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DIAGNOSE THYROID LEAF DISEASE BY USING DEMPSTER SHAFER METHOD

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ABSTRACT

To make a diagnosis of thyroid gland disease by using technology required a method. The method used in this research is dempster shafer method. Dempster shafer method is a method that takes the value of density as the end result of disease diagnosis process. The value will be the benchmark to find out how likely a person exposed to thyroid gland disease suffering symptoms related to the disease. The final result in solving the problem is to provide a density value as a benchmark value of the certainty of someone affected by thyroid gland disease.

Keywords*: Expert System, Thyroid Disease, Dempster Shafer Method.*

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1. INTRODUCTION

Thyroid disease is a disorder or problem that occurs in the thyroid gland. The gland located under the Adam's apple is responsible for regulating the various metabolic systems in the body so that its role is very important to us. The performance of the thyroid gland is controlled by the brain. When the body has a deficiency or excess thyroid hormone, the brain will stimulate the thyroid gland to adjust its performance so that the hormone levels are back in balance.

To make a diagnosis of thyroid gland disease by using technology required a method. The method used in this research is dempster shafer method. The dempster shafer method is a method that takes the density value as the end result of the disease diagnosis process. The value will be a benchmark to find out how likely it is a person exposed to thyroid gland disease suffering symptoms related to the disease.

Symptoms of thyroid gland disease are often not realized because of the absence of special symptoms that indicate the presence of thyroid disease. If not detected early, it will cause the disease getting worse. A system has certain characteristics that is:

1. System components (Components)
   A system consists of a number of interacting components, which work together to form a unity. The components of the system can be a form of subsystem. Each subsystem has the properties of a system that performs a particular function and affects the overall system process.
2. System limitations (Boundary)
   The scope of the system is the area that limits the system with other systems or systems with external environment. This system boundary allows a system to be viewed as an indivisible whole.
3. Environment outside the system (Environtment)
   Any form that exists outside the scope or limits of the system that affect the operation of the system is called the external environment of the system. The external environment of this system can be profitable and can also harm the system.
4. System connector (Interface)
   The media that connects the system with other subsystems is called the system or interface interface. This connection allows resources to flow from one subsystem to another. The output of a subsystem will be input to other subsystems by passing the link.
5. Input system (Input)
   The energy put into the system is called the system input, which can be maintenance (input maintenance) and input signal (input signal).
6. Output system (Output)
   The results of energy are processed and classified into useful outputs. This output is an input to other subsystems.

7. Processing system (Process)
   A system that can have a process that will convert input into output.
8. Target system (Objective)
   A system has definite and deterministic goals and objectives. If a system does not have a target, then the system operation is useless.

2. MATERIALS AND METHODS

2.1 Thyroid Disease

Thyroid disorders (thyroid gland) 4-5 times more common in women than men. Most occur when pregnant women are due to hormonal changes and metabolism. A good thyroid function is very important for the mother and fetus it contains. Especially during the first 3 months of pregnancy, at that time only the mother who became the source of thyroid hormone for the fetus. The most common disorder in pregnant women is lack of thyroid hormone (hypothyroidism). Thyroid deficiency in pregnant women is generally characterized by high TSH values found in about 2.5% of normal pregnancies. 4-9% of women of childbearing age (18-45 years) are known to have elevated TSH levels. High TSH levels significantly affect thyroid function, particularly during pregnancy. Thyroid disease can be categorized into several types, including:

1. Hypothyroidism
   Hypothyroidism is the condition of too little thyroid hormone produced by the thyroid gland so that the body is deficient. This condition is more often experienced by women (especially elderly) and has common symptoms such as constipation, dry skin, fatigue, weight gain for no apparent reason, and more sensitive to cold.
2. Hyperthyroidism
   If the thyroid gland produces excessive thyroid hormones in the body, you may experience overactive thyroid gland or hyperthyroidism. The disease is generally characterized by rapid or irregular heartbeat, sudden weight loss despite increased appetite, sweating, nervousness, and anxiety.
3. Mumps
   Thyroid disease is a swelling of the thyroid gland which generally causes a lump in the neck. In addition to lumps that become the main symptoms, people with this disease can also experience changes in voice, difficulty breathing and swallowing, and a sense of tightness in the throat.
4. Thyroid Nodules
   Thyroid nodules are solid or water-filled lumps that arise in the thyroid gland. This lump can be a benign tumor or cyst. Thyroid nodules rarely cause symptoms so that they are generally only detected when sufferers undergo general medical examinations. But if the nodule grows large enough, this condition can cause difficulty breathing, difficulty swallowing and pain in the throat.

2.2 Disease of the Thyroid Gland in Pregnancy

Thyroid disorders may appear to be too little thyroid hormone or too much thyroid hormone. Too thyroid hormone called hypothyroidism. In this disorder, metabolism is faster and usually caused by graves disease. The disorder is usually treated with surgery or drugs to reduce the amount of thyroid hormone system body. If this disorder is not treated during pregnancy, there is a high risk of premature birth and low fetal weights. If care should be taken during pregnancy, safe medications are available.

Symptoms of the thyroid gland in pregnancy:

1. Easily tired
2. Nausea
3. Weight gain
4. Changes in skin, hair and nails
5. Dizziness
6. Mood changes
7. Headache

Individuals at high risk for experiencing thyroid deficiency during pregnancy are individuals who have:

1. Tendency of thyroid deficiency before pregnancy
2. History of autoimmune thyroid disease in the family and self
3. Diabetes mellitus type 1
4. Other autoimmune disorders, such as rheumatoid arthritis, Sjogren's syndrome

Decreased thyroid reserves (probably due to a history of neck irradiation and partial thyroidectomy).

2.3 Disease of the Thyroid Gland in Parents

When it gets older, the symptoms of thyroid hormone disorder become unclear. It may seem lighter, it may also seem more severe than thyroid disease in young people. Typical thyroid signs are often blurred when it

comes to elderly people. If there is another disease in the elderly who is not from the thyroid gland, bias also affects the course of thyroid disease, even bias to change the blood hormone examination results. If you are 60 years old, the possibility of hypothyroidism to 20%. Compared with men, older women are more likely to develop hypothyroidism. Appearance of a person experiencing the aging process is actually similar to the description of a hypothyroid that is, mirror and decreased metabolism of the body.
Symptoms of the thyroid gland in the elderly:
1. Heart palpitations
2. Sweating a lot
3. The eyes stick out
4. Genetar hands

2.4 Thyroid Gland Disease in Children

Compared with adults, thyroid disease in children is very rare, however, thyroid gland abnormalities that occur in children is very important to know, because the bias interfere with the growth of children, even damage the development of the brain. Thyroid disease in adults who are left untreated for years without occasional recoverable bias. Unlike adults, hypothyroidism in children who are not treated promptly bias causes mental disability and the child's body will grow dwarf. While hyperthyroidism in children can trigger the growth and mettabolisme very quickly even in hyperthyroid infants will result in death.
Thyroid symptoms in children:
1. Enlarged thyroid gland
2. Weight does not increase despite drinking much milk
3. Eyes that protrude out
4. Heart rate becomes fast, even high blood pressure
5. Regular Mumps
Hair loss
7. Painful joints
8. There is an emotional change
9. Swollen glands
10. Easily tired

Thyroid disorders may appear to be too little thyroid hormone or too much thyroid hormone. Too thyroid hormone called hypothyroidism. In this disorder, metabolism is faster and usually caused by graves disease. The disorder is usually treated with surgery or drugs to reduce the amount of thyroid hormone system body. If this disorder is not treated during pregnancy, there is a high risk of premature birth and low fetal weights. When it gets older, the symptoms of thyroid hormone disorder become unclear. It may seem lighter, it may also seem more severe than thyroid disease in young people. Typical thyroid signs are often blurred when it comes to elderly people. If there is another disease in the elderly who is not from the thyroid gland, it can also affect the course of thyroid disease. Compared with men, older women are more likely to develop hypothyroidism. Compared with adults, thyroid disease in children is very rare, however, thyroid gland abnormalities that occur in children is very important to know, because the bias interfere with the growth of children, even damage the development of the brain. Thyroid disease in adults left untreated for years without occasional remedies. In contrast to adults, hypothyroidism in untreated children can cause mental disability and the child's body will grow dwarfed.

Kode	Sympton Name	Probabilitas
G01	Easily tired	0.3
G02	Weight gain	0.4
G03	Skin, hair and nail changes	0.3
G04	Nausea	0.2
G05	Dizzy	0.4
G06	Mood changes	0.3
G07	Headache	0.6
G08	Diametes mellitus type 1	0.5
G09	Family history of illness	0.7
G10	Tends to lack of thyroid before pregnancy	0.6
G11	Autoimmune disorders	0.4
G12	Heart beat	0.7
G13	Sweating a lot	0.5
G14	The eyes stick out	0.4
G15	Hand shaking	0.7
G16	Weight is not increased	0.3
G17	The thyroid gland enlarges	0.6
G18	Hair loss	0.3
G19	Joint pain	0.3
G20	Emotional change	0.2

Table-1: Probability Value Symptoms

2.3 System Algorithm

The system algorithm in diagnosing thyroid gland disease is calculated from several steps of calculating dempster shafer as follows.

1. Initialize symptom data
2. Determine the value of plausibility
3. Calculate the density value

For example, a child experiences symptoms that appear as follows:

G07 = headache
G012 = heart palpitations
G013 = sweats a lot
G015 = shaking hands

To find out how strong the child is suffering from thyroid gland disease, then by dempster shafer method is calculated on the discussion of system algorithms.

2.4 Calculating Density Values

The steps taken to find the dempster shafer density values based on four symptoms in the case are as follows:

M_1 (G01) = 0.6 M_2 (G02) = 0.7

$M_1\{\theta\}$ = 0.4 $M_2\{\theta\}$ = 0.3

$$m3 = \frac{m1 * m2}{1 - (m1\_\theta * m2)}$$

$$M3 = \frac{0.6 * 0.7}{1 - (0.4 * 0.7)} = \frac{0.42}{0.72} = 0.58$$

0.58 is the density value of thyroid gland disease of 2 symptoms G01 and G02. For further on symptom G03 then calculated as follows:

M_1 (G01,G02) = 0.58 M_2 (G03) = 0.5

$M_1\{\theta\}$ = 0.42 $M_2\{\theta\}$ = 0.5

$$M3 = \frac{0.58 * 0.5}{1 - (0.42 * 0.5)} = \frac{0.26}{0.79} = 0.33$$

0.33 is the density of the thyroid gland density of 3 symptoms G01, G02 and G03. For further on the symptoms of G04 then calculated as follows:

M_1 (G01,G02,G03) = 0.33 M_2 (G04) = 0.7

$M_1\{\theta\}$ = 0.67 $M_2\{\theta\}$ = 0.3

$$M3 = \frac{0.33 * 0.7}{1 - (0.67 * 0.7)} = \frac{0.23}{0.53} = 0.43$$

0.43 is the density value of thyroid gland disease of 3 symptoms G01, G02, G03 and G04, which means the four symptoms in the case discussed have the percentage of the disease 43% (0.43 x 100). For further if there are symptoms of G05, then the calculation step to find the value of density of thyroid gland disease done the same way.

From the results seen in the above process which shows the 4 main symptoms selected, it is known the density value is 0.43 or can be said someone who has 4 symptoms have a certainty level of thyroid gland by 43%. Comparison of calculations made by the system has a difference of 0.02 with the calculations that have been done in chapter 3 previously with 4 similar symptoms that is 0.45.

3. CONCLUSION

Some conclusions from the process of designing expert systems for the diagnosis of thyroid gland disease according to the symptoms of the disease included in the calculation are as follows:

1. The calculation result of dempster shafer method represents the level of certainty as a result of thyroid gland disease.
2. Implementation of Dempster Shafer method is very easy to use in disease diagnosis process.
3. Expert systems that apply the dempster shafer method can be adapted well to help diagnose thyroid gland disease.

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