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Diagnosis Of Cancer Of The Women In The Content Using Bayes Theorem

M. Syaifuddin[1]

[1]Information Systems Study Program, Stmik Triguna Dharma, Indonesia

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ABSTRACT (10 PT)

Uterine cancer is a malignant process an event that occurs in female reproduction, so that the surrounding tissue cannot perform its function properly. This condition is usually accompanied by abnormal vaginal bleeding and discharge, this disease can occur repeatedly. The possibility of uterine cancer can attack the womb for pregnant women as great as those who are not pregnant. The condition of cancer in the uterus or reproduction during pregnancy is not something that is taken lightly so that it is immediately possible to take appropriate action and treatment. For proper treatment, of course, requires an expert who in this case is a doctor. However, it is not uncommon to get service and treatment from a doctor, having to wait a long time. This is because there are few doctors who handle this case but there are many patients who must be treated. This is not to mention the costs incurred are fairly large. With a fairly large cost, it is not uncommon for people to choose traditional medicine. Therefore, to overcome difficult problems and the high cost of treatment, one alternative is to provide an application to diagnose uterine cancer. With an application that can be accessed online, it makes it easier for the public to find out early on and seek treatment. The results of research that adopts an expert system and Bayes' theorem as an alternative are difficult and expensive to treat, so that people are more helped and get education from an early age.

Corresponding Author:

M. Syaifuddin
Information Systems Study Program, Stmik Triguna Dharma, Indonesia
Email: msyaifuddins@gmail.com

1. INTRODUCTION

Uterine cancer is a malignant process that occurs in female reproduction, so that the surrounding tissue cannot perform its function properly. This condition is usually accompanied by abnormal vaginal bleeding and discharge, this disease can occur repeatedly[1]. In the early stages, the occurrence of uterine cancer there are no special symptoms. Symptoms usually arise in the form of irregular menstrual cycles, amenorrhea, hypermenorrhea, and frequent distribution of vaginal secretions or intermenstrual bleeding, post coitus and strenuous exercise. The typical bleeding that occurs in this disease is blood that comes out in the form of mucoid [2]. The possibility of uterine cancer can attack the womb for pregnant women as great as those who are not pregnant The condition of cancer in the uterus or reproduction during pregnancy is not something that is taken lightly. This is because cancer of the uterus is a dangerous threat to women who are pregnant or even with their babies [4]. To overcome these problems, it can be solved by using the diagnosis of an expert.

An expert is a person who has expertise or knowledge in a particular field. With the help of an expert, everything will be handled appropriately and quickly[5]. However, to be able to conduct consultations with experts is not easy and cheap, this is due to their expertise which requires struggle and research that is not easy. The knowledge of an expert has limitations of space and time so that it cannot be reached at a certain time and space. So that this knowledge can be felt by the wider community and is available at any time when needed and needed, the knowledge of an expert must be poured into a computer[6]. By pouring someone's expertise, the reach of an expert's knowledge can be wider and can be accessed as needed.

Knowledge of an expert who has been computerized is called an expert system. With this expert system, a person's knowledge can be used widely and not limited by time. With this expert system, people who need solutions and

knowledge will feel like they are consulting with an expert directly. This is because the expert system provides facilities for questions and solutions as an expert treats patients [7].

To make computers able and able to solve a problem related to the field of expert expertise, a solution algorithm is needed. In an expert system there are many algorithms that can be used, one of which is the Bayes theorem. This algorithm has advantages and good accuracy in solving a problem. This is because the solution uses and reads the previous history (probability). By providing such a solution, it can be concluded that the solution given is close to a high truth.

2. RESEARCH METHOD

2.1 Uterine Cancer

Cancer is a cell that grows continuously uncontrollably, indefinitely and abnormally or abnormally. Cancer can attack all levels of society[8]. The uterus is the place where the fetus grows and develops during pregnancy. The lining of the uterus is called the endometrium. At the bottom of the uterus, there is an organ that connects to the vagina, namely the cervix or cervix [9][10]. Uterine cancer is a malignant process that occurs in female reproduction, so that the surrounding tissue cannot perform its function properly. This condition is usually accompanied by abnormal vaginal bleeding and discharge, this disease can occur repeatedly[11].

2.2 Expert system

Expert System is a branch or part of the scientific clump of artificial intelligence (artificial intelligent). With an expert system, someone who uses it does not have to be an expert in the field, but must master and understand how to use a system. With the development of technology, both in terms of information and communication devices as it is today, someone's computerized knowledge can reach unlimited space and time [12][13].

2.3 Bayes' Theorem Method

Bayes theorem is used to calculate_probability_occurrence_of an event based influence obtained from observations. Besides this, the Bayes method makes use of the sample data obtained from the population and also takes into account an initial distribution which is called the prior distribution [14].

Bayes' theorem is a theorem with two different interpretations. In Bayesian interpretation, this theorem states how far the subjective degree of belief must change rationally when there are new clues. In the interpretation of the frequency_theorem it describes the inverse_representation of the probability of two_events. The form of Bayes' theorem is single evidence E and single hypothesis H. Bayesian probabilities are one way to solve uncertainty by using . Formula_Bayes declared_as follows [15].

$$P(H \mid E) = \frac{\mathrm{p(E \mid H)\ .p(H)}}{\mathrm{p(E)}} \quad (1)$$

Explanation :

P(H | E): the probability of the hypothesis H if there is evidence E
P(E | H): the probability of the emergence of evidence E if the hypothesis H
P(H): the probability of the hypothesis H regardless of any evidence
P(E) : probability of evidence E regardless of anything
The application of Bayes' theorem to overcome uncertainty, if more than one evidence appears, it is written as follows:

$$P(H \mid E, e) = \mathrm{P(H|E)}\frac{\mathrm{p(e|E.H)}}{\mathrm{p(e|E)}} \quad (2)$$

Explanation :
e: old evidence
E: new evidence
P(H|E,e): the probability of a hypothesis H, if new evidence appears E from old evidence e
P(e|E,H) : probability of the relationship between e and E if hypothesis H is true
P(e|E) : probability_relationship between e_and E regardless of any hypothesis
P(H|E) : probability_hypothesis H if there is_evidence E

2.4 *(Data Collecting)*

Some of the things carried out in this research are as follows:
1. Observation
In the observation_researchers do pre-research_first to_look for problems that occur_in diagnosing_uterine_cancer in_utero. The data used in this research is primary data.
2. Interview_

The interview technique was carried out to dig up information about the symptoms and types of uterine cancer in the womb. Based on the results of interviews conducted, the initial data becomes the benchmark in diagnosing uterine cancer in the womb:

1. **Disease Data**

Table 1 Disease Data and Solutions for Uterine Cancer in the womb

Disease Code	Uterine cancer in the womb	Solution
P001	Cervical / cervical cancer	Surgery, radiotherapy, chemotherapy
P002	Uterine cancer	Hysterectomy, radiotherapy
P003	Ovarian cancer	Surgery, Chemotherapy
P004	Endometrial cancer	Administration of non-steroidal anti-inflammatory drugs, hormone therapy, laparoscopy, laparotomy, hysterectomy
P005	Vaginal cancer	Surgery, radiotherapy

2. **Symptom Data**

Table 2 Data on symptoms – Symptoms of Uterine Cancer in the womb

No	Symptom Code	Symptom Name
1	G001	There is an abnormal lump in the vagina
2	G002	Weight loss
3	G003	Menstruation is not normal and the amount is large
4	G004	Reddish yellow vaginal discharge
5	G005	Bleeding and pain when urinating
6	G006	Vaginal smells very pungent
7	G007	Loss of appetite
8	G008	Stomach looks swollen
9	G009	Pain when urinating
10	G010	Lower back pain
11	G011	Digestive tract is constantly disturbed
12	G012	Shortness of breath and fever
13	G013	Frequent urination
14	G014	Frequent excessive itching in the vagina
15	G015	Often very sick during menstruation in the lower abdomen
16	G016	Frequent pain and heaviness in the pelvis
17	G017	Frequent pain during sexual intercourse
18	G018	Frequent bleeding during sexual intercourse
19	G019	Frequent bleeding between 2 menstrual cycles
20	G020	Frequent vaginal bleeding
21	G021	Difficult to defecate
22	G022	Pain when urinating
23	G023	A scab appears on the inside of the vagina
24	G024	Injuries to the vaginal lining

3. Knowledge Base

Table 3 Knowledge Base Symptoms - Symptoms of Uterine Cancer in the womb

No	Symptom Code	P01	P002	P003	P004	P005
1	G001					*
2	G002			*		
3	G003		*			
4	G004	*	*		*	*
5	G005				*	
6	G006	*				
7	G007			*		
8	G008			*		
9	G009		*			
10	G010				*	
11	G011			*		
12	G012			*		
13	G013			*		
14	G014	*				
15	G015	*				
16	G016			*		
17	G017			*	*	
18	G018	*	*			
19	G019	*	*			
20	G020	*	*			
21	G021			*		*
22	G022				*	
23	G023	*				
24	G024					*

4. Algorithm

1. Adding Probability Values

After the probability value has been obtained, then the next probability value will be added up. Based on the new sample data sourced from the consultation table, they are as follows:

Table 4 Symptoms of uterine cancer in the womb and the value of symptoms based on the sample consultation

Disease Code	Disease Code	Symptom Value
P001	G004	0,7
	G006	0,7
P002	G003	0,7
	G004	0,7
	G009	0,6
P003	G002	0,7
	G007	0,7
P004	G004	0,7
	G005	0,8
	G010	0,8
P005	G001	0,8
	G004	0,7

$$\sum_{Gn}^{n} k = 1 = G1 + \cdots + Gn \quad (3)$$

1. P001 = Cervical / cervical cancer
G004 = P (E|H_4) = 0.7
G006 = P (E|H_6) = 0.7

$$\sum_{G2}^{2} k = 2 = 0.7 + 0.7 = 1.4 \quad (4)$$

2. P002 = Uterine cancer
G003 = P (E|H_3) = 0.7
G004 = P (E |H_4) = 0.7
G009 = P (E |H_9) = 0.6

$$\sum_{G3}^{3} k = 3 = 0.7 + 0.7 + 0.6 = 2 \quad (5)$$

3. P003 = Ovarian cancer
G002 = P (E|H_2) = 0.7
G007 = P (E|H_7) = 0.7

$$\sum_{G2}^{2} k = 2 = 0.7 + 0.7 = 1.4 \quad (6)$$

4. P004 = Endometrial cancer
G004 = P (E|H_4) = 0.7
G005 = P (E|H_5) = 0.8
G010 = P (E|H_{10}) = 0.8

$$\sum_{G3}^{3} k = 3 = 0.7 + 0.8 + 0.8 = 2.3 \quad (7)$$

5. P005 = Vaginal cancer
G001 = P (E|H_2) = 0.8
G004 = P (E|H_7) = 0.7

$$\sum_{G2}^{2} k = 2 = 0.8 + 0.7 = 1.5 \quad (8)$$

1. Looking for the probability value of the hypothesis H regardless of the evidence Mencari probabilitas hipotesa H tanpa memandang *evidence* dengan cara membagikan nilai probabilitas *evidence* awal dengan hasil penjumlahan probabilitas berdasarkan data sampel baru

$$P\ (H_i)\ =\ \frac{P\ (E\ |H_i)}{\sum_{k=n}^{n}} \quad (9)$$

1. P001 = Cervical / cervical cancer
   a. $G004 = P\ (H_4)\ =\ \frac{0.7}{1.4}\ = 0.5$
   b. $G005 = P\ (H_5)\ =\ \frac{0.7}{1.5}\ = 0.5$
2. P002 = Uterine cancer
   a. $G003 = P\ (H_3)\ =\ \frac{0.7}{2}\ = 0.35$
   b. $G004 = P\ (H_4)\ =\ \frac{0.7}{2}\ = 0.35$
   c. $G009 = P\ (H_9)\ =\ \frac{0.6}{2}\ = 0.3$
3. P003 = Ovarian cancer
   a. $G002 = P\ (H_2)\ =\ \frac{0.7}{1.4}\ = 0.5$
   b. $G007 = P\ (H_7)\ =\ \frac{0.7}{1.4}\ = 0.5$
6. P004 = Endometrial cancer
   c. $G004 = P\ (H_4)\ =\ \frac{0.7}{2.3}\ = 0.304$
   d. $G005 = P\ (H_5)\ =\ \frac{0.8}{2.3}\ = 0.347$
   e. $G010 = P\ (H_{10})\ =\ \frac{0.8}{2.3}\ = 0.347$
4. P005 = Vaginal cancer
   a. $G001 = P\ (H_1)\ =\ \frac{0.8}{1.5}\ = 0.533$
   b. $G004 = P\ (H_4)\ =\ \frac{0.7}{1.5}\ = 0.466$

1. Looking for the probability value of the hypothesis H regardless of the evidence

Look for the probability of hypothesis H regardless of the evidence by dividing the probability value of the initial evidence with the sum of the probabilities based on the new sample data.

$$\sum_{k=n}^{n} = P\ (H_i) * P\ (E|H_i) + \cdots + P(H_i) *\ P\ (E|H_i)$$

1. P001 = Cervical / cervical cancer

$$\sum_{k=2}^{2} = (0.7 * 0.5) + (0.7 * 0.5) = 0.7$$

2. P002 = Uterine cancer

$$\sum_{k=3}^{3} = (0.7 * 0.35) + (0.7 * 0.35) +\ (0.6 * 0.3)\ = 0.67$$

3. P003 = Ovarian cancer

$$\sum_{k=2}^{2} = (0.7 * 0.5) + (0.7 * 0.5)\ = 0.7$$

4. P004 = Endometrial cancer

$$\sum_{k=3}^{3} = (0.7 * 0.304) + (0.8 * 0.347) +\ (0.8 * 0.347)\ = 0.768$$

5. P005 = Vaginal cancer

$$\sum_{k=2}^{2} = (0.8 * 0.533) + (0.7 * 0.466)\ = 0.753$$

2 . Finding the value of the hypothesis H is true if given evidence

The value of P(Hi|Ei) or the probability of the hypothesis H, by multiplying the result of the probability value of the hypothesis regardless of the evidence with the initial probability value and then dividing by the result of the probability of the hypothesis by looking at the evidence.

$$P\ (H_i|E_i) = \frac{P(H_i) * P(E|H_i)}{\sum_k^n = n}$$

1. P001 = Cervical / cervical cancer
   a. $P\ (H_4|E) = \frac{0.7\ *\ 0.5}{0.7} = 0.5$
   b. $P\ (H_5|E) = \frac{0.7\ *\ 0.5}{0.7} = 0.5$
2. P002 = Uterine cancer
   a. $P\ (H_3|E) = \frac{0.7\ *\ 0.35}{0.67} = 0.365$
   b. $P\ (H_4|E) = \frac{0.7\ *\ 0.35}{0.67} = 0.365$
   c. $P\ (H_9|E) = \frac{0.6\ *\ 0.3}{0.67} = 0.268$
3. P003 = Ovarian cancer
   a. $P\ (H_2|E) = \frac{0.7\ *\ 0.5}{0.7} = 0.5$
   b. $P\ (H_7|E) = \frac{0.7\ *\ 0.5}{0.7} = 0.5$
4. P004 = Endometrial cancer
   a. $P\ (H_4|E) = \frac{0.7\ *\ 0.304}{0.768} = 0.194$
   b. $P\ (H_5|E) = \frac{0.8\ *\ 0.347}{0.768} = 0.289$
   c. $P\ (H_5|E) = \frac{0.8\ *\ 0.347}{0.768} = 0.289$
5. P005 = Cancer vagina
   a. $P\ (H_1|E) = \frac{0.8\ *\ 0.533}{0.753} = 0.566$
   b. $P\ (H_4|E) = \frac{0.7\ *\ 0.466}{0.753} = 0.433$

3. Finding Conclusion Value

Finding the value of the conclusion from the Bayes theorem method by multiplying the probability value of the initial evidence or P (E|Hi) with the true value of the hypothesis Hi if given evidence of E or P (Hi|E) and adding up the multiplication.

$$\sum_{K=1}^{n} bayes\ = P\ (E|H_i) *\ \ P(H_i|E_i) \ldots . + P(E|H_i) *\ \ P(H_i|E_i)$$

1. P001 = Cervical / cervical cancer

$$\sum_{K=2}^{2} bayes\ = (0.7 * 0.5) + (0.7 * 0.5) =\ \ 0.7$$

2. P002 = Uterine cancer

$$\sum_{K=3}^{3} bayes\ = (0.7 * 0.365) + (0.7 * 0.365)\ +\ (0.6 * 0.268)\ =\ 0.672$$

3. P003 = Ovarian cancer

$$\sum_{K=2}^{2} bayes\ = (0.7 * 0.5) + (0.7 * 0.5) =\ \ 0.7$$

4. P004 = Endometrial cancer

$$\sum_{K=3}^{3} bayes\ = (0.7 * 0.194) + (0.8 * 0.289)\ +\ (0.8 * 0.289)\ =\ 0.77$$

5. P005 = Vaginal cancer

$$\sum_{K=2}^{2} bayes\ = (0.8 * 0.566) + (0.7 * 0.433) =\ \ 0.76$$

From the calculation process using the Bayes theorem above, it is known that the patient who did the consultation experienced endometrial cancer with a confidence value of 0.77 or 77%.

4. RESULT

1. Main Menu Page Display

The main menu page is the initial display of the system to perform data processing in the expert system to diagnose cancer in the womb. Below is a display of the main menu page is as follows:

Figure 1 Main Menu Page Display

1. Process Form Page Display
The following is the display of the Process Form:

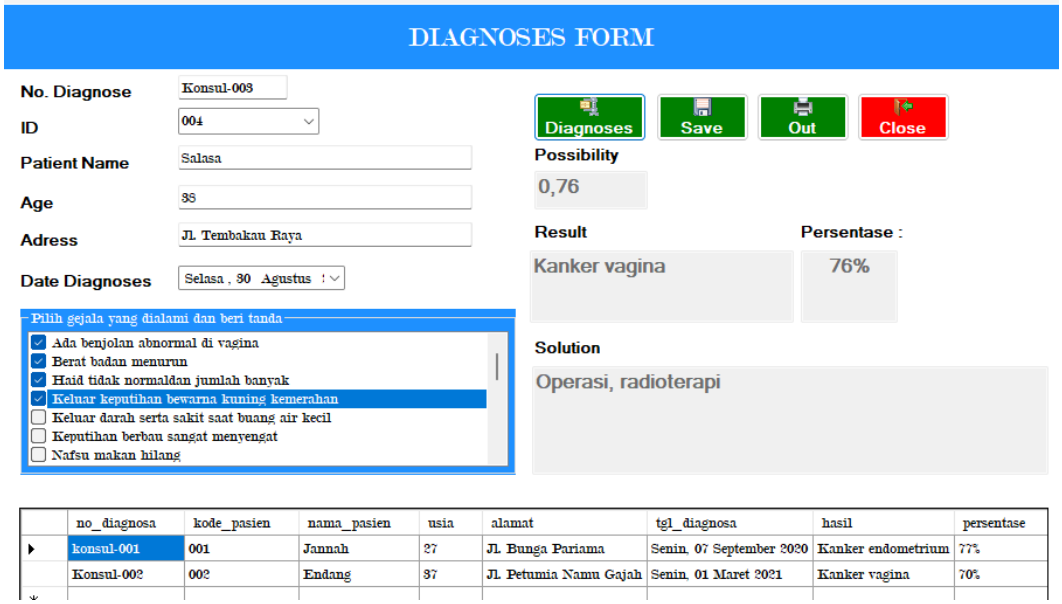
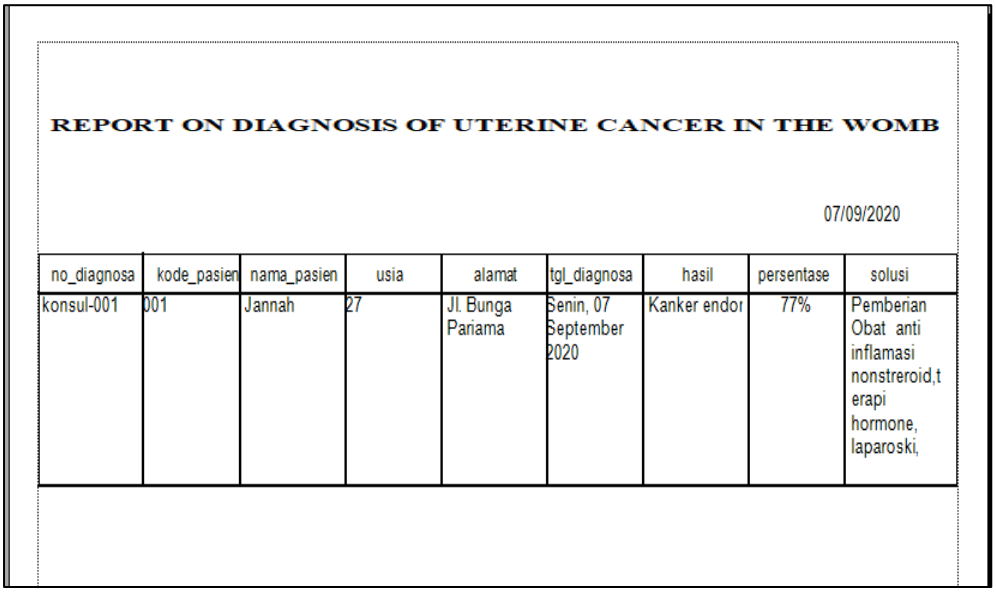


Figure 2 Display Process Form

2. Display of Calculation Result Report form
The following is a display of the Calculation Result Report form:



REPORT ON DIAGNOSIS OF UTERINE CANCER IN THE WOMB

07/09/2020

no_diagnosa	kode_pasien	nama_pasien	usia	alamat	tgl_diagnosa	hasil	persentase	solusi
konsul-001	001	Jannah	27	Jl. Bunga Pariama	Senin, 07 September 2020	Kanker endor	77%	Pemberian Obat anti inflamasi nonstreroid,terapi hormone, laparoski,

Figure 5 Display of Calculation Result form

5. CONCLUSION

So the conclusion that can be concluded from the results of the diagnosis of uterine cancer in the womb is the analysis of problems to diagnose uterine cancer in the womb using an artificial intelligence system, namely an expert system that adopts the Bayesian theorem method which is able to recognize the type of disease. The process of diagnosing uterine cancer in the womb using the Bayesian theorem method begins with the process of determining the disease and symptoms, then the calculation process is carried out by selecting the symptoms experienced so that the conclusion value of each disease is determined based on the highest value.

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