European Journal of
Human Health

ORIGINAL ARTICLE

ANALYSIS OF PUBLISHED THESES ON ECTOPIC PREGNANCY WITH SOCIAL NETWORK ANALYSIS

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ABSTRACT

Aim: In this study, it is aimed to use social network analysis to identify key concepts and topics related to ectopic pregnancy, which were published in a thesis between 1973 and 2022.

Methods:As part of this research, social network analysis was conducted using keywords extracted from theses related to ectopic pregnancy. The theses used in this study were sourced from the National Thesis Center website (https://tez.yok.gov.tr/UlusalTezMerkezi/). Specifically, the theses containing the phrase "ectopic pregnancy" in their title within the department of obstetrics and gynecology were selected, and their associated keywords were included in the analysis.

Results:It has been determined that the keyword with the highest degree and betweenness centrality is "ectopic pregnancy". The keywords "ectopic pregnancy", "methotrexate", "human chorionic gonadotrophin " and "medical treatment" have the highest degree and betweenness centrality.

Conclusion: As we expected, the topics "Ectopic pregnancy", "Methotrexate," and "Human chorionic gonadotropin (β-hCG)" are closely related. We believe that future theses and research should focus on this relationship to provide early medical treatment options.

Keywords: Gynecology, ectopic pregnancy, social network analysis, degree centrality, betweenness centrality

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Received: ***July 13, 2023;*** *Accepted:* ***August 1, 2023;*** *Published Online:* ***September 01, 2023***

Cite this article as: Ortac, H., Rahimli Ocakoglu, S., Inan, K. & Ocakoglu, G.(2023). Analysis of Published Theses on Ectopic Pregnancy with Social Network Analysis. European Journal of Human Health 3(3),80-88.

INTRODUCTION

Ectopic pregnancy (EP) is a potentially life-threatening condition that occurs when a fertilized egg implants outside the uterus, most commonly in the fallopian tube. This abnormal implantation can lead to tubal rupture, resulting in internal bleeding and potentially fatal consequences. Ectopic pregnancy is a well-studied topic in gynecology practice, with numerous research studies investigating the etiology, diagnosis, and treatment options of EP. Some key studies in this area include the work of Barnhart and colleagues[1], who in detail evaluate EP medical treatment regimens, and the research of Jurkovic and colleagues[2], which updated the latest information related to EP.

The clinical presentation of ectopic pregnancy varies, but typical symptoms include low abdominal pain and abnormalities in the vaginal bleeding patterns, including amenorrhea.Diagnosing ectopic pregnancy involves a combination of clinical examination, laboratory tests, and radiological assessment. İn some cases, there may be no symptoms of EP,making an obstacle in early detection and diagnosis crucial for successfully managingthis condition. Treatment options depend on the patient's clinical condition and may include medical management with methotrexate (MTX) or surgical intervention with salpingectomy or salpingostomy.

Social network analysis is a research methodology that analyzes relationships between individuals or groups in a network. In recent years, social network analysis has been increasingly used in healthcare research to study the diffusion of information, the spread of diseases, and the identification of key opinion leaders. Examples of social network analysis in healthcare research include the study of healthcare provider networks, patient-centered networks, and disease-specific networks. For instance, a study conducted by Wong et al.[3] used social network analysis to explore the collaboration patterns between obstetricians and midwives in a regional healthcare system in Australia. Another study by Zhang et al.[4] used social network analysis to identify the most influential actors in disseminating COVID-19 information on Twitter.

In the present study, we aim to use social network analysis to identify key concepts and topics related to ectopic pregnancy, which were published in a thesis between 1973 and 2022.By doing so, we hope to provide guidance for future research in this area and contribute to developing effective strategies for preventing and managing this condition.

METHODS

In this study, social network analysis was conducted based on the keywords obtained from the theses prepared in the field of ectopic pregnancy, evaluated by the bibliometric method. Theses used in the study were obtained by providing their access via https://tez.yok.gov.tr/UlusalTezMerkezi/. A

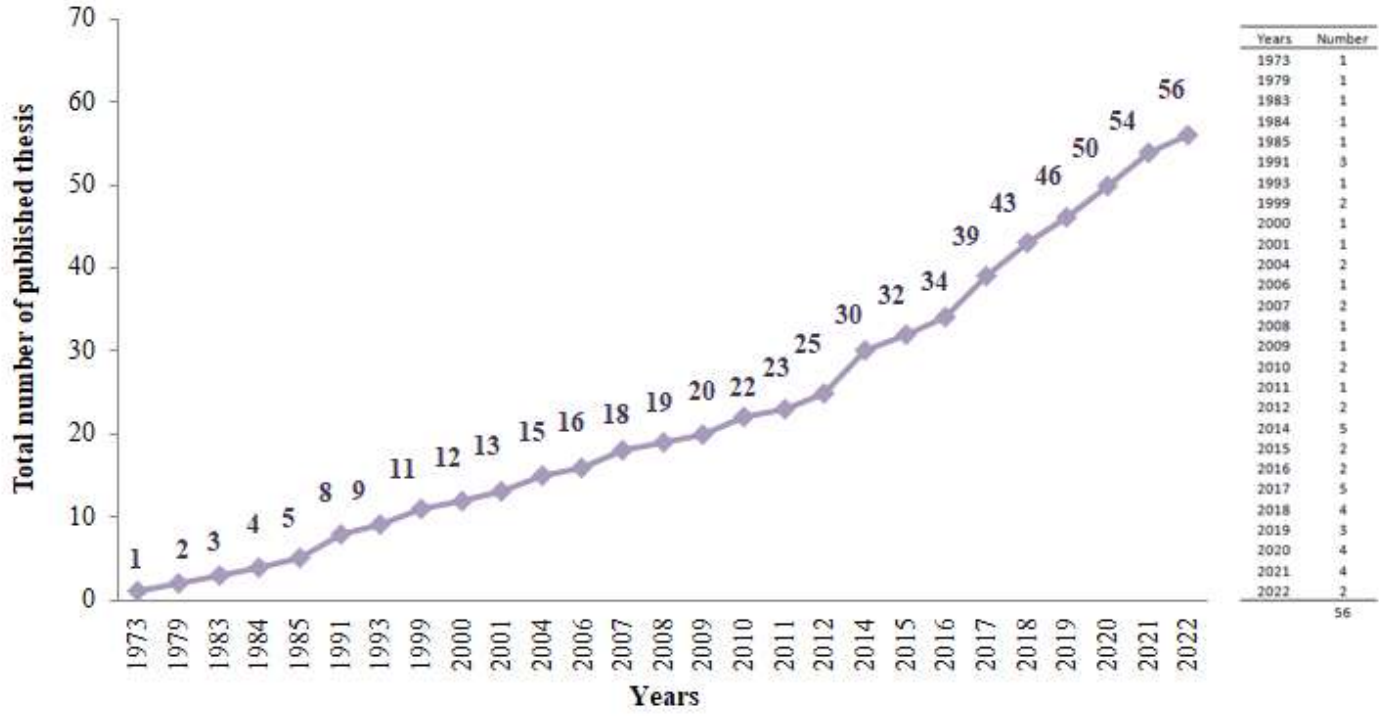
review of the theses published in the field of "Ectopic Pregnancy" (EP) in the Department of Obstetrics and Gynecologywas conducted, and the keywords obtained from these theses were included in the study for analysis.Out of a total of 56 theses identified, keywords could only be obtained from 36 theses, which were included in the analysis.Within the scope of the study, a total of 57 keywords were identified from the 36 theses included in the analysis.

Bibliometric analysis is a precise and widely used method for examining and analyzing large amounts of scientific data, which facilitates the exploration of a particular field's thematic and evolutionary history in greater detail.[5] Social networks and the use of SNA provide a means for researchers to understand the complexities of relationships better and to determine what types of interventions are necessary. Consequently, SNA has increasingly become a popular method across various research fields.[6,7,8] Furthermore, this technique involves analyzing the structure of a given research area, identifying the underlying network structure, and visualizing and modeling relationships between different communities within the field.[9]Within this study's framework, the analysis units were constructed using keywords extracted from theses related to ectopic pregnancy in the Gynecology department. Employing SNA, the investigation examined the relationships between the identified keywords and generated a network map to visualize their connections.

The centrality criteria can clarify the identification of important actors in the social network. Centrality measures are categorized into degree and betweenness centrality. Degree centrality can be represented in two different forms, either the number of links associated with a node or the number of degrees of relations linked to that node.[10,11]Betweenness centrality is another measure used in social network analysis that reflects how quickly a node can reach all other nodes in the network. It measures the shortest path between nodes and the degree of separation from other nodes. This measure is often used to identify influential actors in a network and can be useful in understanding how information flows through a network.[12]In this study, SNA was used to examine the keywords from 36 available theses on ectopic pregnancy, and an attempt was made to visualize the network map created by the keywords.The UCINET[13] software program was utilized for the analyses in this study.A data matrix of 57x57 was generated by using the UCINET software based on the 57 keywords extracted from the theses. In order to avoid repetition, some keywords with identical meanings were merged into a single keyword.

RESULTS

The cumulative distribution of theses published on "Ectopic Pregnancy"(EP) in the department of gynecology between 1973 and 2022 is given in Figure 1. When Figure 1 is examined, it is understood that the date when theses on ectopic pregnancy started to be written was 1973. The keywords of only 36 theses out of 56 theses were accessed. Using SAA, it is aimed to reveal the network structure of the keywords obtained from 36 theses. SAA was performed after the 57x57 square matrix of 57 keywords obtained from 36 theses within the scope of this study.



Years	Number
1973	1
1979	1
1983	1
1984	1
1985	1
1991	3
1993	1
1999	2
2000	1
2001	1
2004	2
2006	1
2007	2
2008	1
2009	1
2010	2
2011	1
2012	2
2014	5
2015	2
2016	2
2017	5
2018	4
2019	3
2020	4
2021	4
2022	2
	56

Figure 1. Distribution of accessed theses between 1973 and 2022

Table-1 includes the degree and betweenness centrality findings for keywords. In order not to make the table-1 too long, words with less than six degrees of centrality are not considered.

Table 1. Important keywords with degree and betweenness centrality value in the field of ectopic pregnancy

Degree centrality		Betweenness centrality	
Keyword	Value	Keyword	Value
Ectopic pregnancy	50	Ectopic pregnancy	2,064.659
Methotrexate	23	Methotrexate	192.104
Human chorionic gonadotrophin (β-hCG)	12	Human chorionic gonadotrophin (β-hCG)	42.058
Medical treatment	10	Medical treatment	22.498
Surgical treatment	9	Surgical treatment	12.902
Salpingectomy	7	Single-dose protocol	10.058
Single-dose protocol	6	Tubal patency	8.142
Anti Müllerian Hormon	6	Laparoscopic salpingostomy	8.142
Tubal ectopic pregnancy	6	Fertility	5.831
Fertility	6	Tubal ectopic pregnancy	4.167
Laparoscopy	6	Salpingectomy	2.833

Table-1 shows that the keyword with the highest centrality and betweenness centrality is "ectopic pregnancy". The keywords "ectopic pregnancy", "methotrexate", "human chorionic gonadotrophin (β-hCG)" and "medical treatment" have the highest degree of centrality. These keywords have the most links and are the most discussed words in the theses. There is a high degree of betweenness between the keywords "ectopic pregnancy", "methotrexate", "human chorionic gonadotrophin (β-hCG)" and "medical treatment". These keywords act as a bridge, linking unrelated concepts. The network map of keywords obtained from theses on ectopic pregnancy is shown in figure-2.

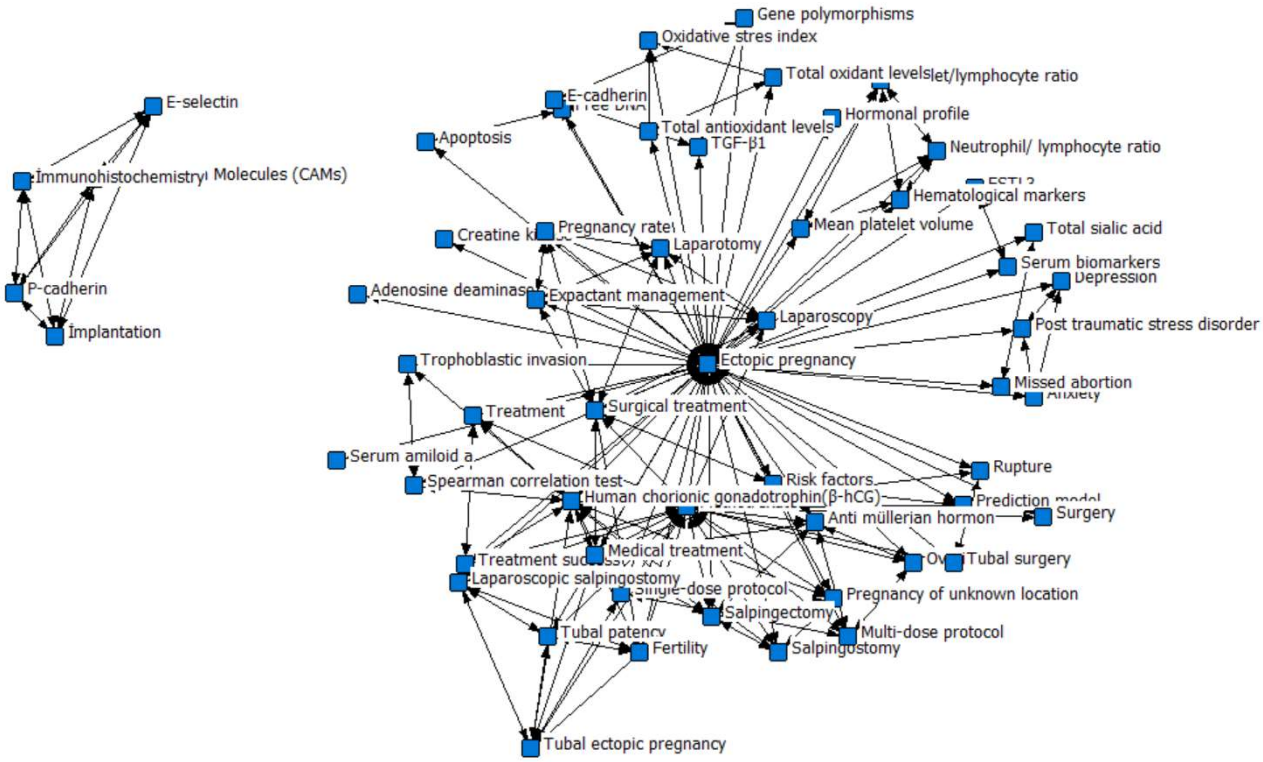


Figure 2: Network map of keywords obtained from theses included in the study

DISCUSSION

Ectopic pregnancy, one of the most life-threatening pathologiesin gynecology practice, has been increasing in recent years.EPis defined as a pregnancy that occurs outside of the uterine cavity.[14]Most ectopic pregnancies occur in the fallopian tube, but other possible sites include interstitial, cervical, intramural, ovarian, or abdominal.[15]

As a result of the findings obtained through social network analysis, it was determined that the concept with the highest centrality was ectopic pregnancy. As is known, EP is an essential issue in gynecological practice, as it is the most common cause of pregnancy-related death in the first trimester of pregnancy in developed countries.[15]Ectopic pregnancy should be considered in any patient presenting early in pregnancy withan abnormal vaginal bleeding pattern or lower abdominal pain in whom intrauterine pregnancy has not yet been established. EP can be diagnosed by transvaginal ultrasound (TVUS) in the absence of a gestational sac in the uterine cavity and by visualization of a yolk sac and/or embryo in the adnexa.Patient symptoms (lower abdominal pain, symptoms of hypovolemia, abnormal vaginal bleeding, and amenorrhea)combined with serial ultrasonography and trends in beta human chorionic gonadotropin levels are used to make the diagnosis. The first-line therapy for a diagnosed ectopic pregnancy is

medical treatment with intramuscular injection of methotrexate(MTX)[16], however, in case of treatment failure, surgical treatment (salpingostomy or salpingectomy) is performed.[17,18]

This study aims to create a network map of keywords in theses published on ectopic pregnancy.According to our study after the keyword "ectopic pregnancy", "methotrexate," and "human chorionic gonadotrophin (β-hCG)" have a high degree of centrality. "Methotrexate (MTX)" and "human chorionic gonadotrophin (β-hCG)" are often examined together with the concept of ectopic pregnancy.

Advances in medical technology, which gives us medical options for treating ectopic pregnancy, are now widespread. The most widely used medical treatment method worldwide is methotrexate.[19]The majority of patients with early diagnosis can be treated with MTX. While surgical approaches are the gold-standard treatment, because of advances in early diagnosis, many patients are candidates for medical therapy with methotrexate MTX, and the overall success rate of medical treatment in properly selected patients is high.[20]Quantitative β-hCG measurements in a pregnancy test are of great importance in diagnosing ectopic pregnancy.β-hCG values are related to the week of pregnancy and are used to diagnose.[21]Medical treatment with MTX for ectopic pregnancy has comparable efficacy to surgery and results in similar fertility outcomes. Surgical intervention should be performed in hemodynamically unstable patients, or only when TVUS examination shows a clear tubal ectopic pregnancy or an adnexal mass suggestive of ectopic pregnancy. If no mass is visualized sonographically, there is a high probability that a tubal pregnancy will not be visualized or palpated at surgery, thus resulting in unnecessary surgery.Previously, researchers have investigated many biomarkers to determine the resolution time of conservatively treated ectopic pregnancy and to predict cases that may progress to surgical intervention. No other biomarker gained as predictive value as β-hCG. Tawfiq et al. have shown that MTX is suitable for treatment when baseline β-hCG is > 4000 IU/L.[22] In their study, Ocakoğlu and Develioğlu found that the most effective predictor for acute abdomen was β-hCG values ≥6486 mIU/ml and above and adnexal mass ≥17.5 mm and above.[23]They showed that cases with these findings mighthave a negative response to conservative treatment and may be referred to surgery.

Among the concepts examined in the study, the highest betweenness centrality was associated with ectopic pregnancy. Ectopic pregnancy serves as a bridge between concepts that do not have any relationship between them. After the keyword "ectopic pregnancy", there is a high centrality between the concepts of "methotrexate" and "human chorionic gonadotrophin (β-hCG)" as in the degree centrality.

CONCLUSION

As we expected, the topics "Ectopic pregnancy", "Methotrexate," and "Human chorionic gonadotropin (β-hCG)" are closely related. We believe that future theses and research should focus on this relationship to provide early medical treatment options.

Conflict of Interest: The authors declare that there is no conflict of interest.

Financial Disclosure: No financial support was provided for the study.

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