The Effect of Chronic Energy on Increasing the Effectivity of Pregnant Women's Nutrition Using Decision Support Systems (DSS) with Analytical Hierarcy Processs (AHP)

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Abstract. The Indonesian Ministry of Health in 1999 proclaimed LILA as a measure of the upper arm circumference used by pregnant women in childbearing age as a chronic energy deficiency indicator (SEZ), with a LILA limit of <23.5 the risk of SEZ. Chronic energy deficiency can cause low birth weight babies (LBW), so pregnant women will be at risk of experiencing difficulties and pain during the birth process. The lack of technology that can quickly determine how pregnant women experience Chronic Energy Deficiency has an impact on increasing the mortality rate in pregnant women and the conceived fetus. Some variables of effectiveness of nutritional intake of pregnant women such as diet, exercise, vitamins C, D, and E are the nutrients needed during pregnancy. There is no proper formulation to know the nutritional needs of pregnant women and nutritional quality factors are different, so nutrition experts desperately need a petrified system to analyze quickly, accurately, easily, effectively and efficiently in determining the best decisions from various alternatives for pregnant women who lack symptoms of energy Chronic (KEK) by combining analytical data and models on computerized systems using multicriteria Decision Support System (DSS) method, namely Analytical Hierarchy Process (AHP). This study designed the DSS using AHP method by combining Expert Choice in it. DSS research is designed not to make decisions, but as a tool that helps to support decision making.

1. Introduction

The Indonesian Ministry of Health in 1999 proclaimed LILA as the upper arm circumference measure used by pregnant women at childbearing age as a tool of Chronic Lack of Energy indicator (KEK), with LILA limit <23.5 SEZ risk [1]. During pregnancy is very dangerous a pregnant woman if chronic energy deficiency. Chronic energy deficiency can cause low birth weight babies (LBW), so that pregnant women will be at risk of difficulty and pain during childbirth. The lack of technology that can quickly detect pregnant women Chronic Less Energy has an impact on increasing mortality rates in pregnant women and the fetus is conceived. Research Sumarno et al also showed that pregnant women KEK in West Java have a risk of giving birth to LBW 2.3 times compared with pregnant

women who KEK. Whereas LBW has a high risk of death seita will experience growth disorders (45) [2]. Some variables of the nutritional intake of pregnant women such as Diet, Sports, Vitamin C, D, and E are the nutrients needed during pregnancy. Nutritional needs of pregnant women in intake food required fetus during pregnancy if there is no proper formulation then it can lead to Chronic Energy Lack. Maternal nutrition supporting factors are basically the same, but the nutritional value level is different, so the quality or quality of nutrition is also different. Given the same variety of factors, but there are different levels of factor values in each pregnant woman, the determination of pregnant women with chronic energy deficiency symptoms becomes difficult, so nutrition experts desperately need a system that can help to analyze quickly, precisely, easy, effective and efficient in determining the best decision from various alternative pregnant women who suffer from symptoms of Chronic Energy Lack (KEK). In 2010 Yuli Wahyuni researchers have successfully found the right method used for decision support system that is Analytical Hierarchy Process (AHP) method which is effective and efficient to solve multikreterian problem in decision support decision system especially for pregnant mother nutrition with variable of calcium, energy, vitamin A, phosphorus, folic acid, vitamin K, iodine, iron and soup that must be consumed by mother hami (salmon soup, tomato soup, asparagus crab soup, white mushroom soup, red bean soup and pumpkin cream soup) [4] . The development of research conducted by Yuli Wahyuni in 2017 has succeeded in making DSS application which helps nutrition experts in making decision by using basic nutritional data data, namely: dietary variable, pregnant women's exercise variable, vitamin C, vitamin D and vitamin E, while alternative soup choices include: alternative soups of choice for pregnant women: salmon soup, tomato soup, asparagus crab soup, white mushroom soup, red bean soup, yellow pumpkin soup accompanied by ingredients contained [5]. Sumarno in 2005 in his research revealed that Increased access to health services can improve the state of health and nutrition. In addition, efforts to improve the state of health and nutrition can take the form of treatment and prevention [3]. Examples of cases are categorized cases of multicriteria (compound criteria) / complex. The multicriteria decision-making method is Analytical Hierarchy Prosess (AHP), where factors influencing decision making are analyzed in the structure of tiered problems by assessing and ranking alternative decisions. The computerized system Decision Support System (DSS) combines data and analytical models for semiterstructured or unstructured issues. In this research the design of DSS using AHP motode, making the application using MS Access as DBMS database subsystem and while Microsoft Excel on the model subsystem and calculation process is integrated through VBA (Visual Basic For Application), to solve the problem, without covering the maintenance step (maintenance) and adaptation. In DSS research that is designed not to make decisions, but as a tool that helps to support decision-making.

1. Materials and Methods

a. Measured Variables

In this research the measurement of Chronic Energy Lose indicator (KEK) using height, upper arm circumference and high Rahim. While the variables of nutritional intake of pregnant women such as Calcium, Energy, Vitamin A, Phosphorus, Folic Acid, Vitamin K, Iodium, Iron, Diet, Sports, Vitamin C, D, and E.

b. Models Used

In this research, the model used is Analytical Hierarchy Process (AHP) which later as the basis of simulation in decision making.

1) Research Design

Designing AHP-based DSS system, this is tailored to the needs of system design that includes:

a) Planning Sub System Model Base.

b) Measurement factors of maternal nutrition selection along with their importance level measurement, problem solving with AHP method and creating enterprise model.

c) Planning Sub Data Base System.

d) Create a list of entities, create DFD (Data Flow Diagram), create ERD (Entity-Relationship Diagram) and database design.
e) Planning Sub User Interface System.
f) Menu and form design.
g) Planning Algorithm with Flow Chart.

c. Data Collection

In collecting this data, the data collected in the form of primary data consists of:
a) Data of pregnant women
b) Data factors that affect the nutrition of pregnant women
c) Data of nutrient intake in the form of variable data of Calcium, Energy, Vitamin A, Phosphorus, Folic Acid, Vitamin K, Iodium, Iron, Diet, Sport, Vitamin C, D, and E
d) The primary data collection techniques as follows: Interviews, literature and system testing
e) System test
Verification, validation and prototype.

3. Results

The application of the Nutrition Information system for pregnant women can improve maternal health services from nutritional factors, thereby reducing the mortality rate of pregnant women and Chronic Energy Deficiency.

A. Problems and Solutions

a) Solving Model Database Problems

1. Structure Preparation Hierarchy

In this AHP application, the goal to be achieved is to obtain the best results in deciding a pregnant woman Chronic Energy Deficiency, based on the factors manifested in three alternative options, namely height, upper arm circumference and high uterus Rahim.

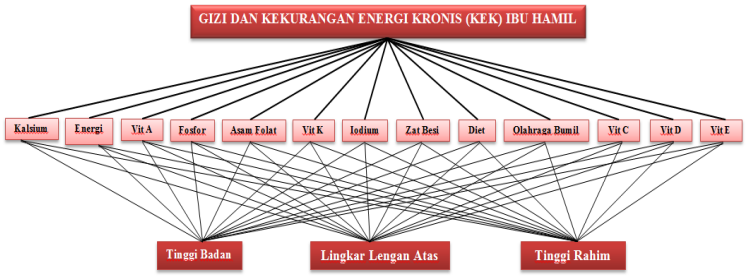

Figure 1 Hierarchy of Process Objectives

2. Factor Calculation Result

Here is a picture of the calculation of interests between factors of nutritional selection of pregnant women based on AHP scale with the result of 0.08 which means that the judgment data judgment has been correct. The exact calculation standard in determining the ratio value is less or equal to 0.1.

3. Result of Factor Calculation Graph

Here is a graph of the calculation of factors Selection of nutrition and chronic energy shortage of pregnant women.

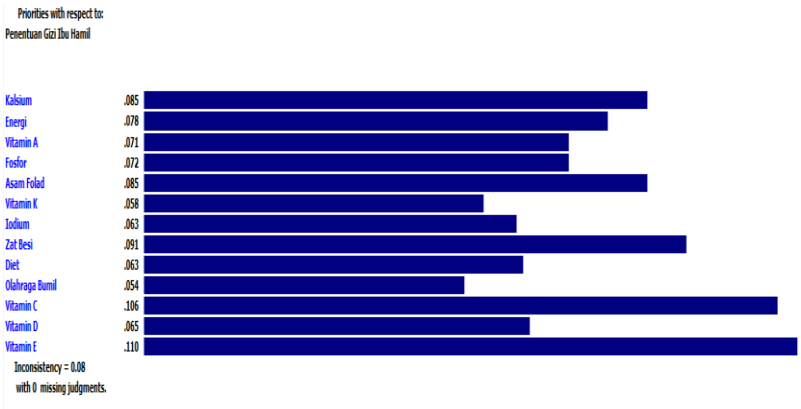

Figure 2 Calculation of Factor Value

4. Selection of Pregnancy Selection of Pregnant Women

Here are some of the system application display of Nutrition Information for pregnant women:

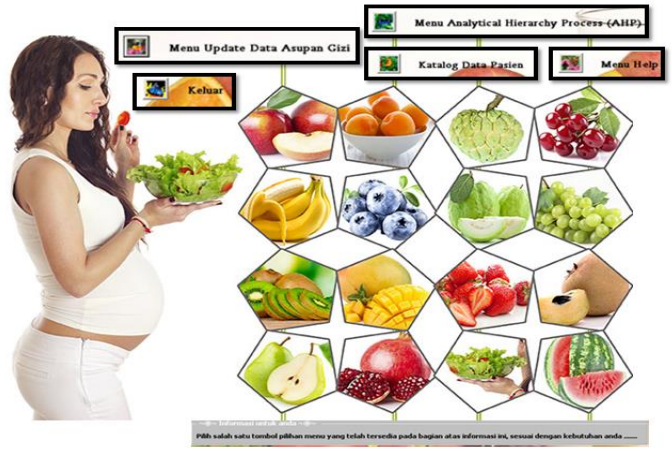

Figure 3 Display Main Menu

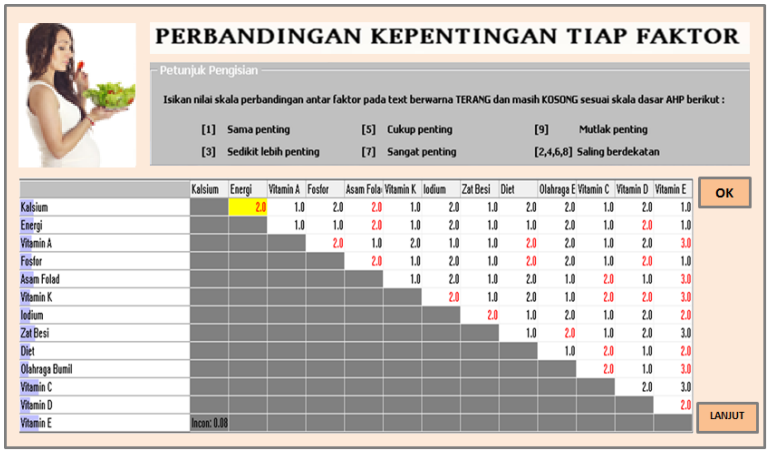

Figure 4 Input Number Value Scale Comparison Interest Factor Level

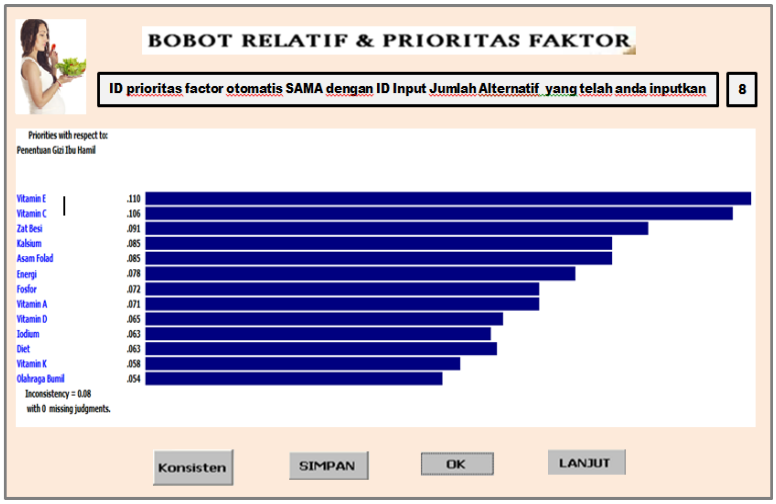

Figure 5 Relative Weight and Priority Value Factor along with the Graph

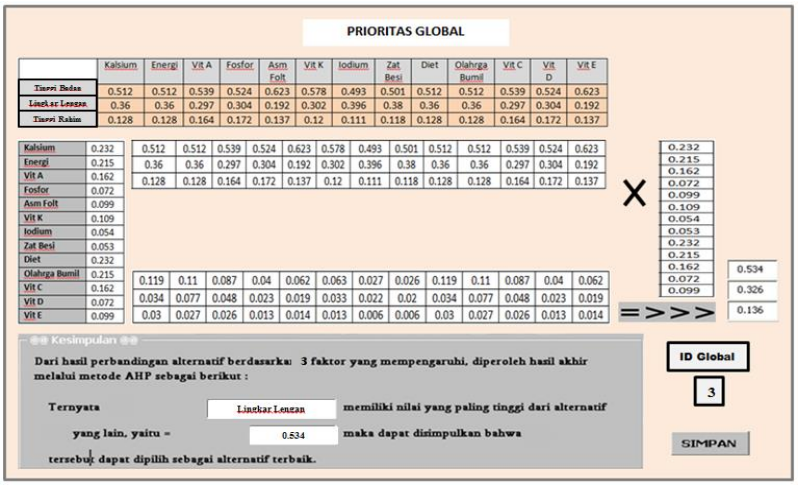

Figure 6 Global Priority Values and Alternative Conclusions

4. Conclusion

1. Application of Decision Support System has been successfully executed using AHP method with measurement of Chronic Energy Chronic indicator (KEK) using height, upper arm circumference and high Rahim. While the variables of nutritional intake of pregnant women such as Calcium, Energy, Vitamin A, Phosphorus, Folic Acid, Vitamin K, Iodium, Iron, Diet, Sports, Vitamin C, D, and E.
2. On the basis of existing data, built sub system:
   a. Databases consisting of patient data tables, complaint tables, login tables, alternative input tables, nutrition variable tables, factor priority tables, alternative priority tables, and global priority tables.
   b. A base model using AHP, by comparison of the importance level between factors, the determination of relative weight and priority for each alternative, the consistency calculation of the comparison of interests between factors, the comparison of the importance of all alternatives to each factor, the determination of the relative weights and the alternative priorities on each factor, and determination of overall rank (global priority).

c. Designing a sub-system of user interfaces, especially the visualization of the final result of global priority that shows the final conclusion that pregnant women know Chronic Energy Less in him so that it can prevent low birth weight babies (BBLR) early on. DSS design uses AHP method by combining Expert Choice in it. DSS research is designed not to make decisions, but as a tool that helps to support decision making.

3. System testing is done by:
   a. Verify with the result that the mathematical function for the calculation of the number of factor scale values has been properly realized in the design of the pre-designed model sub-system.
   b. Validation resulted in the conclusion that the application has been realized and able to produce the best solution and with this system nutrition experts in the community feel helpful in providing alternative solutions nutritional choices so as to avoid Chronic Energy Deficiency in Pregnant Women who can minimize low birth weight (LBW) from an early age.
   c. Testing prototype produces that the system has advantages in terms of ease, completeness, accuracy, and effectiveness.
4. System testing is carried out by:
   a. Verification with the results that the mathematical function for calculating the number of factor scale values has been realized correctly in the design of the model sub-system that has been previously designed.
   b. Validation generates the conclusion that the application has been realized and is able to produce the best solution and with this system nutrition experts in the community find it helpful in providing alternative nutritional solutions so that they can avoid Chronic Energy Deficiency in Pregnant Women who can minimize low birth weight babies (LBW) early.
   c. The prototype testing resulted that the system has advantages in terms of ease, completeness, accuracy, and effectiveness.

References

[1] Department of Health RI. RI Guidelines. Guidance of the Upper Arm Circumference (LILA) in women of childbearing age. Jakarta: MOH RI, 1999.

[2] Sumarno, I; E Sarasrmti; E Moses; Yhazhazy; R Aryanti; et al. The risk of anemic pregnant women to deliver low birth weight babies (LBW). Bandung: Cooperation of Health Office Prov. West Java with Nutrition Research Center MOHRI, 1998.

[3] Sumarno, Chronic Risk Factors of Chronic Energy In Pregnant Women In West Java (Advanced Analysis), PGM, [2005], Vol 28, No. 2, p. 66-73.

[4] Wahyuni Y, Santoso BP, Nurwasito H, Decision Support System Development for Determining Nutrition of Pregnant Women Using AHP (Analytic Hierarchy Process) Method, J. Development of Informatics & Computer Management, [2010], Vol 1, No 2, 116-127 .

[5] Wahyuni Y, Ardita M, Decision Support System System Improved Effectiveness of Nutritional Intake of Pregnant Women, Computing, Scientific Journal of Computer Science and Mathematics, [2017], Vol 14, No 1, Page 1-50, ISSN 1693-7554.