



Secondhand Smoking and the Fetus: A Bibliometric Analysis

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Abstract

Background: Bibliometric analysis may indicate the most active specialist, authors, and journals in a given research field. To the authors' knowledge, there is no bibliometric analysis to provide a macroscopic overview in the field of secondhand smoke that harms non-smoker.

Methods: Using the bibliometric method, 644 articles that were present in the Scopus database between 1973-2020 on the subject were considered. The data were analyzed by two visualization and science-mapping software called Bibliometrix and VoS Viewer. Also, reference publication year stereoscopy and Co-Citation historiography were used. In the qualitative analysis, 52 articles were selected that had the most citation and were analyzed.

Results: In this paper, the findings show that the documents were published in 364 sources with an average citation per document of 25.14 and more than 3 authors or nearly 4 authors per document. The peak reference publication year stereoscopy happened in the year 199 with 974 references. The countries with the highest number of MCP were the USA, China, and Spain. The "International Journal of Environmental Research" and "Public Health", has raised their publications in the field of secondhand smoke and pregnancy rapidly since 2003. Among the titles, "passive smoking" was the most used.

Conclusion: The study highlights the importance of understanding the harmful effects of secondhand smoke on the developing fetus. The findings also shed light on key research trends, influential authors, and active research areas, which can guide future studies and support evidence-based decision-making in the field of maternal and child health.

Keywords: Tobacco, Secondhand smoking, Pregnancy, Fetus, Health, Environmental smoke, Bibliometric

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Introduction

Every year all over the world, more than 8 million people die because of exposure to tobacco smoke. Of these, more than 7 million people are smokers, while about 1 million people are non-smokers and are exposed to secondhand

smoke(SHS). The hazards of SHS include different cardiac in the youth, sudden death in infants, and the birth of an infant with low weight in pregnant women. In fact, there is

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↑What is "already known" in this topic:

Indeed, a substantial body of research has been conducted on the effects of secondhand smoke on the fetus. In order to provide a comprehensive understanding of the existing knowledge, our study goes beyond a mere review of individual studies. Instead, we employ a rigorous bibliometric analysis to obtain a systematic classification of the research conducted in this area and examine the trends within the field.

→What this article adds:

While the existing knowledge on the adverse effects of secondhand smoke on the fetus is well-established, our study adds value by conducting a bibliometric analysis. This analysis offers a macroscopic perspective on the research field, identifying trends, influential authors, and active research areas. By providing a comprehensive overview, our study contributes to the existing body of knowledge and underscores the importance of addressing secondhand smoking as a significant public health concern during pregnancy.

no place safe from exposure to cigarette smoke (1). Children who are constantly exposed to cigarette smoke may suffer from respiratory diseases, asthma, and stomach infections. Otitis media is also observed in these people. Since children have a higher respiratory rate than adults and their organs rapidly react to cigarette smoke, environmental pollutants such as cigarette smoke can also disrupt the growth and development process of children over the years (2, 3).

Using tobacco is the main cause of death and many diseases that can be prevented. SHS is defined as spontaneous exposure to a composition of diluted, lateral stream cigarette smoke and exhaled smoke from smokers (4). Smoking during pregnancy can lead to innumerable difficulties for pregnant women and fetal growth. Public health concerns about the transmission of pollutants, such as nicotine, carbon monoxide, and other harmful chemicals resulting from smoking in pregnant women are on the rise. The substances in tobacco can affect vascular functioning. The umbilical blood flow directly transfers the smoke to the fetus and disrupts its neurological functioning (5, 6).

The effect of mother cigarette smoke during pregnancy on baby weight has been recognized since 1957 (7), and the first report concerning the harmful effects of environmental tobacco smoke on newborn's health was published in 1967 (8). Passive smoking refers to the inhalation of smoke that is named SHS or environmental tobacco smoke (ETS), by another one as an active smoker, which occurs when tobacco smoke is in the environment. A massive source of disease, death, and disability is exposure to SHS. Secondhand smoke causes many diseases similar to direct smoking, including cardiovascular disease, lung cancer, and respiratory diseases (9).

A Bibliometric study entitled "Forty years of secondhand smoke research, the gap between discovery and delivery" has been done by Harris, Luke (10) on the topic of SHS published between 1965 and 2005. This research only examined citation networks and the type of publications related to secondhand smoke. However, in this article, the authors, using the bibliometric method, seek to examine various aspects such as highly cited authors, commonly used keywords and publications, and finally, the qualitative review of highly cited articles. As far as our knowledge, there is not any other Bibliometric study in the research area of SHS and pregnancy. Therefore, the present Bibliometric study is carried out to explore the research trends and insight in the area of SHS and pregnancy, to quantitatively and quantitatively analyze publications, and to provide suggestions for future research opportunities. Bibliometric studies seek to measure and analyze scientific products and are widely used for the analysis and evaluation of scientific literature. Bibliometric studies measure research output efficiency based on different indices, such as the number of publications, the number of collaboration networks, and citations (11). The dominant method of literature review solely assesses the researchers' experience and knowledge in a systematic fashion, while bibliometric studies give a larger overview of the subject under study that can be adjusted from micro to macro scopes (12).

Due to the importance of the effects of SHS on the fetus,

and the hidden nature of consuming this smoke by mothers and fetuses, it is essential to examine different dimensions of the effects of tobacco smoke on the fetus. The objective of this study is to explore the trends and insight of the publications in the research area of SHS during women's pregnancy.

Methods

The bibliometric approach is a technique that quantitatively measures scholarly outputs using various indices, including the number of publications, citations, and keyword frequency within publications (13). However, it is important to note that bibliometric analysis alone lacks the qualitative insights derived from a comprehensive examination of the documents. Therefore, to obtain a more holistic understanding, a bibliometric study should be complemented by a qualitative study. Moreover, the findings obtained from bibliometric analysis offer practical implications for improving research practices, such as enhancing research selection, guiding training and mentoring programs, and providing support for early career researchers (14).

The objective of this study is to explore the trends and insight of the publications in the research area of Secondhand Smoke during women's pregnancy. To find all relevant keywords to SHS, MEDLINE, which is a bibliographic database of life sciences, searched for second-hand smoke synonyms. Therefore, "Passive smoke", "Environmental tobacco smoke", and "Tobacco smoke pollution" were retrieved from the MEDLINE database. There are two similar words when a woman has a fetus in her womb that is "pregnancy" and "gestation". The search strategy was set up for looking at the SHS and their relevant synonyms in the title of published scholarly documents and then refined by the "pregnancy" and "gestation". This strategy leads the researcher to find all documents relevant to the study objective.

There are two major scientific databases, Web of Science (WOS) and SCOPUS (15). Depending on the research area, the researchers may select either WOS or SCOPUS and sometimes both of them. In the current study, WOS and SCOPUS databases search for the selected search terms and results summarized in Table 1. The asterisk "*" after each word will be replaced by any characters by machine (for instance, Smoke* is equal to Smoke and Smoking). Bibliometric studies rely on data derivation from well-known databases such as Web of Science (WoS) and Scopus (16), the latter of which deals more extensively with sciences than the other one (17). In this study, the data were collected from SCOPUS. This database contains valuable contributions from different researchers and is commonly used in bibliometric studies, either alone or in combination with other databases. According to the data presented in Table 1, it is evident that SCOPUS contains a greater number of documents related to the research topic compared to the Web of Science (WoS) database. Therefore, the SCOPUS database was selected for collecting the data on March 29, 2020.

The 644 documents retrieved from SCOPUS are based

Table 1. Search WOS and SCOPUS databases for the selected search terms

| No. | Search term | WOS | SCOPUS |
|-----|--|------|--------|
| 1 | TITLE: "Secondhand smoke*" OR "Second-hand Smoke*" OR "Passive smoke*" OR "Environmental tobacco smoke*" OR "Tobacco smoke* pollution" | 5350 | 5359 |
| 2 | TITLE: ("Secondhand smoke*" OR "Second-hand Smoke*" OR "Passive smoke*" OR "Environmental tobacco smoke*" OR "Tobacco smoke* pollution") AND TOPIC: (Pregnancy OR gestation) | 412 | 644 |

Table 2. Type of documents in the period of 1973-2020

| Document types | Results |
|------------------|---------|
| Article | 490 |
| Review | 82 |
| Letter | 20 |
| Note | 15 |
| Conference Paper | 14 |
| Editorial | 13 |
| Book Chapter | 6 |
| Erratum | 2 |
| Short Survey | 2 |

on the title and topic search in the research area. These 644 documents were published in 364 sources (Journals, Books, etc.) in the period of 1973 – 2020, with an average citation per document of 25.14 and 3.85 authors per document. The type of documents illustrated in Table 2 the number of conference papers is very low, which means the research area is mature.

The collected data is organized in different formats to explore the trends and insights of the publications. The EXCEL sheets were used for descriptive analysis while the reference management data including the original documents pdf files, were used for qualitative analysis. The data were analyzed by two visualization and science-mapping software called Bibliometric and VoS Viewer. Bibliometric is a R-Tool package designed for science mapping and quantitative Bibliometric research (18). The VoS in the VoS viewer stands for “Visualization of Similarities” (19). The VoS viewer software uses both mapping and clustering approaches to calculate association strength between keywords. In his technique, the keywords that are closely associated are structured into the same clusters by the same colours (19, 20).

After reviewing the articles in the Scopus database, according to Table 1, 644 research in second-hand smoke and pregnancy scope have been performed. Among them, 52

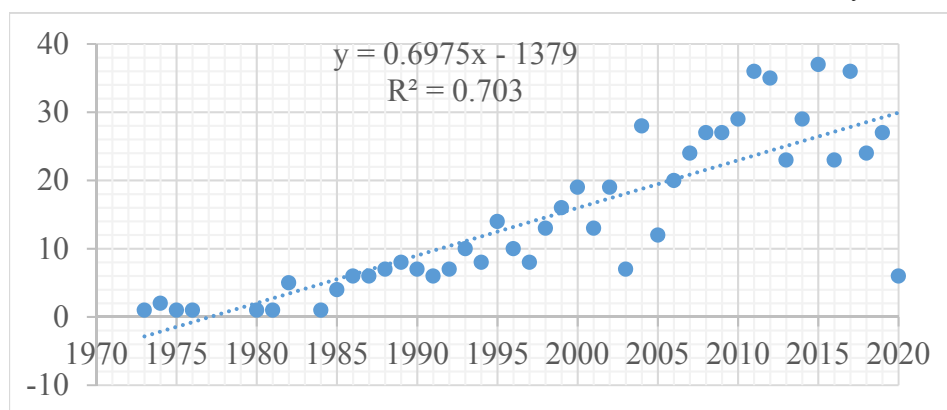
articles were selected that had the highest citation rate compared to previous years of research and have been selected up to the limit of the citation rate of at least 5. These 52 selected articles were analyzed qualitatively.

The search query used in this study led to the retrieval of 644 documents from Scopus. WoS database would like to yield some additional studies which were not included in the research data set. A bibliometric study is not advisable for other researchers with less knowledge of their research topic or of bibliometric analysis methods. In the present research, citation was the main criterion used to establish the quality factor, although it is occasionally an inferior indicator of this factor.

Publications Trends and RPYS

Figure 1 shows the trends of publications in the research area of second-hand smoking and pregnancy from 1973 – 2020. The publications are growing from one document in the year 1973 to 27 documents in the year 2019. There were some fluctuations in different years, which rose to 36 in the year 2011 and 2017 and fell to 23 in the year 2011. However, the publication trend is growing gradually.

Reference publication year stereoscopy (RPYS) is a quantitative method for identifying the historical origins of research fields and topics (21). Figure 3 shows the results of the RPYS analysis of 644 documents in the area of SHS

**Figure 1.** Publications trend of second-hand smoking and pregnancy from 1973 - 2020

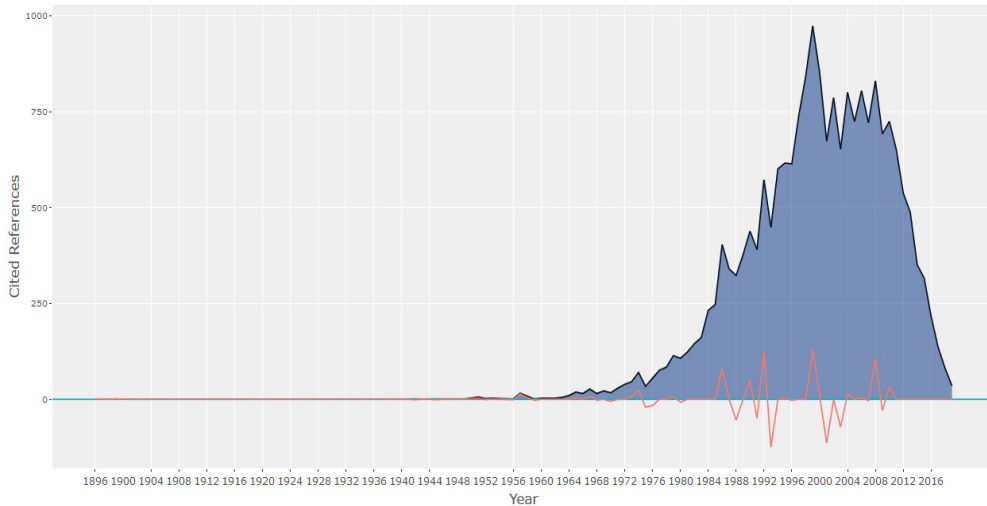


Figure 3. RPYS of 644 documents

and pregnancy. The blue line indicates the number of cited references per year, and the red line represents a deviation from the 5-year median. The peak happened in the year 1999 with 974 references. There are four peaks in the red line that occurred in the years 1986, 1992, 1999, and 2008 with 404, 573, 974, and 831 references respectively. The detail of raising cited references will be discussed in the section of Co-Citation Historiography.

Results

Co-citation Historiography of 644 documents

The co-citation network of the references in SHS and pregnancy research is visualized in Figure 2. Each node in the network represents the document and the edge represents the number of citations received by the articles. The line size indicates the higher numbers of co-citations ties. Nodes are labeled with the author’s first initial, last name,

and year of publication (18). The network of cited authors in Figure 2 contains both the authors of the papers and the authors cited in the references of the articles. It illustrates the connections and relationships among authors based on their co-citation patterns within the literature on this topic. The network aids in recognizing the most cited authors who have written second-hand smoking and pregnancy papers or who have been cited in the SHS and pregnancy papers. Documents written by Rubin, Leventhal (22), Martin and Bracken (23), Windham, Eaton (24), Eskenazi and Castorina (25) and another one written by Leonardi-Bee, Smyth (26) received the highest attention and citations.

Rubin, Leventhal (22), in a study in Denmark, consecutively examined 500 women and controlled different aspects such as age, sex of the infant, Social class, diseases during pregnancy, equality, consumption of alcohol, and smoking. The result of both examinations showed that the

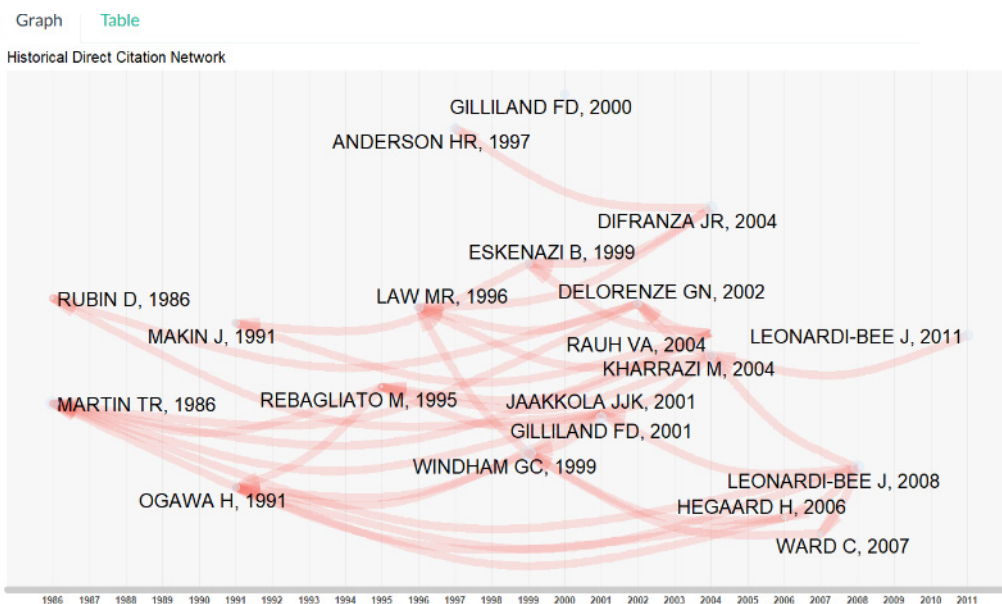


Figure 2. Author co-citation network on second-hand smoking and pregnancy

father's smoking as SHS has destructive effects on infants and is positively correlated with the low weight of the infant. The high precision of this study and performing a comprehensive examination at a time when most attention was focused on first-hand smoke have contributed to the high validity and credibility of this study.

The study by Martin and Bracken (23) was another study with a high view rate and has received many citations. In an extensive study from 1980 to 1982, 3891 patients who were at the hospital before giving birth were examined. Those who had been exposed to SHS and those who smoked were monitored, and the process of the pregnancy was checked. In Social Sciences, a large sample size affects the credibility and generalizability of the study. Extensive studies have been conducted over a long time. In this study, the effects of SHS and cigarette smoke were examined practically and under control. Moreover, a large number of participants has contributed to the validity and credibility of this study.

Eskenazi and Castorina (25) investigated the relationship between exposure to SHS experienced by mothers and children and the neurological problems resulting from SHS. In this study, 17 epidemiological studies trying to separate the effects of active smoking by the mother from the effects of SHS have been closely examined. In a meta-analysis, the details of the all-encompassing effects on the infants' neurological systems were extracted in two groups of mothers. The reason for the attention paid to this study could be that it presents the gist of 17 valid epidemiological studies on this topic.

Windham, Eaton (24) performed a retrospective study to examine the pregnancy and the conditions of the infants of 992 women who had given birth. They examined the history of these women to see whether they had been exposed to cigarette smoke, and the results were examined concerning infant weight. The important point contributing to the fame of this study was the comparison of the results with the findings of 16 other studies on the same topic. The researchers compared their results with those of other studies and found that the findings were similar to a small error percentage.

Leonardi-Bee, Smyth (26) performed a systematic review and meta-analysis. They examined and compared different references of publications examining the effects of cigarette smoke on infant weight without any language restriction. The results revealed that, in all the studies, cigarette smoke has led to a reduction in infant weight but has not considerably affected the process of pregnancy. This review has examined the previous studies and is a general study and summary of the results of previous studies. As a result, it has become a highly cited and viewed research.

Corresponding Author's Country

Figure 4 illustrates the corresponding author's country in single-country publications (SCP) and multiple-country publications (MCP). The SCP means the number of documents produced by the authors of a country and MCP means the rate of cooperation of each country's authors with other countries' authors. According to the countries where the corresponding authors published, around 25% of

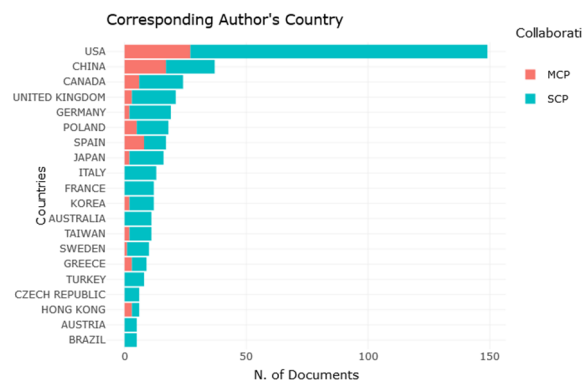


Figure 4. Corresponding Author's Country

studies in the USA were published in MCP. The countries with the highest number of MCP were the USA, CHINA, and SPAIN with the numbers of 27, 17, and 8 multiple country publications respectively.

Three-Fields Plot Authors, Index keywords, and Sources

Figure 6 demonstrates a tree-filled plot of the relationship between top authors (left side), top index keywords (middle) and top sources (right side) in the research area of second-hand smoking and pregnancy. This figure shows that authors like Pinkerton KE, Hanke W, and Chen wk were working in the field of "Pregnancy", "Female", "Passive smoking" or "Infant" and most of the studies in this area were published in the "International Journal of Environmental Research and Public Health". Overall, this figure illustrates the relationship between keywords plus and the top sources that they are printed on. Figure 7 shows the co-occurrence of the top 50 index keywords in the published documents of second-hand smoking and pregnancy research area. The yellow color shows an emerging field in the research area.

The increased consumption of tobacco and the resulting mortality, despite all the warnings, have not undermined the problems associated with cigarettes. Rather, over time, more attention has been paid to its different dimensions. Since health is currently an important issue, and because tobacco smoke damages different aspects of human life, more attention has been paid to this problem, and different studies have examined its dimensions. Upon progress in medical science and a reduction in the mortality of infants, concerns for the complete health of infants have become a major pregnancy-related health topic. Another problem is that the direct smoke consumed by the mother can be controlled by quitting smoking even for a short period. However, second-hand smoke exerts its effect on the environment, and in the contemporary world in which women are highly active in society, they are exposed to smoke in the environment. These issues have raised the attention of those in charge of health to this problem.

Figure 8 illustrates the top five indexed keywords growth during the year 1973 to 2020 in the SHS and pregnancy research area. When analyzing the preferred keywords through time, the most frequent ones nowadays presented a negative slope except for "PASSIVE SMOKING". Figure

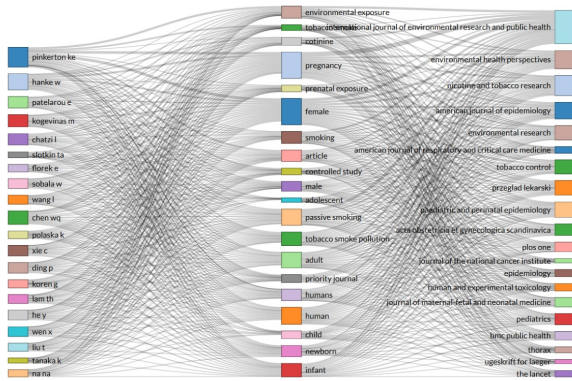


Figure 6. Three-Field Plot of top authors, top index keywords, and top journals on second-hand smoking and pregnancy

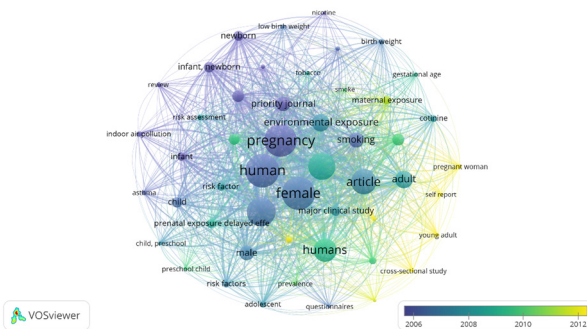


Figure 7. Co-occurrence of top 50 index keywords

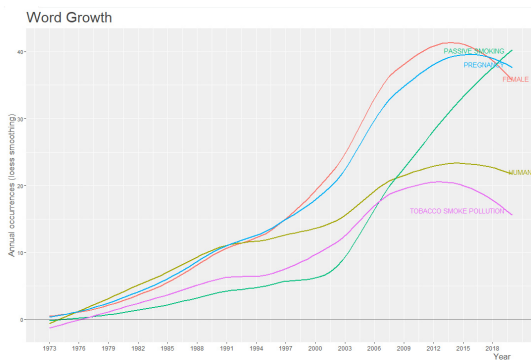


Figure 8. Index keywords growth

5 shows the top keywords in the abstract of 644 documents relevant to the SHS and pregnancy research area. The size of the word represents the frequency of the word in the document's abstract. The combination of Figure 6 to 8 gives a perspective of what researchers have been doing in the area of SHS and pregnancy.

As noted before, among the keywords, some are more frequently repeated in the abstract and the list of keywords, as demonstrated in Figure 7 and Figure 8. The repetition of words such as “pregnancy” in different years shows the attention to the phenomenon of “pregnancy” itself as a vital period of life. The high repetition of the word “smoking” indicates the growing use of “tobacco” and the fact that this

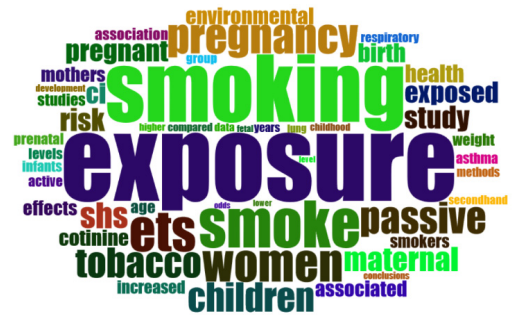


Figure 5. Top keywords in the abstract of 644 documents

phenomenon has become an international problem. In recent years, without any equivalence, warnings have been issued about the global problem of “smoking”. The repetition of the words “female” or “women” indicates the growing attention of the global community to women’s issues. The demands of “women” in research have also been effective, leading to studies on different dimensions of women’s lives, including “pregnancy” and “pregnancy health”. The repetition of words related to “humans” and “children” demonstrates the importance of public health and the fact that health is not a personal issue but a public one, and everyone is responsible for health. Words related to “second-hand smoke” and “passive smoking” suggest the significance of public health and the effects of adherence (or lack thereof) to “environmental health” on others. SHS is a critical and undeniable problem in today’s world.

Source Dynamics of 644 documents

Figure 9 shows that the journal growths fluctuated from 1973 to 2020. The “International Journal of Environmental Research and Public Health (IJERPH)”, has raised its publications in the field of second-hand smoking and pregnancy rapidly since 2003. A citation coupling of the IJERPH journal is illustrated in Figure 10. Citation coupling of sources. The citation coupling shows that a journal is interested in working with specific journals. Therefore, the author should know about journal citation networks.

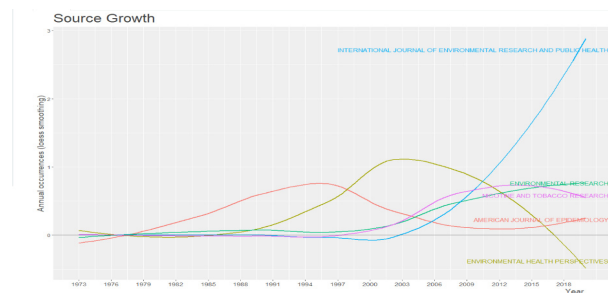


Figure 9. Journals growths occurrences by year in second-hand smoking and pregnancy

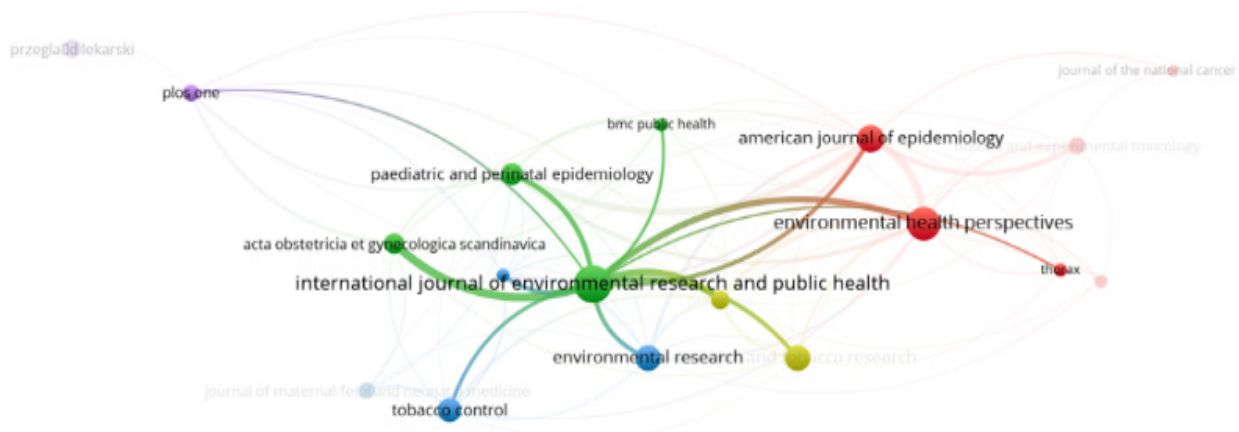


Figure 10. Citation coupling of sources

Discussion

In this study, we review the 52 articles highly cited papers on the topic. According to Table 3, we examined the “subject of research methods, statistical population and research results” in these 52 articles. Among the titles, “passive smoking” with 24 items and “environmental tobacco” with 19 items had the most repetition. These two terms include the types of “smoke” left in the “environment”. For example, DiFranza, Aligne (27) and Leonardi-Bee, Smyth (26) in this research, “investigated the effect of passive and environmental on fetus weight and growth”. But 12 order “second-hand smoke” has been used. Among the “effects of tobacco smoke”, “pregnant women exposed to tobacco smoke”, about the “health of the fetus and child”, 13 cases are due to the “effect of tobacco smoke”. According to the table above, in 12 cases, pregnant women are exposed to secondhand smoke. Gilliland, Li (29) in addition to the impact of the study of “pregnant women, those in the study also looked at the effect of children’s health and fetal health”. “Children’s health with” 12 cases are more common than “fetal health” with 8 cases.

64% of the best articles have used the “meta-analysis method”. This method is mostly used to understand the function of treatment or to study the results of one subject on another subject scientifically, among other scientific studies of systematic study (74). Existing articles that have “examined” the effects of SHS have found it necessary to study scientific cases through experimentation increasingly. The experiment method was used with 12 items after meta-analysis. This method has been used frequently when the researcher has tried to study the effect of SHS more scientifically, and most of these researchers have been doctors or medical staff (37). But where the researcher does not have access to direct testing, the method of “meta-analysis” and “analysis” of other researchers’ data is a useful option (33, 75). The use of a “questionnaire” with 9 items and a survey with 7 items was used less among the top researchers in this field. In the topics related to the study of the effect of the “questionnaire” and the “survey”, most of them

had the aspect of completing other methods.

Among the results extracted from the articles, according to the list in Table 3, the highest results were obtained with the influence of SHS on “weight at birth weight” with 16 cases and “infant growth” with 15 studies. Being underweight at birth and not growing enough in the fetus is one of the principal items of newborn mortality. Outbreak and risk factors have been important, which needs to identify and prevent the factors that affect it (76). Therefore, more studies have been done on the effects and dimensions of tobacco smoke on these cases (27, 29). The next result is “congenital anomalies” with 10 cases and “respiratory disease” and “asthma” with nine cases (35). “Abortion and sudden fetal death” with 6 cases and “fetal brain development” with 7 cases were also obtained from the results. Some articles focus on “behavioral problems, especially hyperactivity,” with six cases (33, 58).

Attention to issues related to “fetal weight” and “brain growth” has been at the forefront of “SHS” and “environmental smoke” from the early years, but since 2004, more attention has been paid to behavioral and brain effects, however physiological effects such as fetal growth and lung problems remain at the forefront. Researchers have also studied the effects of SHS on a variety of cancers, heart failure in adulthood and a variety of infections. Perhaps the reason for less attention to these cases is the low prevalence of “cancers” and “infections” in the early years of research in this field and over the years, one or two have been seen among the top articles. Due to the results and effectiveness of tobacco smoke on “cancer” and “heart” and “infectious” diseases, it is recommended to do more research on these issues. After reviewing the articles, the point that attracted the most attention was the lack of interdisciplinary research. Top research has been done mostly by medical and health researchers. “Sociological” or “psychological” research is needed to provide solutions to prevent SHS exposure to secondhand smoke.

Secondhand Smoking and the Fetus

Table 3. Data Short summary review of the top 52 articles

| | | Subjects | | | | | | Research Methods | | | | Statistical community | | | | Results | | | | | | | | | | | | | | | | |
|----|--------------------------|-------------------|-------------------------|--------------------------|-----------------------|-----------------|--------------|------------------|--------|---------------|----------------|-----------------------|---------|----------------|----------|---------|--------------|--------------|---------------------|-------------------|----------------------|-------------------|--------------------------------|----------------------|---------------------|-----------|---------------|----------------|--------------------|---------|---------------|--|
| | | Second hand smoke | The effects of Prenatal | Prenatal exposure to SHS | Environmental tobacco | Passive smoking | Fetal Health | Children' health | Survey | meta-analysis | The experiment | Questionnaire | Parents | Pregnant women | Children | Baby | Fetal growth | Birth weight | Sudden infant death | Premature infants | Congenital anomalies | Brain development | Respiratory disease and asthma | Middle ear infection | Behavioral problems | Cleft lip | Hyperactivity | Type of cancer | Type of infections | Allergy | Heart disease | |
| 1 | DiFranza, Aligne (27) | | * | | | * | * | | * | | | | * | * | | * | * | * | * | * | | * | * | | | | | | | | | |
| 2 | Slotkin, Pinkerton (28) | * | * | | * | | | | * | | | | * | | | | | | | | * | | | | | | * | | | | | |
| 3 | Gilliland, Li (29) | | | * | | * | | * | | | | | * | | | * | | | | | | | | | | | | | | | | |
| 4 | Florescu, Ferrence (30) | | * | | | | | | | | * | | | | * | | | | | | | | | | | | | | | | | |
| 5 | Leonardi-Bee, Smyth (26) | | | * | * | | | | * | | | | * | | | * | * | | | | | | | | | | | | | | | |
| 6 | Gilliland, Li (31) | | * | * | | | | | * | | | * | | | | * | | | | | | | | | | | | | | | | |
| 7 | Salmasi, Grady (32) | * | * | | | | | | * | | | | * | | | | * | | | * | | | | | | | | | | | | |
| 8 | Herrmann, King (33) | | * | | * | | | * | * | | | | * | | | | * | | | * | | | | | | | * | | | | | |
| 9 | Qiu, He (34) | | * | * | | * | | | * | | | | * | | | | * | | | * | | | | | | | | | | | | |
| 10 | Gilliland, Berhane (35) | | * | | | * | | | * | | | * | | | | | | | | * | | | | | * | | | | | | | |
| 11 | Honein, Rasmussen (36) | | | * | * | | | * | | | | | * | | | | | | | | | | | | | | * | | | | | |
| 12 | Gergen, Fowler (37) | | * | | | * | | | * | * | | * | * | * | | | * | | | | | | | | | | | | | | | |
| 13 | Vardavas, Hohmann (38) | | | * | | * | | | * | | | | * | * | * | | * | | | | | | | | | | | | | | | |
| 14 | Ward, Lewis (39) | * | * | | | | | | * | | | * | | | | | * | * | | * | | | | * | * | | | | | | | |
| 15 | Cheraghi and Salvi (40) | | | | * | | | * | | | | | * | | | * | | | | | | | | | | | | | | | | |
| 16 | Kabesch, Hoefler (41) | | | | * | | * | | * | | | | * | | | * | | | | | | | | | | | | | | | | |
| 17 | Anderson and Cook (42) | | | | | * | | * | | | | * | * | * | | * | * | | * | | | | | | | | | | | | | |

Table 3. Continued

| | | Subjects | | | | | Research Methods | | Statistical community | | | | Results | | | | | | | | | | | | | | | | | |
|----|-------------------------------|-------------------|---|-----------------------|-----------------|--------------|------------------|--------|-----------------------|----------------|---------------|---------|----------------|----------|------|--------------|--------------|---------------------|-------------------|----------------------|-------------------|--------------------------------|----------------------|---------------------|-----------|---------------|----------------|--------------------|---------|---------------|
| | | Second hand smoke | The effects of Prenatal exposure to CHS | Environmental tobacco | Passive smoking | Fetal Health | Children' health | Survey | meta-analysis | The experiment | Questionnaire | Parents | Pregnant women | Children | Baby | Fetal growth | Birth weight | Sudden infant death | Premature infants | Congenital anomalies | Brain development | Respiratory disease and asthma | Middle ear infection | Behavioral problems | Cleft lip | Hyperactivity | Type of cancer | Type of infections | Allergy | Heart disease |
| 19 | Windham, Eaton (24) | * | * | | | | | * | | | | * | | | | * | | | | | | | | | | | | | | |
| 20 | Klonoff Cohen, Edelstein (43) | * | | | * | | | * | * | | | * | | | | | | | | | | | | | | | | | | |
| 21 | Bloch, Althabe (44) | * | * | | | | * | | | | | | * | | | * | | | | | | | | | | | | | | |
| 22 | Husgafvel-Pursiainen (45) | * | | | | | | * | | | | * | | | | * | | | | | | | | | | | | | | |
| 23 | Tsai, Huang (46) | | | * | | | | * | | | | * | * | | | * | | | | | | | | | | | | | | |
| 24 | Hull, North (47) | | * | | * | * | | * | | | | | | | | * | * | | * | | | | | | | | | | | |
| 25 | Chen, Li (48) | * | | | | | * | * | | | | * | * | | | * | | | | | * | | | | | | | | | |
| 26 | Rauh, Wyatt (49) | | * | | * | | * | * | | | | * | * | | | * | | | | | | | | | | | | | | |
| 27 | Vanker, Gie (50) | | | | * | | * | * | | | | * | * | | | * | | | | | | | | | | | | | | |
| 28 | Collaco, Vanscoy (51) | * | | | | | | * | | | | * | | | | * | | | | | | | | | | | | | | |
| 29 | Steyn, De Wet (52) | * | | * | | | | * | | | | * | | | | | | | | | | | | | * | | | | | |
| 30 | Boffetta, Trédaniel (53) | * | * | | | | | * | | | | * | * | | | | | | | | | | | | | | * | | | |
| 31 | Kum-Nji, Meloy (54) | | | | * | | | * | | | | | * | | | | | | | | | | | | | | * | | | |
| 32 | Lannerö, Wickman (55) | | | | * | | * | | * | * | | * | * | * | | | | | * | | | | | | | | | | | |
| 33 | Qiu, He (34) | | | | | * | | * | | | | * | | | | | | | | * | * | * | | | | | | | | |
| 34 | Eskenazi and Castorina (25) | | | | * | * | | * | | | | * | * | | | * | * | * | | | | | | | | | | | | |
| 35 | Kharrazi, DeLorenze (56) | | * | * | | | | * | * | | | * | | | | * | * | * | * | | * | * | | | | | | | | |
| 36 | Zhou, Rosenthal (57) | * | * | | | | | * | | | | * | * | | | | | | | | | | | | | | | | | * |
| 37 | Dixit, Pletcher (58) | * | | | | * | | * | * | | | * | * | | | | | | | | | | | * | | | | | | |
| 38 | Sabbagh, Hassan (59) | * | * | | | | | * | | | | | | * | | * | | | | | | | | | | | | | | |
| 39 | George, Granath (60) | | | | * | | | * | | | | * | | | | | * | * | | | | | | | | | | | | |
| 40 | Fantuzzi, Aggazzotti (61) | | * | | * | | | * | | | | * | * | | | | * | | | | | | | | | | | | | |

Table 3. Continued

| | Subjects | Research Methods | Statistical community | Results |
|----|--|--|---|--|
| | Second hand smoke The effects of Prenatal Prenatal exposure to SHS Environmental tobacco Passive smoking Fetal Health Children' health | Survey meta-analysis The experiment Questionnaire | Parents Pregnant women Children Baby | Fetal growth Birth weight Sudden infant death Premature infants Congenital anomalies Brain development Respiratory disease and asthma Middle ear infection Behavioral problems Cleft lip Hyperactivity Type of cancer Type of infections Allergy Heart disease |
| 41 | Hyland, Piazza (62) | * | * | * |
| 42 | Rosa, Jung (63) | * | * | * |
| 43 | Pagani (64) | * | * | * |
| 44 | Lee, Ha (65) | * | * | * |
| 45 | Yi, Kwon (66) | * | * | * |
| 46 | Lam, Leung (67) | * | * | * |
| 47 | Dejmek, Solansky (68) | * | * | * |
| 48 | Simons, To (69) | * | * | * |
| 49 | Murray, Britton (70) | * | * | * |
| 50 | Oh, Tcheurekdjian (71) | * | * | * |
| 51 | Jaakkola, Jaakkola (72) | * | * | * |
| 52 | Han, Kwon (73) | * | * | * |

According to superior research and reliable methods of their conclusion, it has been proven that SHS has a destructive effect on the fetus. That's why it is important to probe the usage of practical solutions to decrease the influence of SHS.

Conclusion

This bibliometric analysis provides a comprehensive overview of the research landscape on secondhand smoking and fetal health. The study highlights the importance of understanding the harmful effects of secondhand smoke on the developing fetus and emphasizes the need for interventions to protect pregnant women and their unborn children. The findings also shed light on key research trends, influential authors, and active research areas, which can guide future studies and support evidence-based decision-making in the field of maternal and child health. SHS refers to smoke from the respiration of cigarettes in the environment, which is harmful to non-smokers. As seen in the study, the issue of SHS has been considered since 1973. The importance of this issue in the field of health has led to the formation of many studies on SHS and its effects in different studies with different methods. One of the groups on which the effects of SHS have been measured is the fetus. The research done in this field is considerable. The bibliometric study is needed for things such as the number of publications to discover the most prominent keywords and the process of their change over time; the countries where the most research is done and the articles that are published in this field; the results obtained from these researches and the methods used to reach an appropriate classification. This study is quantitative and qualitative. For this purpose, in the quantitative part, using the bibliometric method, 644 articles that were present in the Scopus database between 1973-2020 on the subject of the effects of SHS on the fetus were considered. The 52 articles were selected that had the most citations. In this study, we reviewed studies on second-hand tobacco and fetal smoke to classify topics, results, recurring keywords, producing countries, and methods used in top articles.

The trend of using keywords has been investigated through the simultaneous analysis of superior keywords in research on the effects of second-hand tobacco smoke on the fetus. The subject of research on second-hand tobacco smoke and its effects on the fetus was searched with the keywords "exposure and smoking". In the study, by examining the trend of articles related to SHS and fetuses, we reached a classification in the field of study methods, statistical population, topics and results. The first place in the publication of articles on the topic of secondhand smoke is for an American journal, and the next place is for a Chinese journal. The results obtained from the study of articles with superior citation rates show topics about fetal early health have been further explored such as birth weight and proper fetal growth. In fact, especially in the early years of research in this area has been related to the effects of tobacco smoke on the physical health of the fetus and other issues have been considered over time. The methods that have been most considered by researchers were meta-analysis

and laboratory studies. The results show rapid growth of secondhand smoke emissions which is a result of the importance of the issue. Classification of studies helps with health planning and can be a good guide for future research.

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Conflict of Interests

The authors declare that they have no competing interests.

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