Information system implementation for the management of malnutrition in pregnant women: a systematic literature review

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Abstract. Nutrition is a substance that the body needs in order to function properly. The impact of nutrition experienced by the mother can affect the fetus, one of which is less than normal body weight. Maternal nutritional intake is less influential on fetal growth regarding lack of weight, so it requires breakthroughs by using information systems that can provide convenience to understand, teach, connect, motivate, and empower individuals in overcoming problems. This paper is focused on discussing the implementation of information systems for the management of malnutrition in pregnant women. This research design uses a systematic review literature review with international journals. From the review, it can be concluded that the information system can affect the management of nutritional problems such as detecting, diagnosing and providing solutions in the form of health education based on expert / expert recommendations easily and quickly.

1. Introduction

The maternal mortality rate is one of the main indicators of the degree of public health, it can be identified by knowing the causes of maternal mortality, one of the causes of maternal mortality globally is bleeding which has a risk for pregnant women who have malnutrition [1]. The impact of nutrition experienced by the mother can affect the fetus, one of which is less than normal body weight [2]. Poor maternal nutrition is very influential on fetal growth, one of which is less than normal body weight <2500 grams and stunting (short) [2]. Maternal mortality rates in several regions of the world reflect inequality in access to quality health services [3]. One of the problems of malnutrition is that mothers experience chronic energy deficiency that occurs due to an imbalance of energy intake of energy and protein intake of the mother that can be identified Upper Arm Circumference (MUAC) <23.5 cm [3].

Facilities and health workers who have not been optimal in providing services will have an impact on public awareness, one of which can be improved by providing information counseling and education so that it can affect knowledge, behavior regarding pregnancy [4]. mHealth as a quite interesting way in health interventions, even becoming one of the recommendations of the World Health Organization (WHO) in health care, especially in the field of counseling and health education, can help overcome health challenges by reducing health costs and time in care. Health education or mobile-based education is seen as a more cost and energy effective approach compared to conventional methods, for example, flyers [5].
Information systems have an important role in improving the quality of service the existence of health information based on smartphone applications can provide convenience to understand, teach, connect, motivate, and empower individuals in overcoming health problems [5]. The application becomes a new approach to provide information easily at the touch of a button, at no cost, accessible anywhere and anytime [6]. This paper discusses the implementation of information systems in the management of nutritional problems in pregnant women based on several information systems studies and analyzes the implementation in the management of maternal nutrition problems, therefore the authors intend to review systematic literature reviews.

2. Method
This study uses a systematic literature review method to understand most of the information in the health field and as a means to provide answers to questions. The purpose of a systematic review of the literature review is determined by the research topic with more specific questions. The steps in writing this paper are shown in Figure 1, among others [8]:

a. Identify research questions
   1) The information system in detecting the nutritional status of pregnant women is underweight.
   2) Information system for diagnosing nutritional status.
   3) Information systems in providing solutions in the form of recommendations regarding nutritional needs.

b. Develop a metanalysis research protocol
The protocol in this paper uses PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses). The systematic review stage with the prism is determining the inclusion criteria with the Randomized Control Technique (RCT) technique which contains information systems for the management of malnutrition in pregnant women. A paper search was performed on an online database search that included the inclusion criteria. Determine the keywords "information system" and "nutritional status problems". The stages of the Systematic Review with PRISMA are explained in Figure 1.

![Figure 1. Stages of a systematic review with PRISMA](image-url)
3. Results and discussion

A systematic review of the literature review was carried out with information systems in addressing the nutritional problems of pregnant women, including detecting malnutrition in pregnant women, diagnosing nutritional status in pregnant women and solutions in providing motivation for the nutritional needs of pregnant women.

3.1. Detecting malnutrition in pregnant women

Intake of nutritional status can be done by anthropometric measurements obtained from measurements of body weight, height, upper arm circumference (MUAC) [9]. Measurement of LILA is less responsible if the results <23.5 cm and fat measurements can be obtained mathematically by means of body weight in kilograms divided by height squared set in meters or so-called Body Mass Index (BMI) measurements if the results show <18.5 kg / m² then included in the category of underweight [10].

Measurement of nutritional status is updated by using a smartphone that contains an application that contains data inputted from the body, gender, age and food intake [11]. Cellular-based information systems make it easier to access estimates of food and drinks released using the help method of sample image images, videos of food collected based on intake records for 24 hours [12]. SenseCam Camera is an application that consists of a camera that has advantages for reminders and reporting about food intake to be consumed, the SenseCam Camera application can increase energy intake by 12.5% compared to reminders and report 24-hour withdrawals manually [12].

3.2. Nutrition diagnosis of pregnant women

Nutritional diagnosis can be done using an expert system with a certainty factor method that performs translators and modeling appropriate systems that can be made by combining diagnoses to obtain nutrients that can be used by users and accessed more easily and quickly find experts [15]. The application built provides a valid decision with proven conformity of manual calculations with certain factor methods [15]. The use of the certainty factor method used to be able to help sign questions, after which information is provided in the management that helps the mother in carrying out further examinations to places of complete facilities such as referral approval [16]. The certainty factor method is used in expert diagnosis systems which have a validation rate of 100% and certification testing of 100% [16].

Diagnosing nutritional disorders can be done by an expert system by calculating fuzzy logic based on input data, establishing disease rules and substitute data that have been established as a rule base. Fuzzy methods produced are able to overcome nutritional problems and types, based on the facts provided and provide solutions as alternative experts. This system knowledge technique uses the rules of production into a form of fact. Knowledge in the production system is represented by a set of rules in the form of IF (condition) THEN (action) [17].

3.3. Solution in the form of nutrition recommendations for pregnant women

Changing behavior and lifestyle so that optimal maternal nutrition by providing health education in the form of information about nutrition [18]. Health education influences the nutrition knowledge of pregnant women. Good knowledge influences behavior in meeting nutritional needs [9]. Health education regarding the nutritional needs of pregnant women is an important thing to consider including balanced food intake, which balanced diet consists of various food intake in appropriate amounts and proportions [18].

Planning in preparing a balanced menu can be done by choosing foods that contain carbohydrates, proteins, and fats, and dividing the food in a day which includes breakfast at 07.00 and the morning break at 10:00, lunch at 12.00 lunch break at 15.00 and dinner at 18.00 and a snack interlude at 20:00 [9]. The information system automatically obtains personalized nutrition suggestions that are proposed based on the decision tree made by the nutritionist [19].

4. Conclusion
The systematic literature review concludes that information systems in detecting nutritional problems by means of anthropometric measurements such as body weight, height, fat measurements that can be inputted in an application, in addition to the application features include measurements in assessing food intake using SenseCam. The information system in diagnosing nutritional problems can be done by counting calories based on recording food intake. In addition, it can be diagnosed with an expert system or a nutritionist by carrying out certainty factor and fuzzy methods approaches. Information systems in providing solutions in the form of health education that can affect knowledge in improving nutrition in terms of food intake and the proportion of suitable food based on personalized nutritionist advice. The information system created can simplify and speed up the management of nutritional problems wherever and whenever. Future recommendations regarding application features by integrating the needs needed for pregnancy care based on standard operating procedures that have been determined or agreed according to government program policies.

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