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DECISION SUPPORT SYSTEM FOR FOOD MENU SELECTION FOR PATIENTS WITH TYPHOID FEVER USING THE TOPSIS METHOD

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ABSTRACT

A decision support system (DSS) is a system that can help users find the best solution. The decision support system (DSS) has several implementation methods. One of the Decision Support System (DSS) methods is the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). The TOPSIS method is a weighted summation method with specified criteria. In this study, it was conducted to recommend the best food for typhoid patients. The results of the study found that the requirements determined for the best food recommendations were the nutritional content and condition of the patient. The nutritional content of food such as protein, carbohydrates, fat, fiber, vitamins, and minerals. The patient's condition consists of age, test results, weight, patient symptoms, and severity. Implementation of the Decision Support System (DSS) with the TOPSIS method in a case study in the form of a web application using the PHP programming language. The application makes it easy to recommend the best food for typhoid patients according to the patient's condition criteria. In addition, the flexibility of the application can provide convenience to add a list of foods along with the nutritional content of the food.

***Keywords**: Food Recommendations, TOPSIS, PHP*

INTRODUCTION

Typhoid fever is a disease that can occur due to direct contact with the bacteria Salmonella Typhi or Salmonella Paratyphi. Typhoid fever is usually characterized by prolonged fever; therefore, the treatment involves the administration of antibiotics. The fever in typhoid cases typically lasts for about 7 days and reaches its peak on the 14th.
In this study, the determination of food menus for patients with typhoid fever uses the TOPSIS method.[1][2]

TOPSIS is a method used in Decision Support Systems (DSS) to solve multi-criteria decision-making problems. This method selects the best alternative based on the concept of the shortest distance from the positive ideal solution and the farthest distance from the negative ideal solution. The TOPSIS method has been widely applied in various studies, such as decision-making for toddlers experiencing malnutrition and the selection of the best food menu for patients with Gastroesophageal Reflux Disease (GERD) [3]

The implementation of a Decision Support System (DSS) using the TOPSIS method can assist in determining appropriate food menu choices for patients suffering from typhoid fever. This approach involves evaluation based on specific criteria such as protein, carbohydrates, fat, vitamins & minerals, and fiber, to help identify food options that match the nutritional needs of the patient's body

This literature study includes a review of previous research relevant to the identified problem. This step aims to understand the methods that have been applied and the findings obtained from earlier studies. Thus, this research can develop more effective solutions based on existing insights.

a) TOPSIS
TOPSIS is a multi-criteria decision-making method that is effective in selecting food menus

for various health conditions, including typhoid fever, GERD, obesity, and diabetes mellitus [4][5]

b) Software Engineering (SE)
Software Engineering is a discipline that focuses on the development, design, maintenance, and quality management of software, aiming to create efficient and reliable software systems [6][6]

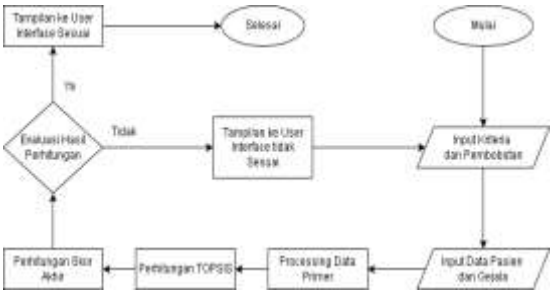
c) Web Programming
Web programming involves the development of information systems through the internet, supported by Software Engineering principles to build applications such as Decision Support Systems. TOPSIS is often used in the development of web-based DSS for various purposes.[7]

d) Implementation of Web Programming in DSS
Web programming using PHP enables the development of efficient and optimal DSS applications, as applied in various community training programs.[8]

e) PHP
PHP is a programming language for dynamic web development, operates on the server side, and is executed within the context of HTML.[9]

f) Laravel
Laravel is an open-source framework with features such as the Artisan CLI, bundling, and migration, which accelerate web development by integrating elements from various other frameworks.[10]

RESEARCH METHODS

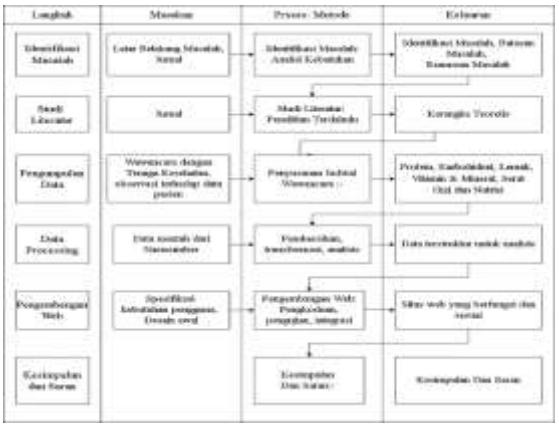


Gambar 1 Diagram Kerja Algoritma

1. **Start**: The initial point of the algorithmic process.
2. **Criteria and Weight Input**: Collecting and assigning weights to the evaluation criteria.
3. **Patient Data and Symptom Input**: Collecting and entering patient data and symptoms into the system.
4. **Primary Data Processing**: Processing primary data into computable values based on the defined criteria and weights.
5. **TOPSIS Calculation**: Applying the TOPSIS algorithm to calculate the preference value of each alternative.

6. **Final Score Calculation**: Calculating the final score based on the distances from the positive and negative ideal solutions.
7. **Evaluation of Calculation Results**: Examining whether the calculation results meet the expected outcomes and predefined criteria.
8. **Result and Report Display**: Displaying the results and reports if the calculation outcomes are appropriate.
9. **Inconsistent Result and Report Display**: Repeating the process if the calculation results do not meet the expected criteria.
10. **End**: Terminating the algorithmic process after all steps have been completed.

Based on the conceptual framework discussed, it can be concluded that the research workflow includes the following stages: **Problem Identification, Literature Review, Data Collection, Data Processing, Web Development, and the Preparation of Conclusions and Recommendations**.



a. **Problem Identification**
In this phase, the researcher formulates the problem by understanding its context, impact, and the importance of finding a solution. This process involves discussions with stakeholders and preliminary observations to ensure the relevance of the problem.

b. **Data Collection**
In this phase, the researcher collects the data required to answer the research questions and achieve the research objectives through interviews. Data collection methods may include interviews and observations, depending on the type of research conducted.

c. **Data Processing**
After the data have been collected, the next step is data processing, which includes data cleaning, coding, and analysis to transform raw data into information that is ready for analysis. The transformed data are then prepared for further analysis and interpretation, as required for TOPSIS calculations.

d. **Web Development**
In technology-based research, this phase involves the development of an application or website to implement and test the proposed solution. Web development includes user interface (UI) design, coding, testing, and the implementation of features according to user requirements.

e. **Conclusions and Recommendations**
In the final phase, the researcher analyzes the results, draws conclusions, and provides

recommendations based on the findings. The conclusions should address the research questions and discuss their implications.

RESULTS AND DISCUSSION

This discussion will address the definition of the problems faced by typhoid patients in choosing appropriate food menus, as well as the proposed solution through a decision support system using the TOPSIS method.

1. Perhitungan Manual Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)

Tabel 1 Data Alternatif Hasil Wawancara

Var	Alternatif
A1	Bubur Ayam
A2	Sup Wortel dan Kentang
A3	Puding Susu
A4	Ayam Rebus
A5	Telur Rebus
A6	Kentang Tumbuk
A7	Ikan Kukus
A8	Nasi Tim Ayam
A9	Yogurt
A10	Apel

Tabel 2 Tabel Data Pasien Hasil Observasi

No	Usia	Gejala Utama	Hasil Tes	Berat Badan	Tingkat Keparahan
P001	35	Demam, Sakit Kepala	Salmonella typhi (+), Leukosit meningkat	71	Sedang
P002	29	Demam Tinggi, Lemes	Salmonella typhi (+), Trombosit menurun	69	Berat
P003	25	Demam, Mual, Muntah	Salmonella typhi (+), Hemoglobin normal	68	Ringan
P004	29	Nyeri Perut, Diare	Salmonella typhi (+), SGOT/SGPT meningkat	72	Berat
P005	18	Sakit Tenggorokan	Salmonella typhi (+), Leukosit menurun	60	Sedang
P006	20	Diare, Mual, Muntah	Campylobacter jejuni (+), Leukosit meningkat	65	Sedang
P007	22	Demam, Mual	Rotavirus (+), Elektrolit tidak seimbang	75	Sedang
P008	20	Nyeri Perut, Muntah	Escherichia coli (+), Hemoglobin rendah	62	Sedang
P009	18	Sakit Kepala, Mual	Enterovirus (+), Trombosit menurun	58	Berat
P010	20	Demam, Kemerahan Pada Kulit	Dengue (+), SGOT/SGPT meningkat	64	Berat

Data dari observasi pasien tipes di atas mencakup usia, gejala, hasil tes laboratorium, berat badan, dan tingkat keparahan penyakit, yang semuanya relevan untuk menentukan rekomendasi makanan yang sesuai. Dengan mempertimbangkan variabel ini, diharapkan rekomendasi makanan dapat mendukung proses pemulihan pasien secara optimal menggunakan metode TOPSIS.

Tabel 3 Tabel Konversi Hasil Observasi

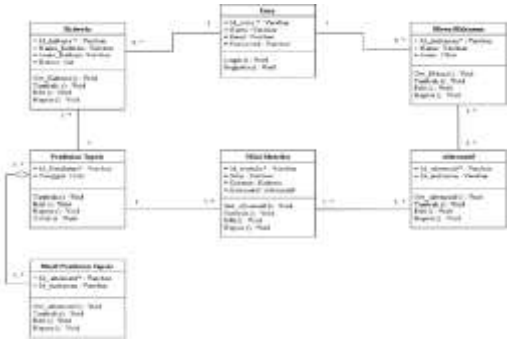
No	Kriteria	Keterangan	Penilaian	Value
1	C1	Gejala Pasien	Ringan	1
			Sedang	2
			Tinggi	3
2	C2	Protein	< 5 g	1
			5-15 g	2
			15-25 g	3
			25-35 g	4
			> 35 g	5
3	C3	Karbohidrat	< 20 g	1
			20-50 g	2
			50-75 g	3
			75-100 g	4
			> 100 g	5
4	C4	Lemak	< 5 gram	1
			5-15 gram	2
			15-25 gram	3
			25-35 gram	4
			> 35 gram	5

a. Unified Modeling Language
b. Use case diagram

Gambar 1 Use Case Diagram

From the use case diagram above, there is one main actor, namely the Typhoid Patient. The use case provides an overview of how a decision support system can assist typhoid patients in managing their food menus using the TOPSIS method.

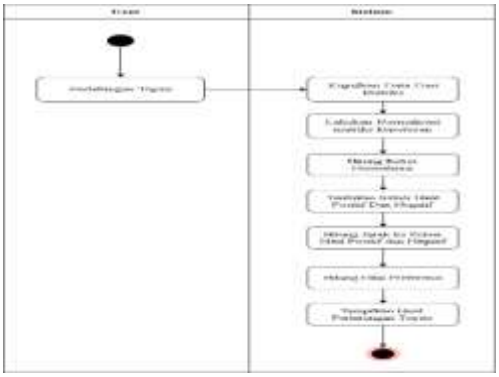
c. Class Diagram



Gambar 2 Class Diagram

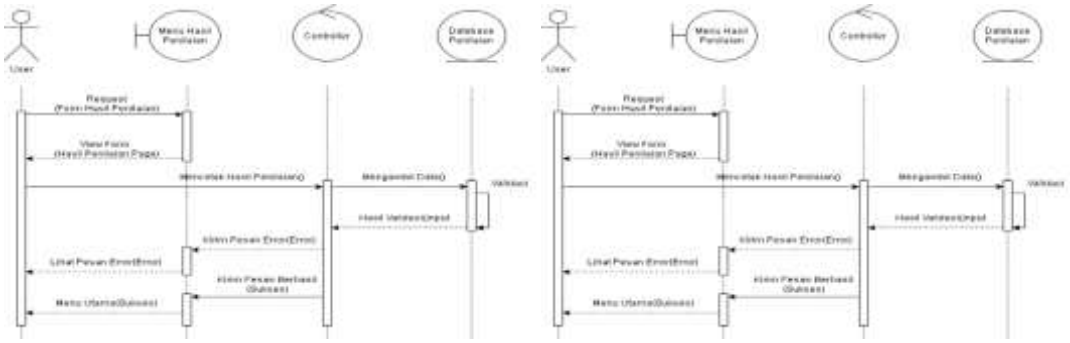
This class diagram provides a clear and well-organized structure for managing patient health records, food menus, and the criteria used in the decision support system for typhoid patients.

d. Activity Diagram



The diagram above illustrates the TOPSIS calculation process within the decision support system, starting from data collection and normalization, weight calculation, and proceeding to the determination of the ideal solution and the distance of each alternative from that solution. The final result is a preference value displayed to the user to support better decision-making.

e. Squance Diagram



Gambar 3 Squance Diagram

The diagram above illustrates the flow of interaction between the user and the system in processing assessment results. The user submits a request to view the assessment results through a form, which is then processed by the controller.

CONCLUSION

Based on the research that has been conducted in the development of a **Decision Support System for Food Menu Selection for Typhoid Patients using the TOPSIS Method**, several conclusions can be drawn as follows:

1. The developed system successfully provides appropriate food menu recommendations for typhoid patients. These recommendations are based on predetermined criteria such as patient symptoms, protein, carbohydrates, fats, vitamins and minerals, fiber, age, laboratory results, body weight, and severity level.
2. The TOPSIS method has proven to be effective in processing patient data and producing accurate decisions. This method is capable of accommodating various criteria that influence food selection for typhoid patients.
3. The criteria used in the system, such as fever symptoms, nausea, vomiting, laboratory test results, as well as the selected food alternatives, have been appropriately determined and are relevant to the needs of typhoid patients.

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