ODÜ TIP DERGİSİ

ODU MEDICAL JOURNAL

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ODU MEDİCAL JOURNAL

(ODU MED J)

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Methods

Results

Discussion

Conclusion

Acknowledgement

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b) Case Report: These are articles that differ in diagnosis and treatment, which are rarely seen. They should be supported by adequate photographs and diagrams.

Structure

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Keywords

Introduction

Case report

Discussion

Conclusion

Acknowledgement

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Title

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Keywords

Introduction

The review also includes subtitles suitable for the text.

Conclusion

Acknowledgement

References (up to 50)

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CONTENTS

EDITORIAL

As 2022 Ends

In these days when we leave another year behind, we are extremely happy to present the last issue of our magazine for 2022 to our valued readers with its rich content written with different perspectives, interesting topics, and current approaches.

With each passing year, while enriching our experiences with what they provide, it once again reveals that there are still many mysteries that have not been discovered scientifically. With a new year, we can sail to new horizons in our journey in the sea of science, giving us the chance to shed light on the undiscovered secrets of science.

I would like to express my sincere gratitude to all our authors who have shared their scientific and academic studies with us for publication in our journal so far and who will share them in the future, and to our valuable referees who have contributed to increasing our publication quality with their evaluations, and to all my colleagues for their efforts with devotion until our journal reaches the publication stage.

I hope that 2023 that will leave a mark on the scientific track, and bring goodness and well-being to the whole world.

Happy new year to everyone, hope to meet you in brand new issues and wish you a good read......

PhD, Assoc. Prof. Ülkü KARAMAN
Editor

ARAŞTIMA MAKALES/ RESEARCH ARTICLE

Application with Multilayer Perceptron and Radial Basis Function from Neural Network-Based Methods to Predict Cervical Cancer

İpek Balıkçı Çiçek[1](ID), Zeynep Küçükakçalı[1](ID)

[1]Department of Biostatistics and Medical Informatics, Faculty of Medicine, Inonu University, Malatya, Turkey.

Abstract

Objective: Cervical cancer is the fourth most prevalent malignancy among women worldwide. Low- and middle-income countries are much more burdened than high-income nations. Therefore, the need to develop new diagnostic techniques to predict the course of the disease and the prognosis of this malignancy has increased. In this study, cervical cancer will be classified to create an accurate diagnostic predictive model using the machine learning method The Multilayer Perceptron (MLPNN) and Radial Based ANN (RBFNN), and disease-related risk factors will be determined.

Methods: This current study considered the open-access data set of patients that cervical cancer and no-cervical cancer samples. For this purpose, data from 72 patients were included. The data set was divided as 80:20 as a training and test dataset. MLPNN and RBFNN were used for the classification Accuracy, specificity, AUC, positive predictive value, and negative predictive value performance metrics were evaluated for model performance.

Results: Among the performance criteria in the test stage obtained from the RBFNN model that has the best classification result; accuracy, specificity, AUC, positive predictive value, and negative predictive value were obtained as 92.3%, 100.0%, 96.5%, 100.0%, and 91.6%, respectively. According to the variable importance obtained as a result of the model, the variables most associated with the diagnosis were behavior sexual risk, empowerment abilities, and motivation strength, respectively.

Conclusion: The applied machine learning model successfully classified cervical cancer and created a highly accurate diagnostic prediction model. With the parameters determined as a result of the modeling, the clinician will be able to simplify and facilitate the decision-making process for the diagnosis of cervical cancer.

Key Words: Cervical cancer, classification, machine learning, Multilayer Perceptron, Radial Based ANN.

Sinir Ağı Tabanlı Yöntemlerden Çok Katmanlı Algılayıcı ve Radyal Bazlı Sinir Ağı ile Rahim Ağzı Kanserini Tahmin Etmek için Uygulam

Özet

Amaç: Rahim ağzı kanseri dünya çapında kadınlar arasında en sık görülen dördüncü malignitedir. Düşük ve orta gelirli ülkeler, yüksek gelirli ülkelerden çok daha fazla yük altındadır. Bu nedenle, hastalığın seyrini ve bu malignitenin prognozunu tahmin etmek için yeni teşhis tekniklerinin geliştirilmesi ihtiyacı artmıştır. Bu çalışmada Çok Katmanlı Algılayıcı (MLPNN) ve Radyal Tabanlı Yapay Sinir Ağları (RBFNN) makine öğrenimi yöntemleri kullanılarak rahim ağzı kanserini sınıflandıran bir tahmin modeli oluşturmak ve hastalıkla ilişkili risk faktörleri belirlemektir.

Metod: Bu çalışmada, rahim ağzı kanseri olan ve rahim ağzı kanseri olmayan hastaları içeren açık erişim veri seti dikkate alınmıştır. Bu veri setinde toplam 72 hasta bulunmaktadır. Veri seti eğitim ve test veri seti olarak 80:20 olarak bölünmüştür. Sınıflandırma için MLPNN ve RBFNN kullanılmıştır. Modelin performansı doğruluk, seçicilik, AUC, pozitif tahmin değeri ve negatif tahmin değeri performans metrikleri ile değerlendirildi.

Bulgular: En iyi sınıflandırma sonucuna sahip olan RBFNN modelinden elde edilen test aşamasındaki performans kriterlerinden; doğruluk, seçicilik, AUC, pozitif tahmin değeri ve negatif tahmin değeri sırasıyla %92.3, %100.0, %96.5, %100.0 ve %91.6 olarak elde edilmiştir. Model sonucunda elde edilen değişken önemliliklerine göre tanı ile en çok ilişkili değişkenler sırasıyla riskli cinsel davranış, güçlendirme yetenekleri ve motivasyon gücüdür.

Sonuç: Uygulanan makine öğrenimi modeli, rahim ağzı kanserini başarılı bir şekilde sınıflandırmıştır ve yüksek doğrulukta bir tanısal tahmin modeli oluşturulmuştur. Modelleme sonucunda belirlenen değişkenler ile klinisyenlerin rahim ağzı kanseri tanısına karar verme süreci basitleştirebilecek ve kolaylaştırabilecektir.

Anahtar Kelimeler: Rahim ağzı kanseri, sınıflandırma, makine öğrenimi, Çok Katmanlı Algılayıcı, Radyal Tabanlı Yapay Sinir Ağları.

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INTRODUCTION

Cervical cancer is one of the most common cancers in women. It is the third rank in the world, and it is reported that approximately 569 thousand women are diagnosed with cervical cancer every year and 311,000 women die due to cervical cancer (1). Human papilloma virus (HPV) is considered to be the primary cause of cervical cancer worldwide. Cervical cancer is one of the preventable types of cancer, and comprehensive planning based on vaccination against HPV and regular HPV-based screening has been shown to be cost-effective in almost all countries. However, due to the difficulty of accessing the vaccine in underdeveloped countries and the inadequacy of cervical cancer screening, the measures are not to the desired extent (2).

The way to reduce the number of deaths from cervical cancer is early detection. Especially in countries where screening programs are not available, early detection of this type of cancer and initiation of effective treatment significantly increases the probability of survival. Under current circumstances, this disease is often not diagnosed until it has progressed, or treatment is available. This causes a high mortality rate in cervical cancer. By understanding and detecting the symptoms of cervical cancer, patients can be diagnosed early (3).

Researchers working in the field of machine learning (ML) are always seeking to produce improved prediction models that are able to understand the most recent data in the sector of cervical cancer. It has been shown that predictive models that are developed via the use of machine learning techniques may be of assistance in the process of cervical cancer detection (4). The Artificial Neural Network (ANN) is one of the machine learning techniques that is used the most (5).

ANN, one of the artificial intelligence methods, is a computational tool based on the properties of biological nervous systems. ANN is a data processing technique developed to solve very complex problems with the help of computers, consisting of a large number of processing elements connected to each other through weighted links, each of which has its own memory (6). It is a method of processing data on a computer that imitates the way biological neurons carry out

their functions and evaluates the connection that exists between a system's inputs and its outputs. The neuron, also known as a node, is the main component of an ANN and the primary building block of the information processing system (7). This machine learning approach has several levels, including inputs, outputs, and hidden layers. The input layer is a layer that doesn't do any computing but gets information from the outside world. The number of input and output variables is equal to the number of nodes in the input and output layers. ANN have been shown to be useful for a number of tasks, such as predicting, modeling, and classifying (8).

The Multilayer Perceptron ANN (MLPNN) is an ANN model for dealing with problems that don't follow a straight line. It is a feed-forward backpropagation network with at least one layer and at least three levels between the input and output layers (9). During the forward propagation stage, while the network's performance and error value are being computed, the relation weight values across the layers are modified to reduce the error value seen during reverse propagation (10).

Radial Based ANN (RBFNN) networks are composed of three layers: an input layer, an output layer, and a hidden layer. It is an ANN model based on neuron cells in the human nervous system. The RBFNN example's training performance becomes an interpolation issue by locating the closest result to the data in the output vector space. RBFNN structures, like ANN structures, normally comprise of an input layer, a hidden layer, and an output layer. However, unlike other ANNs, when the data is sent from the input layer to the hidden layer, it is subjected to radial-based activation functions and a non-linear cluster analysis. The structure between the hidden layer and the output layer functions similarly to other ANN types, and the real training occurs in this layer (11).

The goal of this work was to classify cervical cancer using the open-access "Cervical Cancer Behavior Risk Data Set," to compare the predictions of MLPNN and RBFNN, and to find the risk factors for cervical cancer using these techniques.

METHODS

Dataset

The open access "Cervical Cancer Behavior Risk Data Set" data set to be used in the study can be accessed at https://archive.ics.uci.edu/ml/datasets/Cervical+Cancer+Behavior+Risk#. There are 72 patients in the data set used. Twenty-one of these patients were cervical cancer and 51 of them were non-cervical cancer patients.

Artificial Neural Network Models

Because of their efficiency, adaptability, and usability, artificial neural networks are the chosen solution for many predictive data mining applications. Predictive neural networks are very beneficial in applications with complicated mechanismsIn the past few years, people have

become more interested in using neural networks to solve problems that can't be solved with traditional methods. ANN has been used successfully in many medical applications. Unlike traditional spectrum analysis methods, artificial neural networks not only model signals but also create signal categorization solutions. Another benefit of artificial neural networks over traditional approaches for interpreting biological data is their speed once trained. As seen in Figure 1 shows that each layer is made up of a number of nodes.
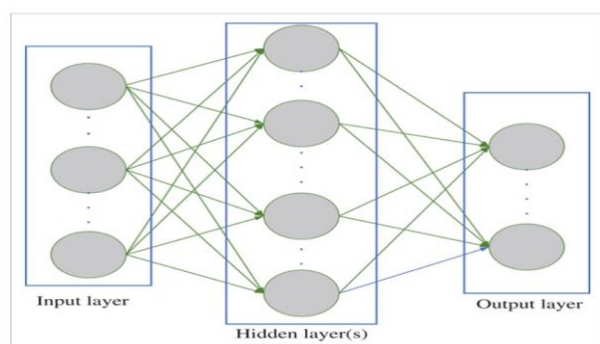
Figure 1. ANN model's structure

MLPNN is a model that that shows how an input vector maps to an output vector in a way that is not linear. It consists of a network of fundamental, interconnected neurons or nodes. Nodes are connected by weights and output signals, and the sum of each node's inputs is replaced by a simple nonlinear transfer or activation function (12).

RBFNN was created in 1908, and it became part of the history of ANN when it was used to solve the problem of filtering. The impact response

characteristics seen in biological nerve cells inspired it. RBFNN model training may be conceived of as a multi-dimensional curve-fitting technique. RBFNN models, like normal ANN architecture, are separated into three layers: input, secret layer, and output layer. Unlike traditional ANN architectures, The progression from the input layer to the hidden layer in RBFNNs is accomplished through the application of radial-based activation functions and nonlinear cluster analysis. The structure of the hidden layer and output layer is the same as in previous ANN types (13).

Statistical analysis

In order to establish whether or not the data followed a normal distribution, the Shapiro-Wilk test was carried out. Quantitative data that did not fit the normal distribution were presented as the median (minimum-maximum). The Mann-Whitney U test was performed to determine whether there was a statistically significant difference in terms of independent variables between the cervical cancer (Target variable) categories "no cervical cancer" and "have cervical cancer". $p<0.05$ was considered statistically significant. IBM SPSS Statistics 26.0 package application was used for all analyzes.

RESULTS

Table 1 contains descriptive information for the independent variables investigated in this research. In terms of, behavior sexual risk, intention commitment, behavior personal hygine, intention

aggregationperception vulnerability, norm fulfillment, perception severity, motivation willingness, , norm significant person, social support appreciation, social support emotionality, empowerment abilities, empowerment knowledge, motivation strength, empowerment desires variables, there is a statistically significant difference (p<0.05).

Table 2 shows the values of the performance metrics obtained from the models built to predict cervical cancer in the test stage.

The accuracy, specificity, AUC, positive predictive value and negative predictive values obtained from the MLP method for the modeling test data set are 88.9%, 100.0%, 100.0%, 100.0%, and 81.8% respectively.
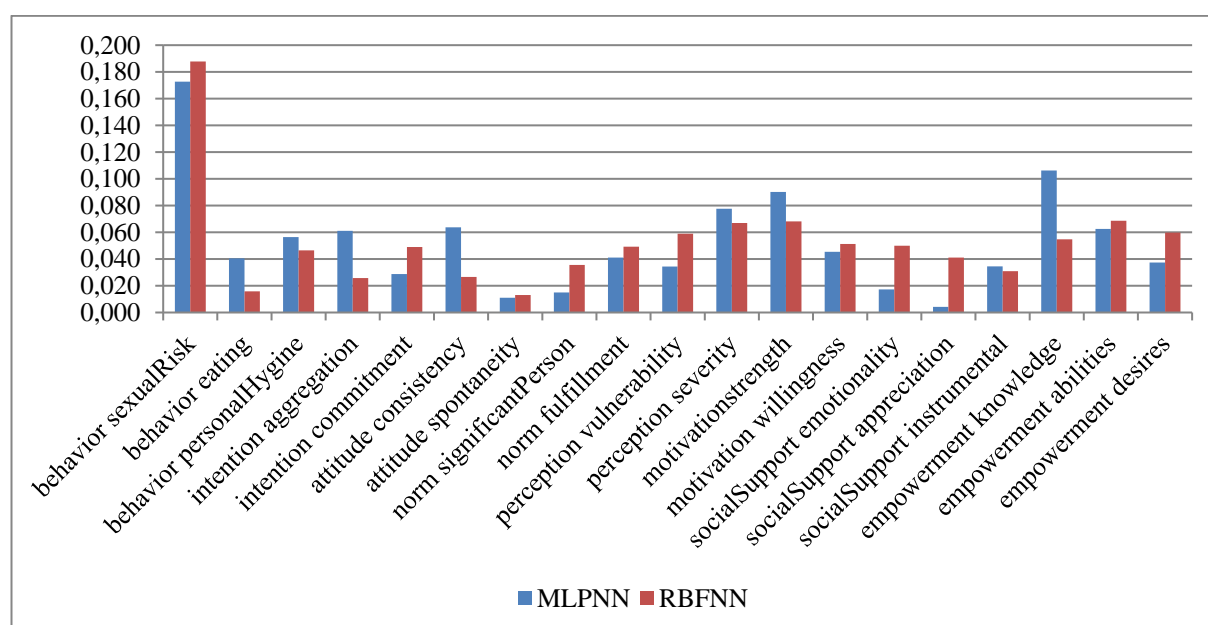
Figure 2. The importance values for possible risk factors

The accuracy, specificity, AUC, positive predictive value and negative predictive value values obtained from the RBF method are 92.3%, 100.0%, 96.5%, 100%, and 91.6% respectively.

In this research, the importance values of the factors associated with cervical cancer are shown in Table 3 while the values for these percentages of importance are represented in Figure 2.

Table 2. In the testing stage, performance metric values are calculated from constructed models.

Model / Performance Metrics	MLPNN Value	RBFNN Value
Accuracy (%)	88.9	92.3
Specificity (%)	100.0	100.0
AUC	1	0.965
Positive predictive value (%)	100.0	100.0
Negative predictive value (%)	81.8	91.6

AUC: Area under the ROC curve

Table 1. Descriptive statistics for quantitative independent variables

Variables	Ca cervix		p value*
	No cervical cancer	Has cervical cancer	
	Median	Median	
Behavior Sexualrisk	10 (6-10)	10 (2-10)	**0.003**
Behavior Eating	13 (3-15)	15 (11-15)	0.106
Behavior Personalhygine	11 (5-15)	9 (3-15)	**0.004**
Intention Aggregation	10 (2-10)	6 (2-10)	**0.004**
Intention Commitment	15(7-15)	14 (6-15)	**0.019**
Attitude Consistency	7 (2-10)	8 (5-10)	0.220
Attitude Spontaneity	8 (4-10)	9 (6-10)	0.673
Norm Significantperson	5 (1-5)	1 (1-5)	**0.014**
Norm Fulfillment	11 (3-15)	5 (3-12)	**0.001**
Perception Vulnerability	10 (3-15)	5 (3-10)	**0.001**
Perception Severity	8 (2-10)	2 (2-7)	**<0.001**
Motivation Strength	15 (9-15)	11 (3-15)	**0.006**
Motivation Willingness	11 (3-15)	5 (3-15)	**0.002**
Socialsupport Emotionality	10 (3-15)	3 (3-13)	**0.001**
Socialsupport Appreciation	7 (2-10)	4 (2-10)	**0.008**
Socialsupport İnstrumental	12(3-15)	9 (4-15)	0.270
Empowerment Knowledge	13 (3-15)	7 (3-13)	**<0.001**
Empowerment Abilities	11 (3-15)	5 (3-15)	**<0.001**
Empowerment Desires	13 (3-15)	6 (3-15)	**<0.001**

*: Mann Whitney U test

Table 3. According to MLPNN and RBFNN models, importance values of explanatory factors

Variables	MLPNN	RBFNN
Behavior Sexualrisk	0.173	0.188
Behavior Personalhygine	0.056	0.046
Intention Commitment	0.029	0.049
Behavior Eating	0.041	0.016
Attitude Spontaneity	0.011	0.013
Intention Aggregation	0.061	0.026
Attitude Consistency	0.064	0.027
Perception Vulnerability	0.034	0.059
Norm Significantperson	0.015	0.036
Perception Severity	0.078	0.067
Norm Fulfillment	0.041	0.049
Motivation Strength	0.090	0.068
Socialsupport Appreciation	0.004	0.041
Empowerment Abilities	0.063	0.069
Socialsupport Emotionality	0.017	0.050
Motivation Willingness	0.045	0.051
Empowerment Desires	0.037	0.060
Socialsupport İnstrumental	0.035	0.031
Empowerment Knowledge	0.106	0.055
Total	1.0	1.0

DISCUSSION

Cervical cancer is a serious worldwide health problem (14). Cervical cancer affects 80% of people in developing countries. By destroying the cervix, this malignancy affects the female reproductive system. Usually, it develops without causing any symptoms at first (15). The symptoms occur in the late stages of the disease, making treatment difficult, and the condition may spread to other organs.

Modern artificial intelligence approaches, such as machine learning applications, have been widely employed and beneficial in the medical health industry in recent years. It may be of considerable aid in illness diagnosis, prognosis,

and treatment, and can substantially improve the work of medical specialists, eventually improving the efficiency and quality of medical care, which has huge implications for improving medical levels, particularly in low-resource countries (16). Many cervical cancer researchers are experimenting with techniques such as machine learning. This ensures that risk variables are readily detected and examined, and that diagnostic accuracy is improved. The subject of cervical cancer classification has been the focus of a great deal of research throughout the years (17).

Nithya et al. (1) investigated cervical cancer risk factors using machine learning. There were 858 rows and 27 features in the dataset. They used the K-NN, r-part, SVM, C5.0, and Random Forest, as well as tenfold cross-validation. Parikh et al. (20) used K-NN to build a system for identifying cervical disease, selecting 25 features, 17 features, and 11 features, respectively. Tseng et al. (21) Tseng et al. utilized a dataset of 12 predictive factors from the Chung Shan Medical University Hospital Tumor Registry from 168 patients to predict cervical cancer recurrence. They compared the performance of the support vector machine (SVM), extreme machine learning (ELM), and C5.0 classifiers. According to the findings of the research, C5.0 has the greatest classification accuracy when compared to other classifiers and may also be used to pick significant independent variables (18). Machmud et al. have worked to detect cervical cancer risk using classification algorithms such as logistic regression and Naive Bayes, and behavioral theory in social sciences. They utilized data from 72 women (22 with cervical cancer and 50 without) gathered from a questionnaire administered at the Primary Health Care Hospital in Indonesia for their research. The questionnaire includes seven questions for each of four behavior-determining theories, such as planned behavior theory and protective motive theory. The study's findings revealed that the Naive Bayes approach outperforms the logistic regression method (19). Sharma utilized a clinical dataset from the International Gynecological Cancer Society that had 237 data points and 10 characteristics. Clinical diameter, uterine body, renal pelvis, and renal primary are some of the characteristics. He provided a classification model with several choices, such as rule sets, amplification, and advanced pruning, using C5.0 to characterize the stages of cervical cancer. C5.0 with pruning option 5 exhibited the greatest accuracy in diagnosing cervical cancer stage, according to the data (20). Lu et al. studied many strategies for cervical cancer advancement and established a recommended and productive assistant pattern to forecast cervical disease. The accuracy of the Decision Tree, SVM, Logistic Regression, Multilayer Perceptron and K-NN, techniques was 77.97%, 79.25%, 82.78%, 83.16%, and 82.93% respectively (21). Wu and Zhou presented a SVM based classification model in their study to diagnose cervical cancer and

determine risk factors. In their studies, they used Recursive Feature Elimination (RFE) and Principal Component Analysis (PCA) techniques to both shorten the processing time and eliminate unimportant features. Thus, they identified the ten most important risk factors for the dataset with 32 features and four target variables. Since there was an imbalance problem in the data set used, the authors applied the balancing process to the data set by using the oversampling technique. Then, three SVM-based approaches were applied for the four target variables, respectively, and when the results were compared, it was shown that the SVM, PCA method was superior to the others (22). Abdoh et al. proposed a technique based on oversampling, RFE, PCA and random forests (RF) for cancer diagnosis. The simulation results show that the proposed technique can be used in the diagnosis of cervical cancer. Rayavarapu and Krishna used a deep neural network for cervical cancer prediction. Deng et al. The performance of XGBoost SVM and RF techniques in cervical cancer classification was investigated. As a result of the study, it has been seen that XGBoost and RF techniques have better performance than SVM (3). Hyeon et al. used a pre-trained convolutional neural network (CNN) and several machine learning classifiers as feature extractors to classify cell images as normal and abnormal. Logistic Regression, Random Forest, AdaBoost and SVM, which are machine learning classifiers, were used in the study. Studies were carried out in MATLAB

software. At the end of the studies, the support vector machine achieved the highest performance with an F1 score of 78% (23).

The goal of this research was to evaluate classification predictions using MLPNN and RBFNN from ANN models using an open-source "Cervical Cancer Behavior Risk" dataset.

An artificial neural network is a mathematical model that solves classification and prediction problems by using the control and functional components of artificial neural networks. Input and output layers, as well as hidden layers that change input to output, make up neural networks. The architecture of an artificial neural network may be constructed in two stages: training and testing, when it is utilized to forecast any illness. The weights of the connections between neurons are fixed once the ANN model has been trained with the given dataset. Second, the model under consideration is validated in order to classify a new data set. Several parameters are used to assess the performance of the produced models (24).

In this research, the RBFNN model performed better than the MLPNN model in predicting the classification of cervical cancer according to performance criteria. During the test stage, the performance measures accuracy, specificity, AUC, negative predictive value, and positive predictive value obtained from the RBFNN method were 92.3, 100.0, 0.965, 91.6, and 100.0 respectively. The three most significant risk variables related with cervical cancer were

assessed in the RBFNN model as behavior sexual risk, empowerment abilities, and motivation strength.

CONCLUSION

As a result, using multi-layer perceptron and radial-based artificial neural network models, this framework estimates various factors (explanatory variables) that may be related to cervical cancer. In light of the obtained results, the applicability of artificial intelligence methods in the classification problem of interest is demonstrated. These models have established the significant levels of potential cervical cancer risk variables for preventive medication.

Ethics Committee Approval: Ethics committee approval is not required in this study.

Peer-review: Externally peer-reviewed.

Author Contributions:

Concept: İBÇ, ZK. Design: İBÇ, ZK. Literature search: İBÇ, ZK. Data Collection and Processing: İBÇ, ZK. İB. Analysis or Interpretation: İBÇ, ZK. Written by: İBÇ, ZK.

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ARAŞTIMA MAKALES/ RESEARCH ARTICLE

A retrospective evaluation of the prevalence of anti- *Echinococcus granulosus* in patients with suspected cystic echinococcosis at İnönü University Faculty of Medicine Turgut Özal Medical Center between 2018 and 2022

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Abstract

Objective: Cystic echinococcosis (CE) is a common zoonotic disease in the world, caused by the larval form of *Echinococcus granulosus* got lodged in various organs in both animals and humans. This study aimed to retrospectively examine ELISA test results in patients who applied to Inonu University Faculty of Medicine Parasitology Department with the suspicion of cystic echinococcosis.

Methods: The study was performed via ELISA to detect the presence of anti - *E. granulosus* immunoglobulin G (IgG) antibodies in the patients who came to the Parasitology Department with the suspicion of CE between January 2018 and June 2022.

Results: It was observed that *E. granulosus* antibody was detected as positive in 1353 (63.7%) and negative in 772 (36.3%) of the serum samples of 2128 patients admitted with the suspicion of hydatid cyst. Of 1353 cases with positive anti-*E. granulosus* IgG antibodies, 700 (51.74%) were females and 653 (48.26%) were males.

Conclusion: The retrospective study presented is intended to raise awareness of public health. As in Turkey, it is necessary to inform the public about CE in Malatya region, to draw the attention of the authorities to this issue, and to establish protection and control programs quickly. And it is recommended that these retrospective studies should be repeated to determine the importance of prevalence from time to time.

Key Words: Cystic Echinococcosis, *Echinococcus granulosus*, ELISA, Malatya

İnönü Üniversitesi Tıp Fakültesi Turgut Özal Tıp Merkezine 2018-2022 yılları arasında kistik ekinokokkozis şüphesi ile gelen hastalarda anti - *Echinococcus granulosus* prevalansının retrospektif olarak değerlendirilmesi

Özet

Amaç: Kistik ekinokokkozis (KE), *Echinococcus granulosus*'un larva formunun hem hayvanlarda, hem insanlarda çeşitli organlara yerleşmesiyle oluşan, dünyada yaygın olarak görülen zoonotik bir hastalıktır. Bu çalışma da, İnönü Üniversitesi Tıp Fakültesi Parazitoloji Anabilim dalına kistik ekinokokkozis şüphesi ile başvuran hastalarda ELİSA test sonuçlarının geriye yönelik olarak incelenmesi amaçlanmıştır.

Yöntem: Çalışma 2018 Ocak - 2022 Haziran tarihleri arasında Parazitoloji ABD'na KE şüphesi ile gelen hasta anti - *E. granulosus* immunoglobulin G (IgG) antikorlarının varlığını saptamak için ELISA yöntemi ile çalışılmıştır..

Bulgular: Kist hidatik şüphesi ile gelen 2128 hastanın serum örneklerinden 1353'ünde (%63.7) *E. granulosus* antikorunun pozitif olarak tespit edildiği 772'sinde (%36.3) ise negatif olarak saptandığı gözlenmiştir. Anti - *E. granulosus* IgG antikoru pozitif olan toplam 1353 olgudan 700'ü (%51.74) kadınlardan, 653'ü (%48.26) ise erkeklerden oluşmaktadır..

Sonuç: Sunulan retrospektif çalışma halk sağlığına yönelik bir farkındalık yaratmak amacıyla düşünülmüştür. Türkiye'de olduğu gibi Malatya yöresinde halkın KE hakkında bilgilendirilmesi, yetkililerin konuya dikkatlerinin çekilmesi, koruma ve kontrol programlarının hızlı bir şekilde oluşturulması gerekmektedir. Bu retrospektif çalışmaları prevalansın önemini belirlemek için tekrar edilmesi önerilmektedir.

Anahtar Kelimeler: Kistik Echinococcosis, *Echinococcus granulosus*, ELISA, Malatya

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INTRODUCTION

Cystic echinococcosis (CE) is a disease caused by the larval forms (metacestode) of *Echinococcus granulosus* and the development of larvae in all tissues and organs, including the liver and lungs, as a result of the accidental ingestion of eggs by humans (1). CE is an important public health problem that is more common in societies where agriculture and animal husbandry are common all over the world. Humans are accidental intermediate hosts for this parasite, where dogs and canines are the definitive hosts (2).

The disease is seen worldwide, being endemic in countries dealing with animal husbandries, such as Mediterranean countries, South America, Central Asia and Russia. It is more common in Central Anatolia and Eastern Anatolia regions in our country. Carnivores are definitive hosts, and humans and some mammals (sheep, goats, camels, horses) are intermediate hosts for E. granulosus(3). The clinic of the patients varies according to the size of the cyst, the organ in which it is located, the eruption of the cyst and the immunological response. Small, well-encapsulated cysts may calcify and remain asymptomatic for years. While liver and lung are most commonly involved, it may rarely be involved in organs such as muscles, bones, kidneys, brain, and spleen. Most of the cysts are asymptomatic and may regress spontaneously (4,5). Currently, four options are recommended for cyst treatment.

1. Percutaneous treatment of hydatid cysts with PAIR technique, 2. Surgery, 3. Anti-infective drug treatment, 4. Watch and wait (6).

The exact prevalence is unknown because most of CE cases are asymptomatic, clinical signs are uncharacteristic, and the cyst development is very slow. When serological methods such as enzyme-linked immunosorbent assay (ELISA), indirect fluorescent antibody test (IFAT), indirect hemagglutination test (IHA), and Western blot (WB) and DNA-based molecular methods are combined with non-invasive imaging techniques, they have been the preferred approaches for monitoring and surveillance in diagnosis and treatment as well as during control programs (7).

This study was performed to retrospectively evaluate the distribution of anti-*E. granulosus* antibodies in patients who came to the parasitology laboratory with the suspicion of CE between January 2018 and June 2022.

METHODS

The study was conducted with the retrospective evaluation of the data by taking blood samples

from the patients who came to the Inonu University Faculty of Medicine Parasitology laboratory with the suspicion of CE between January 2018 and June 2022.

Anti-*E. granulosus* antibodies were analyzed by ELISA (Enzyme-linked immunosorbent assay) method in serum samples of 2128 patients who came to the laboratory. The blood taken from the patients was first centrifuged and separated into serum. ELISA method was studied following the kit procedure of the manufacturer (NOVATEC). The results were read in ELISA reader at a wavelength of 450 nm, and the values obtained were analyzed according to the ratios given in the kit's user manual and evaluated as positive and negative.

Statistical analysis

Data were presented as median (min-max), mean (standard deviation), and number (percent). Compliance with the normal distribution was tested using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Pearson Chi-square and Mann Whitney U test were used where appropriate for statistical analysis. A value of $p<0.05$ was considered statistically significant. IBM SPSS Statistics 26.0 program was used in the analysis.

RESULTS

The study evaluated the presence of anti-*E. granulosus* IgG antibody in the serum samples of 2128 patients who applied to Turgut Özal Medical Center Parasitology Laboratory with suspicion between January 2018 and June 2022. It was observed that *E. granulosus* antibody was detected as positive in 1353 (63.7%) and negative in 772 (36.3%) of the serum samples of the subjects analyzed within the scope of the study. The distribution of the variables in the study was given in Table 1.

The distribution of the subjects in the study by years was presented in Table 2 and Figure 1. When Table 2 was analyzed, it was observed that 232 (30.05%) were negative and 450 (33.26%) were positive in 2018, 164 (21.24%) were negative and 356 (26.31%) were positive in 2019, 149 (19.30%) were negative and 184 (13.60%) were positive in 2020, 146 (18.91%) were negative and 247 (18.26) were positive in 2021, and 81 (10.49%) were negative and 16 (8.57%) were positive in 2022. When the distribution of anti-*E. granulosus* IgG antibodies by years was examined, it was detected that the highest positivity rate was in 2018, and the lowest positivity rate was in 2022. Moreover, there is a statistically significant association with respect to anti-*E. granulosus* IgG antibody by years ($p<0.05$).

The distribution of the presence of anti-*E. granulosus* IgG antibody by gender was given in Table 3 and Figure 2. When the results in Table 3 were examined, 700 (51.74%) were women and 653 (48.26%) were men of 1353 patients with positive anti-*E. granulosus* IgG antibodies. Moreover, there was no statistically significant association with gender in terms of the presence of anti-*E. granulosus* IgG antibody ($p>0.05$). When

the distribution of the positivity rate over the years was analyzed, the positivity rate showed a decreasing trend over the years but started to rise again in 2021.

The distribution of the presence of anti-*E. granulosus* IgG antibodies according to different departments was given in Table 4 and Figure 3. Of the subjects who were positive for anti-*E. granulosus* IgG antibody, 41 (3.03%) were in infection, 350 (25.87%) were in gastroenterology, 517 (38.21%) were in general surgery, 45 (3.33%) were in hepatology, 157 (11.60%) were in liver transplantation, 22 (1.63%) were in proctology, 11 (0.81%) were in examination and 210 (15.52%) were in pediatrics department. Accordingly, the anti-*E. granulosus* IgG antibody positivity rate was the highest in patients who come to the general surgery department. Moreover, there was a statistically significant correlation according to the

departments in terms of the presence of anti-*E. granulosus* IgG antibody ($p<0.05$).

The results of the analysis according to the age and the presence of anti-*E. granulosus* IgG antibody were presented in Table 5. There was a statistically significant difference in age in terms of the presence of anti-*E. granulosus* IgG antibody ($p<0.05$).

The distribution of years by gender in case of positive anti-*E. granulosus* IgG antibody was given in Table 6. According to the findings in the table, the year with the highest positivity rate in both women and men was 2018, and the year with the lowest was 2022.

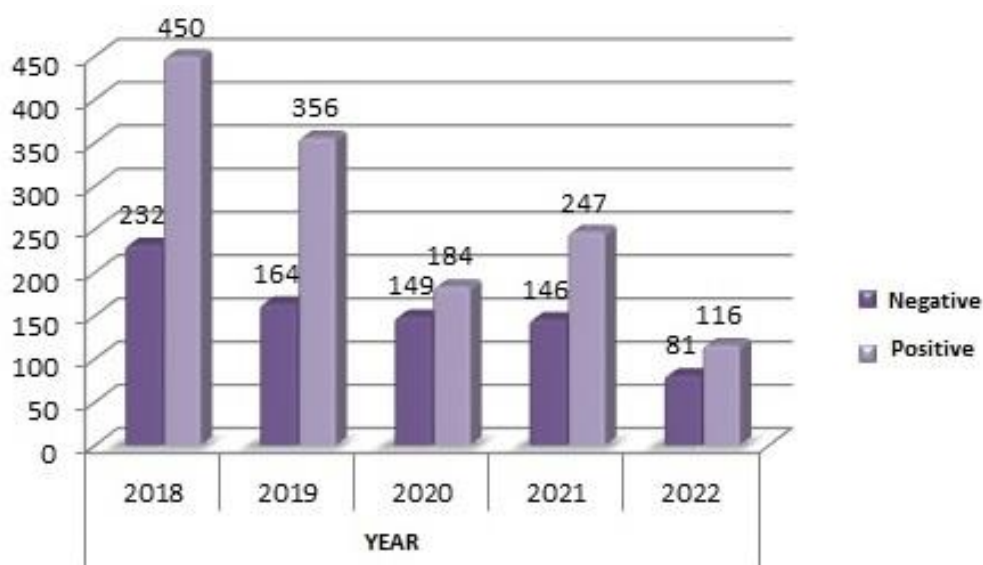The distribution of years by departments in case of positive anti-*E. granulosus* IgG antibodywas given in Table 7.

Figure 1. Distribution graph of the presence of anti- *E. granulosus* IgG antibody by years

Table 1. Variables in the study

Variables	Categories	Number	Percentage (%)
Value	Negative	772	36.3
	Positive	1353	63.7
Year	2018	682	32.0
	2019	520	24.4
	2020	335	15.7
	2021	393	18.5
	2022	198	9.3
Gender	Female	1122	52.7
	Male	1006	47.3
Department	Infection	92	4.3
	Gastroenterology	510	24.0
	General surgery	759	35.7
	Hepatology	105	4.9
	Liver Transplantation	234	11.0
	Proctology	31	1.5
	Examination	17	0.8
	Pediatrics	380	17.9

Table 2. Distribution of anti-*E. granulosus* IgG antibody by years

		Negative [n(%)]	Positive [n(%)]	p value[*]
Years	2018	232 (30.05)	450 (33.26)	
	2019	164 (21.24)	356 (26.31)	
	2020	149 (19.30)	184 (13.60)	**0.001**
	2021	146 (18.91)	247 (18.26)	
	2022	81 (10.49)	116 (8.57)	

*Pearson Chi-square test

Table 3. Distribution of anti-*E. granulosus* IgG antibody by gender

		Negative [n(%)]	Positive [n(%)]	p value[*]
Gender	Female	420 (54.40)	700 (51.74)	
	Male	352 (45.60)	653 (48.26)	0.236

*:Pearson Chi-square test

Table4. Distribution of anti-*E. granulosus* IgG antibody by departments

		Negative [n(%)]	Positive [n(%)]	p value[*]
Department	Infection	51 (6.61)	41 (3.03)	
	Gastroenterology	158 (20.47)	350 (25.87)	
	General Surgery	242 (31.35)	517 (38.21)	
	Hepatology	59 (7.64)	45 (3.33)	
	Liver Transplantation	77 (9.97)	157 (11.60)	**<0.001[*]**
	Proctology	9 (1.17)	22 (1.63)	
	Examination	6 (0.78)	11 (0.81)	
	Pediatrics	170 (22.02)	210 (15.52)	

*Pearson Chi-square test
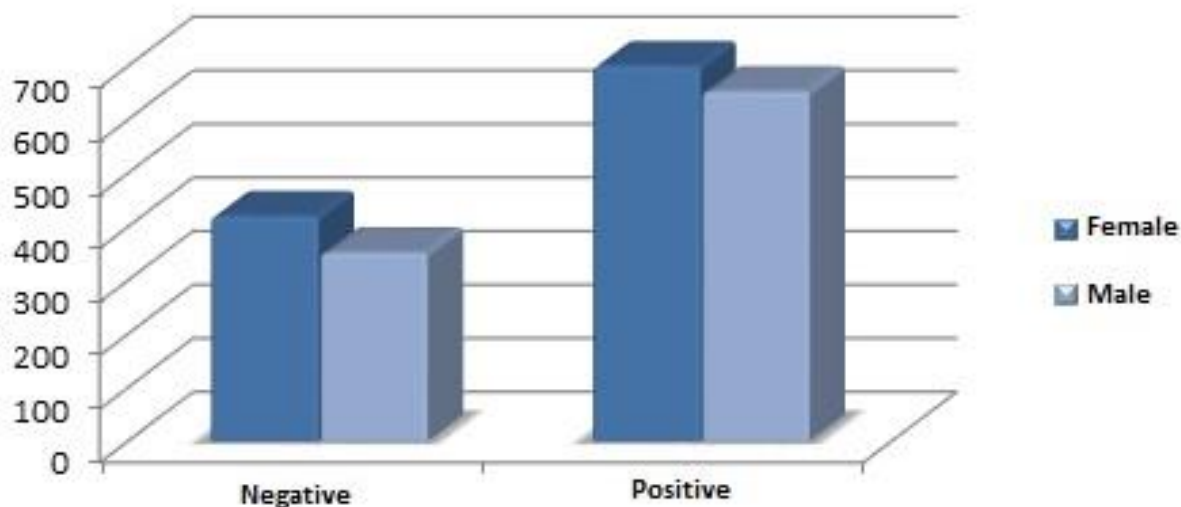
Figure 2. Distribution graph of the presence of anti-*E. granulosus* IgG antibody by gender

1 - Infection
2 - Gastroenterology
3 - General Surgery
4 - Hepatology

5 - Liver Transplant
6 - Proctological
7 - Examination Polyclinic
8 - Pediatrics

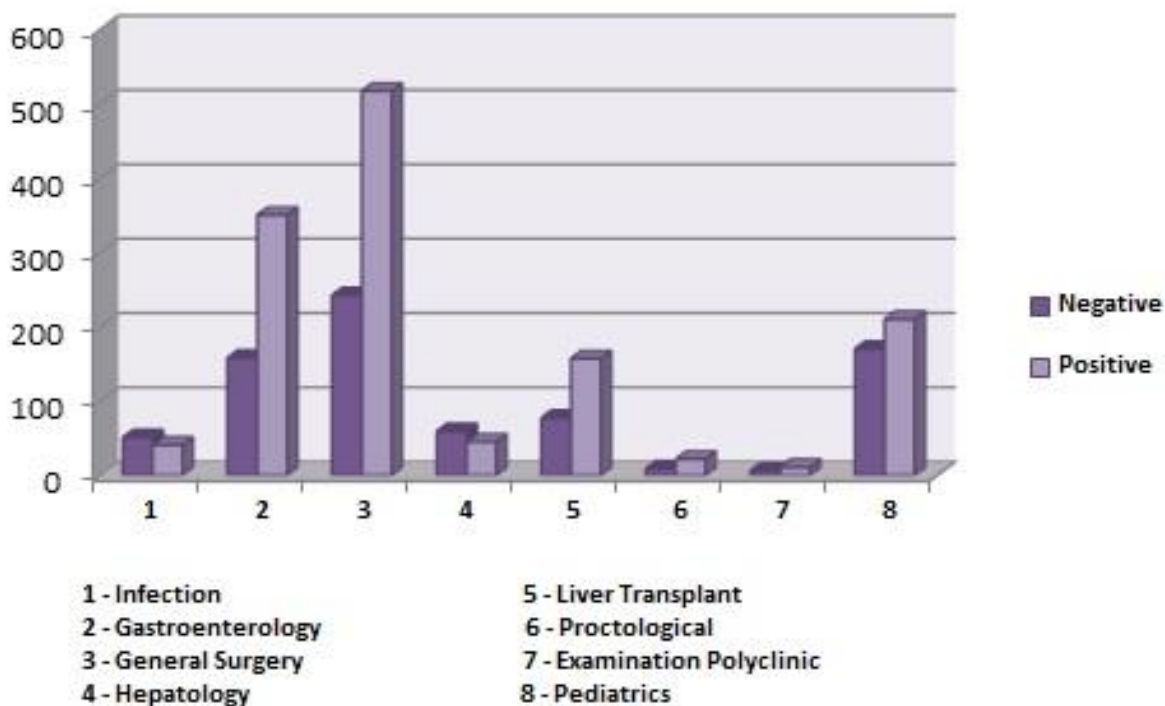**Figure 3.** Distribution graph of the presence of anti-*E. granulosus* IgG antibody by departments

Table 5. Analysis table of age according to presence of anti- *E. granulosus* IgG antibody

	Value		p value[*]
	Negative	**Positive**	
	Median (Minimum-Maximum)	Median (Minimum-Maximum)	
Age	46(1-98)	39(3-90)	**0.003**

*: Mann Whitney U test

Table 6. Distribution of years by gender in case of positive anti-*E. granulosus* IgG antibody

Variables		Gender			
		Female		Male	
		Number	Percentage (%)	Number	Percentage (%)
YEAR	2018	254	36.3	196	30.0
	2019	171	24.4	185	28.3
	2020	93	13.3	91	13.9
	2021	122	17.4	125	19.1
	2022	60	8.6	56	8.6

Table 7. Distribution of years by departments in case of positive anti-*E. granulosus* IgG antibody

Variables		Department							
		Infection [n(%)]	Gastroenterology (n[n(%)]	General Surgery [n(%)]	Hepatology [n(%)]	Liver Transplantation [n(%)]	Proctology [n(%)]	Examination [n(%)]	Pediatrics [n(%)]
Year	2018	7 (17.07)	110 (31.43)	219 (42.36)	14 (31.11)	37 (23.57)	6 (27.27)	7 (63.64)	50 (23.81)
	2019	10 (24.39)	85 (24.29)	154 (29.79)	12 (26.67)	30 (19.11)	2 (9.09)	4 (36.36)	59 (28.10)
	2020	9 (21.95)	107 (30.57)	2 (0.39)	2 (4.44)	27 (17.20)	5 (22.73)	0 (0.00)	32 (15.24)
	2021	14 (34.15)	29 (8.29)	97 (18.76)	7 (15.56)	46 (29.30)	7 (31.82)	0 (0.00)	47 (22.38)
	2022	1 (2.44)	19 (5.43)	45 (8.70)	10 (22.22)	17 (10.83)	2 (9.09)	0 (0.00)	22 (10.48)

DISCUSSION

CE is one of the important zoonotic infections that cause serious health problems and deaths as well as economic losses in humans. It is common in underdeveloped and developing countries due to factors such as hygiene rules, cultural level of the people, uncontrolled and illegal slaughter of butchery animals, the high number of stray dogs, and the discharge of infected internal organs into the environment without destruction (8).

According to serological data in studies conducted in our country, the probability of CE is 3.45% in İzmir (9), 14.6% in Ayon (10), 0.4% in Manisa (11) and 54.1% in Ankara (12). In a retrospective study conducted by Yazar et al. across the country, the rates of CE were reported 13.13% in the Marmara region, 16.94% in the Aegean region, 16.09% in the Mediterranean region, 38.57% in the Central Anatolia region, 5.70% in the Black Sea region, 6.80% in the Eastern Anatolia region, and 2.75% South-Eastern Anatolia region (13).

In our study, anti-*E. granulosus* antibodies were observed in 1353 (63.7%) of 2128 patients admitted with the suspicion of CE between 2018 and 2022, according to serological data.

An important finding in the studies is that the infection is seen higher in women. A higher prevalence was reported in women in previous studies on CE (8, 14). In another study, in which blood samples from 2642 patients were evaluated for CE with ELISA method, 31.9% of men and

29% of women were positive out of 801 (30.3%) seropositive patients (15). It was observed in a study evaluating CE according to hospital records in Kayseri between 1999 and 2004 that 699 subjects were positive, of whom 330 (42.2%) were male and 369 (57.8%) were female (16).

In our study, when the results were assessed with respect to gender, 700 (51.74%) were female and 653 (48.26%) were male, of 1353 patients with positive anti-*E. granulosus* IgG antibody. In addition, there is no statistically significant association with gender in terms of the presence of anti-*E. granulosus* IgG antibody (p>0.05).

In a study in which patients admitted with a pre-diagnosis of CE in Çorum were evaluated radiologically, biochemically and serologically, it was found that most of the patients who were found to be seropositive were from the general surgery outpatient clinic and were followed by the infection and gastroenterology outpatient clinics (14). In a study conducted in Kayseri, it was observed that they applied to general surgery, gastroenterology, chest diseases, infectious diseases, urology, pediatrics and other polyclinics, respectively. (7).

The distribution of the presence of anti-*E. granulosus* IgG antibodies according to different clinics in our studywas that 41(3.03%) of positive subjects were in infection, 350(25.87%) were in gastroenterology, 517(38.21%) were in general surgery, 45(3.33%) were in hepatology, 157(11.60%) were in liver transplantation,

22(1.63%) were in proctology, 11(0.81%) were in examination and 210(15.52%) were in pediatrics. Accordingly, the positivity rate of anti-*E. granulosus* IgG antibodyin patients who come to the general surgery department is the highest. Moreover, there is a statistically significant association according to the departments in terms of the presence of anti-*E. granulosus* IgG antibody (p<0.05).

When the publications made in our country were analyzed, Karaman et al. (17) detected the anti-*E. granulosus* IgG antibody positivity rate as 40.5% by IFA and indirect hemagglutination (IHA) method in Malatya and its surroundings between 1999 and 2002. Karaman et al. (18) evaluated the positivity rate as 34.6% in Kars city center and its villages in 2005, using IHA and IFA methods. Çetinkaya et al. (19) assessed the positivity rate as 24.7% with at least one of IHA, IFA and western blot methods between 1999 and 2010. Beyhan et al. (8) evaluated the positivity rate as 22.7% in Ankara and its surroundings between 2009 and 2013. Ertabak et al. (20) determined the positivity rate as 32% using ELISA method in Aydın province between 2005 and 2017.

In our study, the distribution of anti-*E. granulosus* IgG antibodies according to years in the patients who came to Turgut Özal Medical Center Parasitology laboratory between 2018 and 2022 and analyzed with ELISA method was examined, it was observed that the highest positivity rate was in 2018 (30.05%), and the lowest positivity rate

was in 2022. Moreover, there was a statistically significant association in terms of anti-*E. granulosus* IgG antibody by years (p<0.05).

Ethics Committee Approval: Approval was obtained from the İnönü Universty scientific research and publication ethics committee (Health sciences non-ınvasive clinical research ethics committee) for the study to be carried out.

Peer-review: Externally peer-reviewed.

Author Contributions:

Concept: TMY Design: TMY, TA. Literature search: TMY, TA. Data Collection and Processing: TMY, TA, MA, İBÇ. Analysis or Interpretation: İBÇ. Written by: TMY, MA

Conflict of Interest: The authors declared no conflict of interest

Financial Disclosure: The authors declared that this study has not received no financial support.

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ARAŞTIMA MAKALES/ RESEARCH ARTICLE

Detection of Coronary Heart Disease by Data Mining Methods Using Clinical Data

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Abstract

Objective: The major cause of death worldwide is anticipated to continue to be heart disease, one of the most prevalent diseases in the globe. Therefore, the aim of this study is to classify and predict coronary heart disease using the Random forest (RF) method, which is one of the predictive algorithms of data mining.

Methods: The dataset was divided into 80% training and 20% test sets to avoid bias. Then the model was trained on the training set and tested on the test set. In the study, the RF algorithm was used for the classification of coronary heart disease. The performance of the RF model was evaluated with balanced accuracy, accuracy, sensitivity, F1-score, negative predictive value, positive predictive value, specificity, and confusion matrix results.

Results: The data set included clinical data of 1190 patients, 281 (23.6%) female, and 909 (76.4%) males. Based on the results from the RF model, balanced accuracy, accuracy, sensitivity, F1-score, negative predictive value, positive predictive value, and specificity for heart disease were 0.945, 0.945, 0.920, 0.941, 0.931, 0.963, and 0.968, respectively.

Conclusion: According to the performance measures obtained in the test set for coronary heart disease (CHD), the RF model performed well. As a result, the proposed model can provide clinicians with clinical decision support for the preliminary diagnosis of CHD patients.

Key Words: Heart disease, artificial intelligence, data mining, random forest, parameter optimization

Klinik Veriler Kullanılarak Veri Madenciliği Yöntemleriyle Koroner Kalp Hastalığının Tespiti

Özet

Amaç: Dünya çapında en önemli ölüm nedeninin, dünyadaki en yaygın hastalıklardan biri olan kalp hastalığı olmasının devam etmesi beklenmektedir. Bu nedenle bu çalışmanın amacı, veri madenciliğinin tahmin edici algoritmalarından biri olan Rastgele Orman (RF) yöntemini kullanarak koroner kalp hastalığının sınıflandırılması ve tahmin edilmesidir.

Yöntemler: Modelin doğrulaması için veri seti %80 eğitim ve %20 test setlerine bölünmüştür. Daha sonra model eğitim seti üzerinde eğitilmiş ve test seti üzerinde test edilmiştir. Çalışmada koroner kalp hastalığı sınıflandırması için RF algoritması kullanılmıştır. RF modelinin performansı, dengeli doğruluk, doğruluk, duyarlılık, F1-skor, negatif tahmin değeri, pozitif tahmin değeri, seçicilik ve karışıklık matrisi sonuçları ile değerlendirildi.

Bulgular: Veri seti 281 (%23.6) kadın ve 909 (%76.4) erkek olmak üzere 1190 hastanın klinik verilerini içermektedir. RF modelinden elde edilen sonuçlara göre kalp hastalığı için dengeli doğruluk, doğruluk, duyarlılık, F1-skor, negatif tahmin değeri, pozitif tahmin değeri ve seçicilik sırasıyla 0.945, 0.945, 0.920, 0.941, 0.931, 0.963 ve 0.968 idi.

Sonuç: Koroner kalp hastalığı (KKH) için test setinde elde edilen performans ölçütlerine göre, RF modeli iyi performans gösterdi. Sonuç olarak önerilen model, klinisyenlere KKH hastalarının ön tanısı için klinik karar desteği sağlayabilir.

Anahtar Kelimeler: Kalp hastalığı, kardiyovasküler hastalık, yapay zeka, veri madenciliği, rastgele orman

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INTRODUCTION

One of the most frequent reasons for a heart attack is a clogged coronary artery. The primary cause of death is still heart disease. For the best treatment, the prevention of poor clinical outcomes, and mortality, early diagnosis of this condition is essential. The risk factors for cardiovascular disease (CVD) include male gender, advanced age, inactivity, low education, unemployment, economic situation, psychological state, and hypertension. Heart attack risk can be decreased by eating a diet high in salt, consuming less fat, cholesterol, alcohol, and smoking, exercising frequently, and decreasing weight (1-3).

Artificial intelligence (AI) methods are often used to quickly, and accurately diagnose heart disease (4). AI is a technology that improves performance and productivity in the field by automating processes or tasks that previously required manpower. AI makes it possible for machines to learn from experience, adapt to new inputs, and perform human-like tasks. Using AI technologies, computers can be trained to perform specific tasks by processing large amounts of data and recognizing patterns in the data. These technologies are used in medicine for purposes such as classifying and predicting diseases and determining the most important factors that cause diseases (5-10).

One of the fastest expanding subfields of AI is data mining. Data mining is the process of analyzing large data sets to reveal hidden critical decision-making information for future analysis. The amount of data obtained in the field of medicine is increasing day by day. Predictive algorithms of data mining can be used to extract useful, important, and relevant information from these data for the relevant situation (11-13).

Data mining methods are needed both in estimating heart attacks and other heart diseases and in determining risk factors. From this point of view, in this study, using the risk factors related to heart attack, a successful model is created to predict the disease by classifying it quickly and accurately with minimum error.

METHODS

Dataset

The heart disease dataset from the IEEE Data Port database (https://ieee-dataport.org/open-access/heart-disease-datasetcomprehensive#files) was obtained. The data set included clinical data of 1190 patients, 281 (23.6%) female, and 909 (76.4%) male (14).

Data processing and modeling

The dataset was divided into 80% training and 20% test sets to avoid bias. Then the model was trained on the training set and tested on the test set. Then, 5-fold cross-validation was used as a resampling method. Balanced accuracy, accuracy, sensitivity, F1-score, negative predictive value, positive predictive value, and specificity values were calculated to evaluate the performance of the model.

Random Forest (RF)

RF algorithm, which can be used for classification and regression analysis, is an ensemble classification method. The goal of this community classifier is to improve classification accuracy by building many decision trees. During the training phase, RFs create various decision trees and labels based on the majority. The main distinction between RFs and decision tree methods is that identifying the root node and splitting the nodes essentially work arbitrarily. The RF approach is taken into consideration in this study since it can resolve the over-learning issue and is effective at detecting noise and outliers. It is also one of the best techniques for identifying the most significant feature among the features of the data set (15-20).

RESULTS

Table 1 contains the confusion matrix for the RF model in the test data set. While the RF model could not distinguish 4 patients with heart disease, it accurately predicted 121 patients.

RF model, balanced accuracy, accuracy, sensitivity, F1-score, negative predictive value, positive predictive value, and specificity for heart disease were 0.945, 0.945, 0.920, 0.941, 0.931, 0.963, and 0.968, respectively.

Table 2. Values for performance metrics for the RF model

Table 2. Values for performance metrics for the RF model

Metric	Value
Balanced Accuracy	0.945
Accuracy	0.945
Sensitivity	0.920
F1-score	0.941
Negative predictive value	0.931
Positive predictive value	0.963
Specificity	0.968

Table 1. Confusion Matrix for the RF model

Predict	References	
	Control	Heart disease
Control	103	4
Heart disease	9	121

Table 2 shows the performance criteria obtained with the RF model in the test data set. In Figure 1, the learning curve of the model in train, test and resampling is given. Based on the results from the
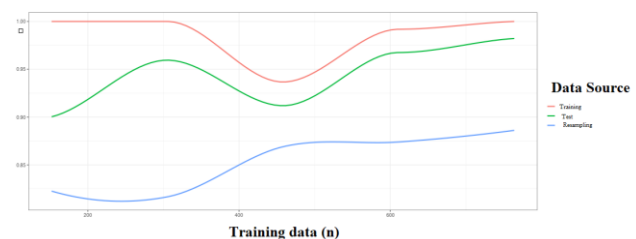

Figure 1. The learning curve for model accuracy performance

In Figure 2, the order of importance and the importance coefficients of the variables included in the model are given according to the contribution of the RF model to the prediction performance. According to the results of the study,

the slope of the peak exercise being the unsloping of the ST segment and the maximum heart rate were the first two features that contributed the most to the estimation performance of the RF model. In addition, the peak exercise ST segment down sloping did not contribute to the determination of heart disease.
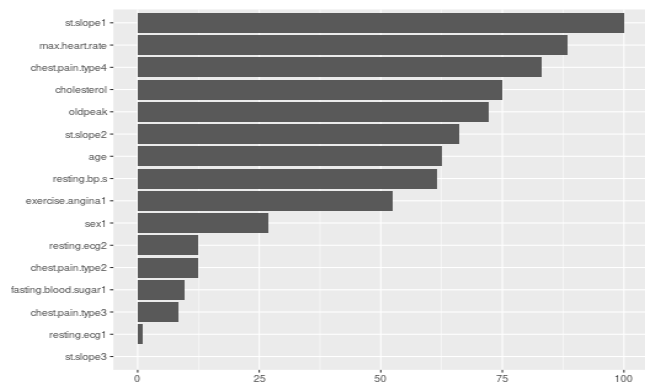

Figure 2. The graphic of feature importance for the RF model

DISCUSSION

Heart diseases are one of the leading causes of death in the world. A heart attack is a physiological condition characterized by severe chest pain and the possibility of death as a result of heart failure caused by a problem with the coronary arteries. A heart attack occurs when the heart's oxygen supply is cut off due to a rapid decrease or interruption of blood flow in the vessels that feed the heart. The clogged vessel can damage or even kill the heart muscle. Heart attack is the most common health problem in rich countries. It is an important health problem that has become more common in underdeveloped countries. The World Health Organization estimates that more than 16 million people die each year due to heart attacks. These results are one-third of all deaths (1, 21-23).

The development of health care has enabled studies such as identifying the variables underlying heart diseases and avoiding its occurrence. Recent studies have been able to pinpoint heart disease risk factors, but many scientists agree that further studies are necessary before we can apply this knowledge to lower the prevalence of heart disease. Different factors may contribute to heart problems. Reducing these heart disease risk factors may really help prevent heart disease, according to certain research studies. The prevention of heart disease risk has been the subject of numerous studies. There will be more options to avoid heart disease as more studies on the condition are conducted (24, 25).

For this reason, early detection and treatment of heart diseases are very important. The use of data mining methods for heart diseases is an important research topic. Based on this, we predicted heart disease with a fast and high-performance model using the heart disease dataset containing clinical data in this study.

The performance criteria obtained from the RF method in the study; balanced accuracy, accuracy, sensitivity, F1-score, negative predictive value, positive predictive value, and specificity for heart disease were 0.945, 0.945, 0.920, 0.941, 0.931, 0.963, and 0.968, respectively.

CONCLUSION

In conclusion, this study can suggest an RF algorithm for the development of predictive models for heart diseases and the developed model can help clinicians in the early diagnosis of cardiac patients.

Ethics Committee Approval: Ethics committee approval is not required in this study.

Peer-review: Externally peer-reviewed.

Author Contributions:

Concept: Design: Literature search: Data Collection and Processing: Analysis or Interpretation: Written by: BY

Conflict of Interest: The author declared no conflict of interest

Financial Disclosure: The author declared that this study has not received no financial support.

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CASE REPORT/OLGU SUNUMU

Hydatid Cyst Mimickers and Cases Mimicked by Hydatid Cyst; With Two Cases

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Abstract

Hydatid cyst is a parasitic disease caused by *Echinococcus granulosus* and is frequently seen in Turkey. Cystic lesions are frequently encountered in routine examinations. These lesions include a wide spectrum from benign to malignant.

Imaging methods are frequently used in the diagnosis, and many cystic hepatic and extrahepatic lesions have different imaging findings. In addition, in some cases, radiological evaluation is not sufficient for a definitive diagnosis. In this case, the diagnosis can be made by evaluating the sample taken from the pathological point of view. Some lesions may also mimic diseases such as hydatid cysts.

In this study, two hepatic cyst cases, which are thought to cause difficulties in diagnosis and may adversely affect the treatment process, are presented because the cyst imitates hydatid disease.

In conclusion, hydatid cysts and hydatid mimics should be kept in mind especially in endemic regions, hepatic and extrahepatic regions.

Key Words: Hydatid cyst, mimics, liver, extrahepatic

Hidatik Kist Taklitçileri ve Hidatik Kisti Taklit Eden Olgular; İki Olgu
Özet

Kist hidatik Echinococcus granulosus'un neden olduğu paraziter bir hastalık olup Türkiye'de sıklıkla görülmektedir. Rutin incelemelerde kistik lezyonlar ile sıklıkla karşılaşılmaktadır. Bu lezyonlar benignden maligniteye kadar geniş bir yelpazeyi içermektedir.

Tanıda sıklıkla kullanılan görüntüleme yöntemleri olup birçok kistik hepatik ve ekstrahepatik lezyonun farklı görüntüleme bulguları vardır. Ayrıca bazı durumlarda kesin tanı için radyolojik değerlendirme de yeterli olmamaktadır. Bu durumda alınan örneğin patolojik açıdan değerlendilerek tanısı konulabilmektedir. Bazı lezyonlar da kist hidatik gibi hastalıları taklit edebilir.

Çalışmada Kist hidatiği taklit etmesi nedeniyle tanıda zorlulara neden olan ve bu doğrultuda tedavi sürecini olumsuz etkileyebileceği düşünülen iki hepatik kist olgusu sunuldu.

Sonuç olarak, özellikle endemik bölgelerde, hepatik ve ekstrahepatik bölgelerde hidatik kistler ve hidatik taklitçileri akılda tutulmalıdır.

Anahtar Kelimeler: kist hidatik, mimik, karaciğer, ekstrahepatik

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INTRODUCTION

Hydatid cyst is a parasitic infection usually caused by *Echinococcus granulosus*. The main source of this parasite is carnivors. These are mostly dogs, wolves, foxes. People get these eggs from raw fruits and vegetables that are not well washed and cooked. Contamination is possible from contaminated drinking water. In addition to humans, ruminant animals such as sheep, goats, cattle and buffalo also get sick by ingesting the eggs (1).

Hydatid Cysts are mostly localized in the liver (70%) and lung (25%) (2). Primary isolated extrahepatic hydatid cyst is most common in the abdomen, with a rate of 6-11% (2). Although some patients may be asymptomatic, the clinical presentation is mostly abdominal pain or symptoms that may vary according to the localization of the cyst. Swelling in soft tissue, spleen, pancreas, kidney, retroperitoneum, bladder, ovaries, bone, heart, chest wall, spine, thyroid gland, brain and muscles can give symptoms according to their location. They may not show symptoms at first (2).

These cases can mimic many benign or malignant cystic and solid lesions, depending on their location. Many lesions also mimic hydatid cyst and give clinical presentation. In this article, it is aimed to examine the lesions that mimic hydatid cyst and cases mimicked by cyst hydatid through two cases.

CASE REPORTS

Two cases are presented. Necessary information has been provided for the cases.

Case-1: A 71-year-old male patient was brought to the general surgery emergency department with acute abdomen after a traffic accident. During the examination a cystic mass in the liver was detected incidentally. After the patient was stabilized, surgical treatment was applied to this cystic mass and the removed material was sent to pathology for diagnosis. In the examinations, a large number of small and medium-sized vascular structures and hyalinized stroma, filled with erythrocytes, were observed in a focal area, adjacent to the normal liver tissue, in the observed areas. In the immunohistochemical study, a diffuse and strong reaction with CD31 and CD34 was observed in these areas. For differential diagnosis, HepPar1, Alpha fetoprotein (AFP), desmin, monoclonal carcinoembryogenic antigen (mCEA) were added to the panel. Nuclear staining (in the most intense area) was observed at a rate of 1-2% with Ki-67. The case was reported as epithelioid hemangioendothelioma (Figures -1,2).
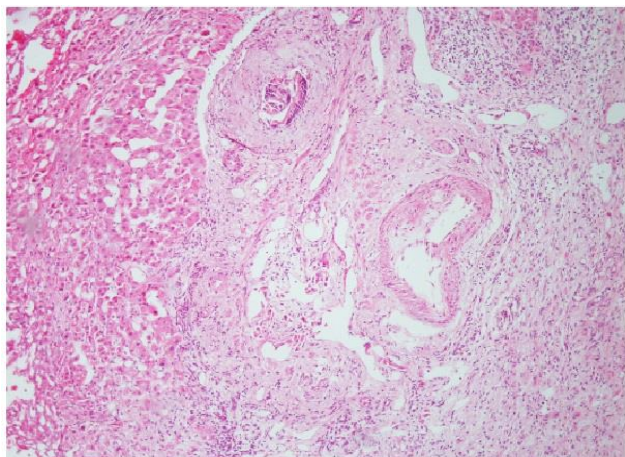
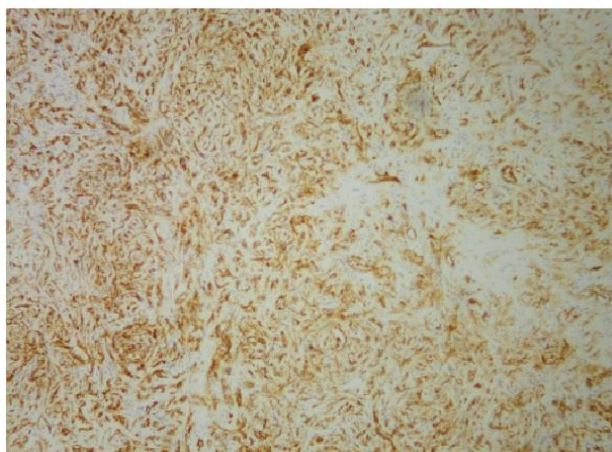Figure 1: The area where vascular structures are observed in the vicinity of the liver tissue (H&EX200)

Figure 2: Positive staining with CD31 was observed in vascular structures (CD31X200)

Case-2: A 69-year-old female patient was resected with a preliminary diagnosis of hydatid cyst, simple cyst, upon detection of a cystic lesion in the liver. The material was sent to pathology. No cuticle or membranous structure was found in the examinations. Necrosis was not present. In the microscopic examination, there was proliferation and cystic enlargement in the biliary glands. As a result of microscopic examination, it was found to be compatible with peribiliary cyst (Figure -3).
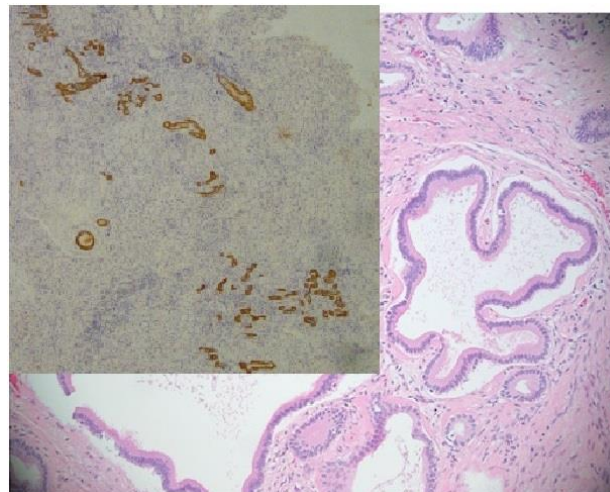

Figure 3: Biliary glands with cystic dilated appearance (H&EX200), positive staining with CK7 showed ((top left image) (CK7X100)

DISCUSSION

Many cystic lesions have classical imaging findings, and these findings may be sufficient for diagnosis. However, in many cases, there may be similar appearances and therefore histopathological evaluation may be required for a definitive diagnosis.

In the literature, these lesions in liver and non-hepatic localizations have led to difficulties in diagnosis because specific clinical symptoms and laboratory findings are absent in hydatid cysts (3-16).

Cystic liver lesions can be divided into developmental, inflammatory, neoplastic, and trauma-related lesions. Simple liver cysts are the most common lesions encountered incidentally.

The number and morphology of the lesions and the determination of solid components within the lesion are important in the differential diagnosis (3).

Cystic lesions of the liver occur in many cases. Congenital simple cysts occur in polycystic disease, portal fibrosis and Caroli's disease. They are mostly asymptomatic. Cases of hydatid cysts are the most common cause of parasitic disease in the liver. Hemangioendotheliomas, mesenchymal hamartomas, and teratomas are among the cystic neoplasms of the liver (4).

In our first case, radiologically cystic appearance of the hemangioendothelioma caused hydatid cyst to be considered in the diagnosis. A definitive diagnosis was made as a result of histopathological evaluation.

In the study of Gupta et al., they evaluated hepatobiliary cystic lesions and included 72 common choledochal cysts, 51 hydatid cysts, 8 simple liver cysts, 2 changes due to congestive heart failure, 6 biliary cystadenoma, 5 liver abscess and presented the histopathology evaluation of 4 cases of cavernous hemangioma (3). In this evaluation, besides hematoxylin-eosin preparations, histochemical stainings such as silver reticulin, Masson's trichrome, periodic acid Schiff (PAS), Voehrhoff Van Gieson were also used. These histochemical stains will not be discussed in this article.

In the second case we presented, if we examine the subject through peribiliary cysts,

these lesions are formed by the localization of the intrahepatic, extramural peribiliary glands at the hepatic hilum and portal tract levels and showing multiple small dilatations. Peribiliary cysts are multiple and may be discrete, clustered, or confluent. It can mimic compound type biliary ductal dilatation (5).

There are many lesions that mimic hydatid cysts. Examples of these lesions are bronchogenic cysts, gossypiboma, schwannoma located in the lung, mesenchymal hamartoma of the liver. These cases were diagnosed by histopathological evaluation (6-9).

Situations mimicked by hydatid cyst are also among the common problems. Liver and lung hydatid cyst cases can also mimic other diseases (10,11). In one study, a case evaluated as pleural abscess or empyema was treated with broad-spectrum antibiotics and surgical intervention. A hydatid cyst was observed after surgery (10,11). It has been reported that approximately 15-40% of patients with pulmonary hydatid cysts also have cysts in the liver simultaneously (11).

In the case presented by Işık et al., a case of hydatid cyst confused with necrotizing pneumonia is presented. In the case, there was no response to the treatment in the patient who was followed up with the complaint of rash, for whom broad-spectrum antibiotic therapy was started because the radiological findings were consistent with necrotizing pneumonia. Multiple thick-walled cystic lesions and pleural effusions were

observed in the computerized tomography, and it was stated that the diagnosis of pulmonary hydatid cyst disease was confirmed by surgical and serological examinations (11).

It has been reported that hydatid cysts located in the heart and deep muscle, as well as in the lung, can cause serious confusion and the diagnosis is clarified by histopathological evaluation after resection. Especially muscle localized mass lesions can mimic soft tissue tumors. Especially in endemic areas, careful evaluation is beneficial. Sometimes there may be a solid appearance without a cystic component (12,13).

Although single, cardiac localized mass lesions have more specific images radiologically, the diagnosis was made after resection in the case presented by Parsaee et al. (12).

Although muscular hydatid cysts are rarely seen, they should be kept in mind in the differential diagnosis in surgical planning because of the risk of anaphylactic reaction as well as recurrence in incomplete surgery (13).

In the literature, cases of phantom tumor, kidney tumor and lung cancer, which have difficulties in differential diagnosis with hydatid cyst, have also been reported (14-16).

CONCLUSIONS

In conclusion, hydatid cysts should be considered in the differential diagnosis of cystic or solid lesions, especially in endemic areas. In the definitive diagnosis, clinical as well as radiological and pathological evaluation results should be evaluated together.

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CASE REPORT/OLGU SUNUMU

Barrett's Esophagus; Case Report

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Abstract

Barrett's esophagus is the transformation of the normal squamous epithelium in the distal esophagus into columnar epithelium with intestinal metaplasia. Barrett's esophagus generally develops as a result of chronic mucosal irritation due to gastroesophageal reflux. Although Barrett's esophagus is usually seen over the age of 50, it can also be seen at younger ages. In our case, it was seen in a 34-year-old male patient. The patient applied to the general surgery outpatient clinic with complaints of swelling in the stomach, pain and watering in the mouth. When endoscopy is performed; the cervical and thoracic esophageal mucosa appeared normal, and the Z line was 40 cm distally. The esophageal mucosa had a hyperemic appearance. Multiple biopsies were taken from these areas. In histopathological evaluation, special columnar epithelium, mucin-filled cytoplasm, goblet cells (intestinal metaplasia) were observed. Goblet cells were positively stained by PAS/Alcian Blue and Mucincarmine histochemical staining.
Key Words: Barrett's esophagus, gastroesophageal reflux, intestinal metaplasia

Barrett Özofagus; Olgu Sunumu
Özet

Barrett özofagus, distal özofagustaki normal skuamöz epitelin intestinal metaplazi ile kolumnar epitele dönüşmesidir. Barrett özofagus genellikle gastroözofagial reflüye bağlı kronik mukozal irritasyon sonucu gelişmektedir. Barrett's özofagusu genellikle 50 yaş üzerinde görülmekle birlikte daha genç yaşlarda da görülebilmektedir. Bizim olgumuzda 34 yaşında erkek hastada görülmüştür. Hasta midede şişlik, ağrı ve ağızda sulanma şikayetleri ile genel cerrahi polikliniğine başvurmuştur. Endoskopi yapıldığında; servikal ve torasik özofagus mukozası normal görünümdeydi, Z çizgisi distalde 40 cm idi. Özofagus mukozası hiperemik bir görünüme sahipti. Bu alanlardan birden fazla biyopsi alındı. Histopatolojik değerlendirmede; özel kolumnar epitel, müsin dolu sitoplazma, goblet hücreleri (bağırsak metaplazisi) gözlendi. Goblet hücreleri, PAS/Alcian Blue ve Mucincarmine histokimyasal boyama ile pozitif olarak boyandı.

Anahtar Kelimeler: Barrett özofagus, gastroözofagial reflü, intestinal metaplazi

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INTRODUCTION

Barrett's esophagus is defined as the replacement of normal squamous epithelium in the distal part of the esophagus with columnar epithelium containing intestinal metaplasia (1). In fact, although Tileston was the first to describe the columnar epithelial line in the lower esophagus, the lesion was first described by Norman Barrett in 1950 as a congenitally short esophagus accompanied by an intrathoracic stomach, and it was later reported that the lesion had abnormal columnar epithelial alignment in the distal esophagus (2). Barrett later explained that the disease is acquired (3). Today, for the definition of Barrett's esophagus, it is necessary to both endoscopically visualize the columnar line in the esophagus and detect the presence of intestinal metaplasia by biopsy (3). In the case report, we aimed to present a case diagnosed as Barrett's esophagus on tissue taken by endoscopic biopsy to emphasize the importance of Barrett's esophagus.

CASE REPORTS

In our case, it was seen in a 34-year-old male patient. The patient applied to the general surgery outpatient clinic with complaints of swelling in the stomach, pain and watering in the mouth. When endoscopy is performed; the cervical and thoracic esophageal mucosa appeared normal, and the Z line was 40 cm distally. The esophageal mucosa had a hyperemic appearance. Multiple biopsies were taken from these areas. In histopathological evaluation, special columnar epithelium, mucin-filled cytoplasm, goblet cells (intestinal metaplasia) were observed. Goblet cells were positively stained by PAS/Alcian Blue and Mucincarmine histochemical staining.

DISCUSSION

Barrett's esophagus patients typically present with symptoms of gastroesophageal reflux disease (GERD) (5). Heartburn and regurgitation are major symptoms (4). There may also be dysphagia, odynophagia, chest pain. While some patients have symptoms at first, they may disappear later, because the areas of esophagitis transform into columnar epithelium, which is less sensitive to acid (5). Most of the patients are middle-aged, smokers and alcohol users. Barrett's esophagus patients may also be symptom-free. The frequency and duration of heartburn are associated with increased frequency of Barrett's esophagus, but the severity of reflux symptoms is inversely proportional to Barrett's esophagus (6). Among the symptoms of Barrett's esophagus, extraesophageal findings such as hematemesis, melena, occult gastrointestinal bleeding and hoarseness, asthma and dental disorders can be seen (5,6). Erosion and ulceration, peptic ulcer, fistula formation, stricture, dysplasia, and tumor development are the main complications and symptoms related to these complications may also develop (7). Dysphagia is an important finding that may suggest adenocarcinoma. Similarly,

gastrointestinal bleeding may be related to esophageal ulcer and severe esophagitis (8). If the cause of chronic blood loss cannot be explained by colonoscopy, such patients should undergo Barrett's esophagus and upper gastrointestinal system endoscopy for esophagitis (9).

Esophageal adenocarcinoma (EAC) is a very deadly type of cancer, and it is the fastest growing cancer type with an annual increase rate of 4-10% in the Americas and Europe (8,9). Barrett's esophagus is the only known precursor lesion of EAC and usually occurs due to GERD (14). However, adenocarcinoma develops in only 1.3-5% of patients with Barrett's esophagus, and the time required for this is estimated to be 20-30 years (10). The risk of developing EAC in patients with Barrettt's esophagus is 30-125 times higher than in normal people (11). The aim of Barrett's esophageal screening in patients with gastroesophageal reflux disease is to detect esophageal cancer in an early and treatable period and to reduce EAC-related deaths (11,12). The American Gastroenterology Association reported that upper gastrointestinal system (GIS) endoscopy should be performed in patients with chronic GERD because of the high incidence of Barrett esophagus, but whether routine screening is necessary or not is still controversial (13). The median age at diagnosis of Barrett's esophagus was 40, and the age of development of EAC was 64. Eloubeidi and Provenzale stated that over the

age of 40 is an independent predictor for Barrett's esophagus (14). Therefore, it is considered appropriate to start Barrett's esophageal screening at this age. Although there is no definitive evidence, it is thought that Barrett's esophageal screening is cost-effective and reduces mortality due to EAC (13,14).

Goblet cells do not show regular distribution in Barrett's esophagus, and their rates differ significantly between patients and specimens (15). Columnar cells among goblet cells resemble gastric foveolar cells or intestinal absorptive cells. Pseudogoblet cells, similar to goblet cells but containing neutral mucin, may be misleading in diagnosis. In Barrett's esophagus, the predominant form of intestinal metaplasia- incomplete intestinal metaplasia consists of a mixture of goblet cells and foveolar type epithelium containing PAS-positive neutral mucin (14,15). These foveolar epithelial cells may contain Alcian Blue-positive acidic mucin, which shows less intense staining than that observed in goblet cells, but detection of Alcian Blue-positive columnar cells is not sufficient for the definitive diagnosis of Barrett's esophagus in the absence of goblet cells (16). Less frequently, the glandular component contains varying proportions of goblet cells, well-formed intestinal absorptive cells. In some cases, incomplete and complete intestinal metaplasia coexist. Pancreatic acinar metaplasia can also be detected, but its diagnostic significance is limited

(17). Typically, the lamina propria shows mild chronic inflammation and fibrosis, with marked thickening and separation, or double-ordering, of the muscularis mucosa. Intestinal metaplasia is mixed with cardiac-type or fundic-type epithelial foci corresponding to normal gastric mucosa, except for varying degrees of mucosal distortion, glandular atrophy, and mild inflammation (18). In the biopsy specimen taken from the distal esophagus in Barret's esophagus, cardiac or fundic type mucosa without intestinal metaplasia (at least 2 cm columnar esophagus) and absence of goblet cells may be the result of sampling error only (17,18).

The treatment approach in Barrett's esophagus should aim to:

(i)   relieve reflux symptoms.

(ii)   prevent reflux of acid and duodenal contents into the esophagus.

(iii)   prevent complications such as erosion, peptic ulcer and stricture.

(iv)   arresting the proximal progression of intestinal metaplasia.

(v)   accelerate regression of intestinal metaplasia to normal mucosa.

(vi)   halt the progression to dysplasia.

(vii)   accelerate regression of dysplasia to nondysplastic cells.

(viii)   stop the progression to adenocarcinoma (19).

The treatment of Barrett's esophagus determines whether high-grade dysplasia (HDD) is present. In Barrett's esophagus without high-grade dysplasia, the most preferred option is medical therapy (20). Developing medical drugs are sufficient to prevent symptoms in most of the patients. Medical treatment can be successful not only in preventing typical reflux symptoms but also in treating cases with complications (19,20). It has been reported that proton pump inhibitors (PPI) are more effective in relieving reflux symptoms compared to H2 receptor blockers. With proton inhibitor therapy, improvement and improvement in symptoms was detected in 95% of patients with erosive esophagitis and Barrett's ulcer (21). Proton inhibitor also reduce bile reflux by reducing gastric secretions. It is difficult to determine the duration of medical therapy in patients with Barrett's esophagus, as discontinuation of treatment almost always causes exacerbation of reflux symptoms (22). Despite symptomatic improvement with medical treatment, complete regression of Barrett's epithelium is not achieved with neither PPI nor H2 receptor blockers. Although aggressive antireflux therapies are successful in reflux control, they cause achlorhydria and increase the risk of adenocarcinoma development

CONCLUSIONS

Ochronosis is a disease that shows autosomal Barrett's esophagus is usually seen over the age of 50, but it can also be seen at younger ages. Follow-up should be done more frequently in younger patients. The risk of developing cancer

in the Barrett esophagus floor is high. The risk of developing cancer in the Barrett esophagus floor is high. The presence and degree of dysplasia in Barrett's esophagus determines the type of treatment to be applied. In cases with non-dysplasia and low-grade dysplasia, medical treatment, antireflux surgery or ablation methods should be preferred.

Ethics Committee Approval: Consent form was filled out by all participants.

Peer-review: Externally peer-reviewed.

Author Contributions:

Concept: TDA, HBH, Design: TDA, HBH; Literature search: GY; Data Collection and Processing TDA, HBH; Analysis or Interpretation: GY, TDA; Writing: TDA, HBH.

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