improve the situation. The indicators of human reproductive health are used to control changes in determined periods, to assess differences between different population groups and by regions (urban, rural), to establish maternal, neonatal and infant birth rates, fertility, morbidity and mortality rates, etc. These indicators can be expressed in absolute figures, in rates and in proportions, such as the Maternal Mortality Ratio (RMM in Spanish). In Peru, according to CDC (2022), the Maternal Mortality Ratio (RMM) decreased in 51% in the first semester of this year, in comparison to the same semester in 2021,

which had 272 deceased – of which 140 were due to COVID-19. The main reason of this decrease is mainly due because the first months of last year we lived the full impact of the pandemic; for the second semester of the same year, this was reduced due to the beginning of immunization of pregnant women against COVID-19 (CDC, 2022).

From that point of view, the sanitary development programs in Peru are currently focused on improving health conditions for mothers and children, especially for vulnerable groups such as pregnant women, parturient mothers and babies in the perinatal period. This is included in the 2020-2024 National Mid-Term Development Plan (RPJMN), which translates into the Strategic Plan of the Ministry of Health in its Maternal and Reproductive Health Program, which aim is to increase access and quality of services in that area (Tyndall et al., 2020).

In general, reproductive health is a global topic and has received special attention at the international level. This started at the International Conference on Population and Development (ICPD), held in Cairo, Egypt, in 1994 (Azaare et al., 2020). At that time, the paradigm of managing population problems and development was oriented towards the control of population and fertility reduction. In this way, the paradigm of managing population problems and development was oriented towards the control of population and fertility reduction (Story et al., 2021), and then it changed into a wider approach focused on reproductive health and efforts to fulfill reproductive rights (Khowaja et al., 2018).

In Latin America, due to the deep existing social gaps, maternal health care faces serious challenges related to specific topics regarding the sanitary activity, but also topics of different nature that go from political violence in some countries, to very poor conditions of the sanitary services, such as certain rural sectors in Colombia (Vélez Álvarez, 2022; Hoyos-Bertel & Muñoz, 2020). Regarding quality of care, in Chile, for example, there has been significant progress, as indicated by Alarcón-Henriquez et al. (2021) within the objectives established as strategic by the Health System of said country in order to improve the quality of reproductive healthcare services in the context of the rights of the individual.

Nevertheless, as specified by Lande (2020), it is considered that several policies and interventions of the maternal and neonatal health programs using large funding have not worked well. And, so far, maternal and neonatal mortality rates remain a problem in the reproductive health area in our country. According to the OMS (2017), the cause for maternal mortality is due to obstetric complications that are not properly and timely treated (around 15% of pregnancies) (Brault et al., 2020). Around 75% of obstetric complications are due to hemorrhages and post-partum infections, high blood pressure during pregnancy, prolonged labor and unsafe abortions. Regarding infant mortality, 185 newborns die every day. Three quarters of those deaths take place during the first week and 40% die within 24 hours of birth. Amongst the most recurrent causes of infant mortality are being premature, complications related to birth labor such as asphyxia or difficulty breathing at child birth, infections and birth defects (OMS, 2018). However, because of the pandemic, it was estimated that in Peru there would be an increase of up to 40% in the maternal and neonatal mortality rates (UNFPA, 2021),

Pose like this the problematic reality, the present study aims to analyze the state of the art of scientific productions related to the determinant factors of Maternal Neonatal Health. In this way, we are looking to "measure" the scientific production through a number of publications and their visibility based on an exhaustive selection of recent researches on this matter, and to the light of the increase in the production of studies, propelled by the most developed countries, which demonstrate their scientific leadership with significant contributions.

MATERIALS AND METHODS
Bibliometry
Due to the nature of its design, this study is descriptive. The technique used is Bibliometry. Bibliometric methods are used to provide results of quantitative analysis of the written publications. This study is based on identifying a

bibliographic corpus, meaning publications in a broader scope and within a specific topic range (Nuankaew et al., 2020). This method has largely benefited from the computerized processing of the data which in the last years have steeply increased. This is due in part because of the computerized methods, as well as to the fact that bibliometric methods must enter a certain volume of data in order for them to be statistically reliable. Thanks to the availability of different programs and tools nowadays, the impact on scientific literature can be interpreted and analyzed in many different ways (Paredes-Chacín et al., 2020). This trend gets a little bit more complicated because of the growth of non-traditional publishing and the number of scientific publishing platforms that can be used as an aggregate data source.

Analysis of citations

The analysis of citations is a quantitative technique that provides information about the level of influence of research articles in a certain topic. Citation analysis allows researchers understand when the key articles that had a great influence in a given field where published and how they have grown in popularity in time; it also allows them to know if an article remains relevant for it to be used in this current research (Russell et al., 2021). The higher frequency of citations demonstrates the article has a relative important influence. The citation analysis can also be used to identify the main research trends (Andersen et al., 2021).

In this study, the bibliometric analysis adopted the method of analysis introduced by Fahimnia et al. (2015). This method includes the definition of the key words in the "maternal and neonatal health" search, the preliminary results from the search, the refining of the search results, the compilation of the preliminary data statistics and data analysis, which will be explained in detailed in the following subsections.

The bibliographic search began in August 2021 using the key word "maternal and neonatal health". Scopus and PubMed databases were used to compile data. As a first step we consulted the key word "maternal and neonatal health", and

established special conditions for "magazine", "only title words", and the years "1990-2022". Newspapers, books, reviews and book chapters were excluded. Based on the compiled data for "maternal and neonatal health", 1093 articles were obtained in the initial search period.

The searches generated after the refining were downloaded, saved in the Mendeley software and exported using RIS format in order to include all the essential information related to the article, including the title, names of the authors, the summary, the key words and the magazine's specifications (publishing magazine, publishing year, volume, number and pages) (Muluneh et al., 2020). Data was analyzed in order to classify the articles per year and by publishing source and editorial source, as of the initial consultation and using the maximum period of time, after verifying if many publications of the magazines were indexed in Scopus and PubMed (Lugobe et al., 2020). Then, the data was extracted independently and processed through the VOSViewer (VV) program, which is used to visualize bibliographies or sets of data that contain bibliographic fields (title, author, review, etc.). In the world of research VV is used for the bibliometric analysis, the research of topics that still have a chance to be researched, the search of the most used references in a given field, and others. This software is able to read sets of data from Web of Science, Scopus, Dimension and PubMed. Besides that, data set formats like RIS, Endnote and RefWork can also be read in VOSViewer. The data was exported to VOSViewer determining occurrences linked to topics related to maternal and neonatal health; after this, the results were transferred to an Excel spreadsheet represented in tables and graphics, one of the most remarkable aspects provided by the VOSViewer (Moran et al., 2018).

RESULTS

The search in the database identified 42397 publications. Once the duplicates were deleted, 1093 titles were examined. Regarding the evolution of the publications (Figure 1), it is observed that the researchers have shown interest in this topic since 1990.
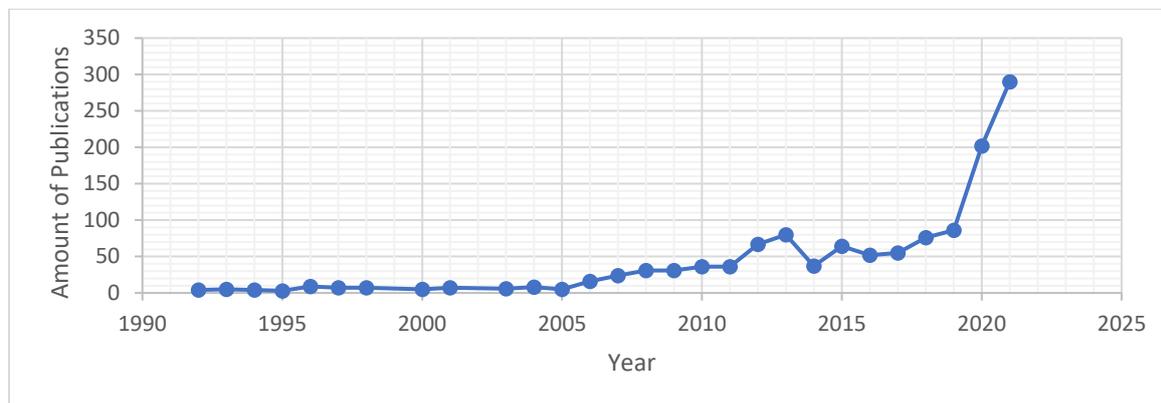
FIGURE 1: Yearly publications in Scopus 1990 – July 2022

Note: Data base consulted: Scopus

This series of data shows an increasing trend considering that the 20 first years around ten to twenty studies were published – according to the analysis of the average figure- and a spectacular increase to 280 publications a year, between 2020 and 2022.

In this regards, during the last six years there has been a notorious increase, having the highest levels in 2020 and 2022. This could also be explained due to the COVID-19 pandemic, which in a certain way motivated the scientific interest in this phenomenon in said population sector. However, since 2011 a rise in the curve can be noticed, although with slight decreases in 2013 and 2014, and then a quick recovery at a very defined research production level. In this sense, new studies are required to explore deeper in this topic.

The interest for mother and neonatal health offers a notorious contrast among different countries considered in the bibliometric report executed. Although it is true, as shown in Figure 2, that the United States of America leads these studies with a production of over 1600 publications; it is also true that they also lead the scientific researches in the world, thanks to a policy of constant incentive for technological and scientific development that spares no expenses when it comes to investing in this area. The United Kingdom, regarding the European continent, is the country with the highest dynamic in the scientific field. Brazil is in the third place, a Latin-American country which has lead in the recent years the sphere of scientific researches. China, India and Iran are next in line, but a little far from the before mentioned countries.
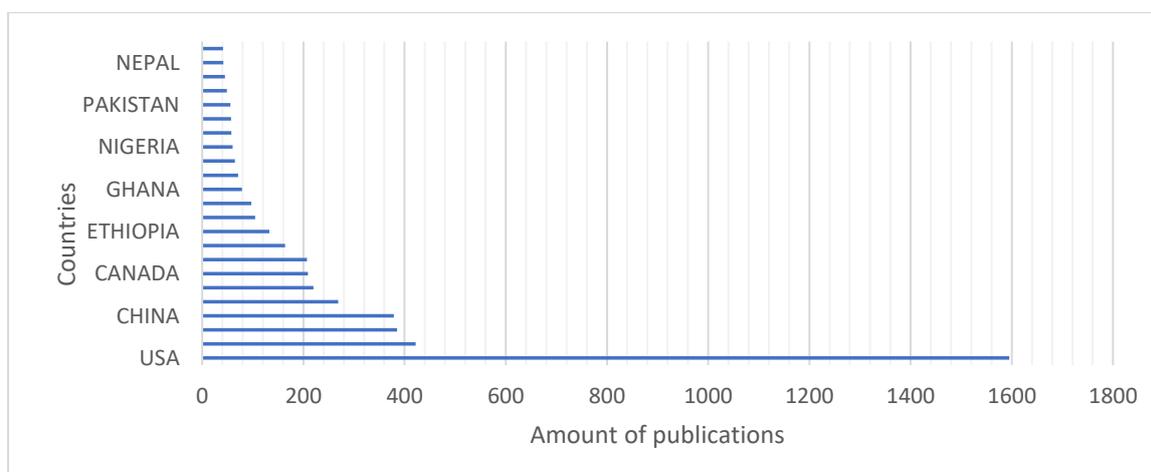

FIGURE 2: Publications per countries 1990 - 2022

Note: Shown 24 of the most relevant countries from a total of 112, considered in Scopus and PubMed data bases.

It should be stressed that in our country the interest for maternal and neonatal health, although it is a growing concern for our health sciences researchers, it still does not have the priority focus as it should, because there are other aspects that are also a priority, such as those related to diseases or to our sanitary services development (Feng et al., 2021). However, maternal and neonatal health is, in the author's opinion, a priority since it is true that this study shows significant progress in this matter, it may vary from one country to another because they have to get adapted to local problems and to the means to solve them, which leaves us somehow in limbo of our own experiences that can be pointed out. (Hamdanieh et al., 2021).

In scientific articles, "affiliation" refers to the institution to where the author belongs to. In general, the names of the authors are listed right after the "department, university" from the institute they worked for while they were doing the study (Plotkin et al., 2022). According to the review made for this article the Department of Dairy Science Virginia is the one concentrating the greatest numbers of affiliations, followed really close by Institute of Health from Jimma University. Almost every institution, except by the two before mentioned, are very close one from the other. In this matter, it is important to point out that, in our current world, where science is more collaborative and multidisciplinary, documents usually have multiple affiliations, the same as the one mentioned before. An individual author can also be associated to multiple institutions, making the affiliation section quite long. (Haile et al., 2020).

In the search for knowledge according to the criteria used, it was considered to look for a semantic approach to our object of study, refining in most of the cases, those terms that shifted the focus to other disciplines that were not related to the proposed objective, being medicine and Nursing the most prominent in terms of the largest volume of publications, followed by the area of Social Sciences in third place. This is a clear indicator that the selection of publications focused on maternal and neonatal health should had been properly centered.

In that regard, the quantitative (bibliometric) methods used to establish the differentiation criteria regarding the specialty or a specific field, required a progressive refinement in order to eliminate every bit of information considered spurious for the specific interests of this research. In that sense, as Tokhi et al. (2018). point out, in order to measure productivity and the impact of the results of what we are looking for, there is a special risk due to the misinterpretation of the data (Tokhi et al., 2018). This is due, as Garces (2020), points out, to the fact that the research from the underlying data is used to be separated from interpretation and its application (Garces et al., 2020), which leads, as indicated by Akseer (2018), that many of the key words break into incorrect directions and with publications that do not have a direct relation with what is being searched for (Akseer et al., 2018). Given that the maternal and neonatal health topic involves terms which semantics (meaning) has a wide range of commitment with underlying issues that are not necessarily in the realm of what is being searched for, one has to be very meticulous with results that are too "noisy" in terms of the variety of specialties in which they may be involved (Pitt et al., 2018).
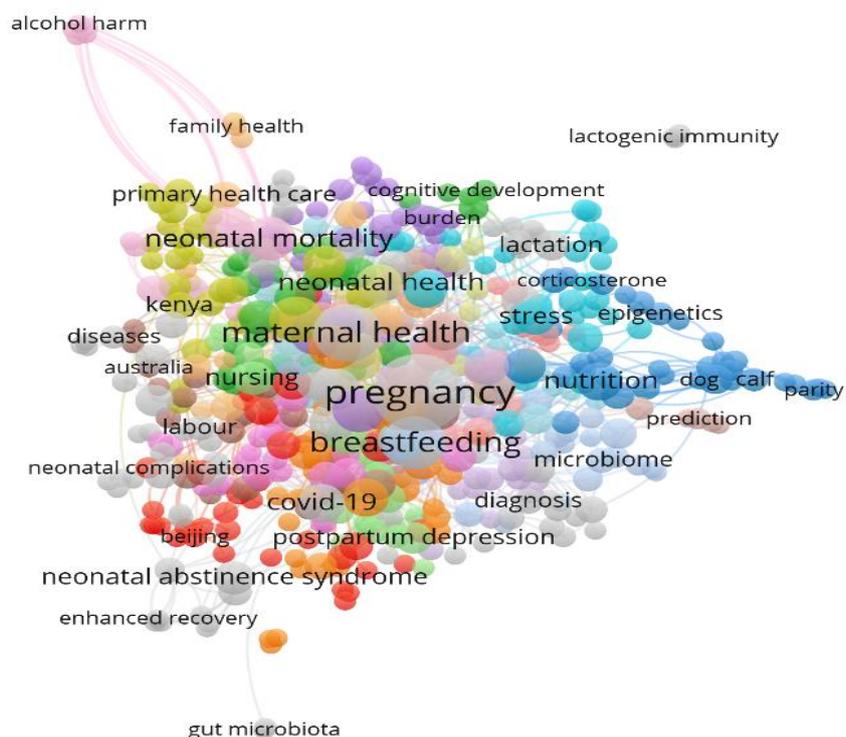
FIGURE 3: Semantic Map on the study of maternal and neonatal health.

Note: Consolidated of Scopus and PubMed data bases processed with an open VOSViewer software.

In relation to semantics at the theoretical conceptual approach of the maternal and neonatal health through the Network Visualization Map of appearances of the key words from the author (meaning, key words listed by the author) (see Figure 3), it has been evident that there are clear trends or orientations towards certain subtopics that integrate the background of scientific literature considered in the search criteria to which Scopus data base was submitted by the researcher (Kenyhercz et al., 2022; Naqvi et al., 2022). In regards to this, it can be observed that clusters like "health", "pregnancy", "maternal", "breastfeeding", "neonatal", represent the most outstanding terms in the analysis performed by VOSViewer, being this feature that one leading us to think that the semantic search is adequate and is framed within the parameters established in the research (Haibin et al., 2020). Studies claim that text mining can be applied to extract useful information related to adverse events of the medication, constitute multiple text sources as electronic health records, and improve the detection and assessment of adverse events that may occur during the pregnancy process or at the time of birth. In this group, the automated learning approaches are mainly applied to the diseases risk modelling (Costello y Naimy, 2019).

Based on the bibliographic data compiled from SCOPUS and PubMed, specifically, the United Stated is identified as the country with the highest number of studies (559, 1/3 of the total amount of publications), followed by the United Kingdom (238) and Germany (102). The main research teams and professionals in maternal neonatal health are located in the aforementioned countries.

DISCUSSION

This document has examined maternal and neonatal health through multiple indicators identified in the publications used as references. We have tried to review the orientations and changes of the consulted studies. In that sense, one of the main coincidences perceived is that there is determining evidence that demonstrates the independent relationship between maternal

health and neonatal health, therefore studying them separately does not seem to be the most advisable (de Loenzien et al., 2021; Roberts et al., 2021; Rodo et al., 2022; Walter et al., 2021). Some discrepancies regarding strategies for reversing negative indicators have also been detected. In relation to this, there are different approaches on how to reach the integration of care for women and children and how this has the potential to speed up the progress towards the Millennium development goals (Gaffur et al., 2022; Patel et al., 2020; Zeng et al., 2022). It is agreed in most publications, that continuity of care encompasses not only the time (preconception, pregnancy, delivery and postnatal period), but also levels of care (home, community and healthcare centers) (Blanchard et al., 2021; Cho et al., 2022).

Regarding the proposed global goal to reduce maternal death within the framework of the Sustainable Development Goals (SDGs), which was set for the year 2030 in a rate lower than 70 per every 100,000 live births, it is evident, from the studies consulted, that the governments around the world have responded positively, not only by the publication of a series of policies but also by the launching of some national actions (Choi et al., 2022). Nevertheless, there authors who also emphasize that these goals have been affected by the COVID-19 pandemic, which have brought as well severe transformations of the health services worldwide, affecting human and logistics resources in every sector of public health, situation which has also affected our country (Castro-Baca, 2021) and where coronavirus became a determining factor of maternal deaths, right after high blood pressure conditions and hemorrhages (Guevara, 2021).

Researchers have also deeply scrutinize the indicators that reflect the association between maternal health and child health (Kenyhercz et al., 2022; Yalçin et al., 2022). However, the possibility that pregnant women may use the information effectively still depends on certain health knowledge (Asefa et al., 2022), which is the synthesis of the beliefs and behaviours with regards to health based on the health knowledge that each social group handles (Ávila et al., 2020; Dávila-Aliaga et al., 2021). In summary, the fast

development of new media has improved health information management.

Finally, neonatal indicators are directly related to maternal health (Akaba et al., 2022; Schneider et al., 2022; Yu et al., 2022). This problem has also been clearly aggravated due to the COVID-19 pandemic because there has been a notorious reduction in the coverage of health services with respect to preventive health, motivated, on the one hand, by the emergency measures applied (Foudil-Bey et al., 2020; Lebrun et al., 2020), which derived in reallocating a large group of the health personnel to assist the pandemic emergency; and, on the other hand, due to the fear of getting infected with the virus (Rodo et al., 2022; Dávila-Aliaga et al., 2021; Akaba et al., 2022). The neonatal deaths rates are most pronounced in the same countries with the highest levels of poverty and where maternal mortality rates are very high as well, due to the poor quality of healthcare services provision (Bayih et al., 2020; Diamond-Smith y Afulani, 2019).

CONCLUSION

For all of the above reason, the state of the art related to the scientific production on the determinants of Maternal and Neonatal Health has been analyzed. For this purpose, 1093 articles with topics concerning maternal and neonatal health indicators were reviewed. The articles were collected from the Scopus and PubMed databases. Once the defining criteria were applied, the search was reduced to 275 articles, which were reduced to 58 articles by applying new selection criteria.

From the indicators identified, mortality of both maternal and neonatal is the most significant indicator and also the one to which all the studies consulted point as an objective to be reduced with the application of various programs, starting with those established by the WHO. In our country, significant progress has been made in this respect, only eclipsed in the last two years by the effects of the COVID-19 pandemic. In view of this reality, not only the magnitude, but also the epidemiological nature and the programmatic needs of this indicator make it essential, according to the opinion of most of the authors

consulted, to rethink these programs in relation to the search for greater efficiency of health systems worldwide.

On the other hand, the gaps in this study suggest future directions for research regarding "maternal and neonatal health". In general, although the study of the concept "maternal health" is on the rise, it is necessary to pay special attention to interregional research collaborations in which Latin-American researchers and other developing countries researchers participate.

Limitation
This research had some limitations. In the first place, this study was based on a limited set of key words and it was also potentially conditioned by the data bases within Scopus and PubMed used to collect the articles. In the second place, although in this study formal tools (VOSviewer, Mendeley, Microsoft Excel) were used, the subjective judgment of the authors exists and may lead to errors.

Statement of Conflict of interest
I declare that this publication is independent regarding the financing and supporting institutions, and that during the execution of this work or the writing of the manuscript I have not affected interests or values different from those usually used in the investigation, therefore, I declare that I do not have any kind of conflict of interests.

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