Effect of Web-Based Early Diagnosis of Dental and Oral Diseases with Validity Level of Dentist Final Diagnosis in Public Health Center, Makassar, Indonesia

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Abstract

Background. One of the organs of the body that is lacking attention is the teeth and mouth, whereas maintaining healthy teeth and mouth is very important, because the nerves of the teeth are related and directly affect the nerves of other organs. The development of information technology that is so advanced has entered the world of health, namely to detect early dental and oral diseases by using an expert system. Making an expert system is not to replace the expert itself but can be used as a very experienced assistant. There is a need to solve this problem so that people can know how to deal with diseases related to teeth and mouth. The various information supporting factors in this study by building an expert system with three methods are Certainty Factor (CF), Dempster Shafer (DS) and Bayes Theorem to diagnosis early dental and oral disease events and determine the effect of expert systems in increasing the validity level of dentist diagnosis. **Material and Method** The type of research used was an observational method in a cross-sectional study design. The sampling method uses total sampling. The study was conducted in September-January 2020. The number of sampling was 200 people. This research consists of three stages are the making of an application system, application testing, and the final stage is a statistical test. The data analysis technique used in this study is Chi-square and validity test. **Results**. The results of the analysis of the relationship between the value of accuracy with the validity of the doctor's diagnosis found variable diagnosis doctor have p value (0.013), DS value, CF and Bayes Value are the same p (0,000) <p (0.05). **Conclusion**. Applications built using the CF, DS and Bayes Theorem methods can be used by users to detect dental disease early before making further examinations to a specialist. The test results given by the system are the same as the results given by experts (dentists). The system of early diagnosis of dental and oral diseases has a very significant effect on the level of validity of the dentist final diagnosis.

Keyword: *System Expert, Dental and Oral Disease, Validity, CF, DS and Bayes, diagnosis doctor*

Background

One of the organs of the body that is lacking attention is the teeth and mouth, whereas maintaining healthy teeth and mouth is very important, because the nerves of the teeth are related and directly affect the nerves of other organs.[1], [2] The development of information technology that is so advanced has entered the world of health are to detect early dental and oral diseases by using an expert system. Making an expert system is not to replace the expert itself but can be used as a very experienced assistant. In addition, lack of knowledge and limited sources of information cause low public awareness of efforts to prevent and even treat oral and dental diseases. Public understanding of dental and mouth disease is still relatively low so that many people still rely on the knowledge of an expert in this case doctors to be able to diagnose an illness, so it requires a long time and expensive costs. Tooth and mouth disease can cause pain and tooth loss. The high prevalence of dental and mouth disease is generally caused by various

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factors, including: factors of knowledge, attitudes and actions in maintaining dental health that is still low. [3], [4], [5], [6], [7] In addition to expensive consultation fees, long queues and looming pain are also the reasons people are afraid to see a dentist.

There is a need to solve this problem so that people can know how to deal with diseases related to teeth and mouth. The various information supporting factors in this study by building an expert system with three methods are CF, DF and Bayes to diagnosis early dental and oral disease events and determine the effect of expert systems in increasing the validity level of dentist diagnosis. Based on the above background, the authors wish to discuss research on the early diagnosis of dental and oral diseases with the level of validity of the diagnosis of dentists in the Public Health Center Makassar, Indonesia.

Material and Method

The type of research used was an observational method in a cross-sectional study design. The sampling method uses total sampling. The study was conducted in September-January 2020. The number of sampling was 200 people. This research consists of three stages are the making of an application system, application testing, and the final stage is a statistical test. The data analysis technique used in this study is Chi-square and validity test.

Results

Data collection was carried out to obtain some information related to making an expert system application for diagnosis of dental and oral diseases are the form of symptom data and disease data. Data obtained during the data collection process was obtained from the results of patient interviews (200 people) with dentists, nurses, and supported by books, journals, and internet browsing related to dental and oral diseases. Data is then processed by the system so that it becomes input data and output data. The method in analyzing data using the algorithm is the CF, DS and Bayes methods.

1. Design Form

The screen will be used to log in by the user by entering a username and password. The design form of the login menu screen is as shown in Figures 1 and 2

Figure 1 Initial Display Menu

Figure 2 Log in Menu

The user/admin screen has facilities for analyzing diseases. If the user as an admin, then has the facility to add user data or disease data, while the user is not allowed to add data. The shape of the design can be seen in Figure 3

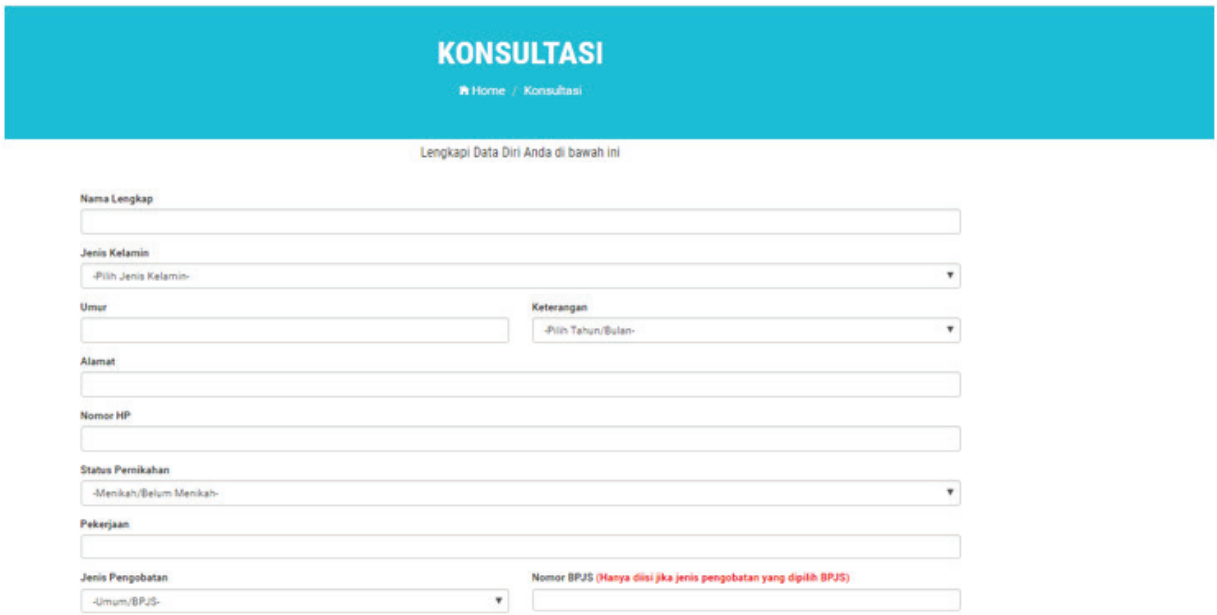

Figure 3 Self Data Form

2. Relationship of Expert Diagnosis System with Validity Doctor's diagnosis

Table 1 Distribution of Respondent Characteristics by Gender, Age, Doctor Check Up, Occupation, Marital Status, Accuracy Value, DF, CS and Bayes

Variable	Frequenci	Percent
Gender		
Female	129	64,5
Male	71	35,5
Age		
5-15 years	47	23,5
16-26 years	65	32,5
27-37 years	42	21
38-48 years	23	11,5
49-59 years	20	10
60-70 years	3	1,5
Diagnosis Doctor		
Doctor A	99	49,5
Doctor B	101	50,5
Occupation		
Work	73	36,5
Not work	127	63,5
Marital status		
Married	83	41,5
Single	117	58,5
Accuraci Value		
Accurate	122	61
No Accurate	78	39
DS value		
Very Sure	123	61,5
Sure	74	37
Almost Sure	3	1,5
Nilai CF		
Sure	131	65,5
Almost Sure	69	34,5
Bayes Value		
Sure	126	63
Almost Sure	74	37
Total	200	100

Table 2 Relationship of Accuracy Values with Doctor Diagnosis Validity

Variable	Accuracy Values with Doctor Diagnosis				Pvalue
	Accuraci		No Accurace		
	Frequenci	Percent	Frekuensi	Percent	
Age					
5-15 years	30	24,6	17	21,7	
16-26 years	42	34,4	23	29,4	
27-37 years	25	20,5	17	21,8	0,649
38-48 years	11	9	12	15,3	
49-59 years	13	10,6	7	8,9	
60-70 years	1	0,8	2	2,5	
Marital Status					
Married	47	38,5	36	46,1	0,285
Single	75	61,5	42	53,9	
Diagnosis Doctor					
Doctor A	69	56,5	30	38,5	0.013
Doctor B	53	43,5	48	61,5	
DS Value					
Very Sure	97	77,6	26	33,3	
Sure	25	20,4	49	62,8	0.000
Almost Sure	0	0	3	3,9	
CF Value					
Sure	99	81,1	32	41	0.000
Almost Sure	23	18,9	46	59	
Bayes Value					
Sure	97	79,5	29	37,1	0.000
Almost Sure	25	20,5	49	62,9	
Total	122	100	78	100	

Discussion

Expert system is one branch of artificial intelligence, which is a computerized application that tries to imitate the reasoning process of an expert in solving specific problems by making a decision. The basic of an expert system is how to transfer the knowledge which are owned by an expert in this case is dentist to a computer, and how to make decisions and draw conclusions based on that knowledge. [8], [9], [10], [11], [12]

As the times evolve, the field of dentistry has utilized technology in an effort to improve better services in diagnosing diseases, one of which is dental and oral disease. [13], [14] Teeth are one of the chewing organs that are very important in digestion process in the human body. [15], [16] If the tooth is disrupted, it will cause a variety of complaints and symptoms that can be fatal. Considering that experts and hours of practice are limited, so patients cannot consult with experts anytime and anywhere, we need an expert system that can replace the role of an expert. [17], [18]

The research results that will be discussed are the expert system designed using three methods, the number of diseases discussed in this study as many as 19 diseases with 61 symptoms observed, and the knowledge base is represented in the form of If-Then Rules. Each table of research results will be interpreted and given an accurate explanation.

Table 1 explains that the number of respondents who filled the expert system were 200 people with the most respondents, namely women (64.5%), ages 38-48 (11.5%), Doctor B (50.5%), not working (63.5%), unmarried (58.5%), Accuracy value (61%), DS Value (61.5%), CF Value (65.5%) and Bayes Value (63%). From the results of a trial of 200 cases of expert system diagnosis data with the doctor diagnosis results obtained in accordance with using the three methods. The test results can be used as a percentage that with expert knowledge that is obtained results above 60% of the truth value. The test results can be used as a percentage that with expert knowledge that is used obtained results above 60% of the truth value. This is different from the results of research conducted by Novi. AH (2014) which explains that the truth percentage of expert knowledge in diagnosing diseases is 100% using one method, the DF method. [19]

This is in accordance with DF theory which explains that a mathematical theory for proving hypotheses is based on belief functions and plausible reasoning, which is used to combine separate pieces of information (evidence) to calculate the likelihood of an event. The DF theory is based on two ideas namely the idea of obtaining a degree of trust from various subjective possibilities and the rules of the DF itself to combine the degree of trust based on the evidence obtained. DS theory is generally written in certain time intervals. [20]

Another study conducted by Jaenal Arifin using another method is CF explained that the level of trial results to determine the diagnosis of dental and oral diseases with a trial of 10 data resulted in a match rate of 9 data so that the accuracy rate was 90%. [21] Research conducted by Ingrid N, MY, etc. (2016) explains that the application of an expert system uses the CF method in early detection of dental disease before further examination to the expert physician showing the results that the results given by the system are the same as the results given by the system expert, is dentist. [22]

CF is a method to prove whether a fact is certain or uncertain in the metric form that is usually used in expert systems. CF was introduced by Short life Buchanan in making MYCIN. CF is the clinical parameter value given by MYCIN to show the magnitude of the trust. [23]

The advantage of the CF method is suitable for use in expert systems to measure whether something is certain or uncertain, calculations using this method in a single count can only process 2 data so that the accuracy of the data can be maintained. The disadvantages of the Certainty Factor method are: the general idea of modeling human uncertainty using numerical certainty factor methods is usually debated, this method can only process uncertainty or certainty in only 2 data only. Need to do several times the processing of data that is more than 2 pieces. [24]

Some of the research results conducted by previous researchers show that the method used is only one method and uses relatively little data. The data used not come from data directly from patients, while the research we used was using 3 methods at the same time. The use of three methods at the same time is used to see whether the results are different or not, but the results obtained are all the same percentage.

Table 2 explains the significant relationship between the value of accuracy with the validity of the doctor's diagnosis results seen from the diagnosis doctor variable p (0.013) < p (0.05), DS, CF and Bayes Value each

having the same value is p (0.000) < p (0.05).

After seeing that there is a significant relationship between the diagnosis doctor variable and the expert system accuracy value then it proves there are similarities between the results of the 2 dentist examinations and the computer expert system. The similarity of the results of the diagnosis of the two doctors shows that the competency between one dentist and the other is the same so that in research it is proven that whatever or whoever is involved in the early diagnosis of the disease through an expert system, it will result in a high accuracy value

Therefore, the expert system is designed to be able to imitate the expertise of an expert in answering questions and solving a problem. Expert system will provide a solution to a problem obtained from dialogue with users. With the help of an expert system, a person who is not an expert or expert can answer questions, solve problems and make decisions that are usually made by an expert. [24]

Knowledge stored on a computer is called a knowledge base. There are 2 types of knowledge are facts and procedures. One feature that must be possessed by an expert system is the ability to reason. If the skills are stored as a knowledge base and the program is able to access the database, then the computer must be programmed to make inferences. This inference process is packaged in the form of an inference engine. Most commercial expert systems are made in the form of rule-based systems, where the knowledge is stored in the form of rules. The rule is usually in the form of IF-THEN. Another feature of the expert system is the ability to recommend. This ability distinguishes expert systems from conventional systems. [7]

Conclusion

Applications built using the Certainty Factor, Dempster Shafer and Bayes methods can be used by users to detect dental disease early before making further examinations to a specialist. The test results given by the system are the same as the results given by experts (dentists). The system of early diagnosis of dental and oral diseases has a very significant effect (p 0.00) on the level of validity of the dentist final diagnosis.

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Conflicts of Interest: The authors alone are responsible for the views expressed in this article and they do not necessarily represent the views, decisions, or policies of the institutions with which they are affiliated.

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