Prediction Nutrition Status using Body Mass Index on Mobile Device

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Abstract

This paper is aim to predict nutrition status using by the Body Mass Index (BMI). BMI for men and women are obtained from the calorie needs. Calorie requirement is used to determine energy needs. The energy needs are determined by the needs of Protein, Carbohydrate, Fat, Vitamin and Mineral. The paper is made in the form of an application program using Mobile Programming. The tool used is a J2ME application on cell phone emulator having minimal CLDC, CDC 1.1, MIDP 2.0 and MIDlet. Main contribution, BMI as the simple, fast and easy to used method. BMI can be used to determine the nutrition status of individual. The benefit for individual reduce the cost of healthcare. The new result is the prediction of the nutrition status of individual using by BMI can be applied with new ways through the Mobile Application on Mobile Device, that is implemented to the cell phone. Mobile Application is a medium for the user can be accessed anytime and anywhere. It is known an application that can yield the rational decision in predicting the nutrition needs.

Keywords: Nutrition, Body Mass Index, Mobile Application

1. Introduction

One of the important things in health information is nutrition [1]. The adequate nutrition of each people should be counted properly. If is known by the people, they will prepare the daily food [2] that are suitable with the needs of the entire family members, easily. A well chosen daily food will provide all essentials nutrients for normal function of the body. Conversely, if the foods are not selected properly, the body will lack of certain essentials nutrients [3]. In addition, all foods have essential nutrients which are differ among them. Based on paper toward the comprise nutrients in different types of food, food pyramid was formed which provide a visual aid to choose a nutritious and healthy food [4]. On the other hand, nowadays the use of cell phone as one of media for communication and information becoming very important. It is portable so it is easy to carry everywhere. Based on a reported data that was taken on June 2011, the users of cell phone in Indonesia have been increased to 180 million users or 80% of the Indonesia population. This number is the highest amount of developed application and the use of mobile devices. Meanwhile one of the applications that can be developed is the use of mobile devices as an aid to predict the nutritious needs of families. This paper aimed at designing a mobile application to predict the nutritional status using by Body Mass Index (BMI) and nutritious needs of families on Mobile Application. Mobile Application tool is Java 2 Micro Edition (J2ME). It can give some possibilities for developers to create multiplatform applications that can be implemented to any mobile phone brands supported by Java applications.

2. Research Method

In this paper used methods of field research, library research and laboratorium research with the framework research. To achieve the aim, this research is conducted in several steps depicted in Figure 1.
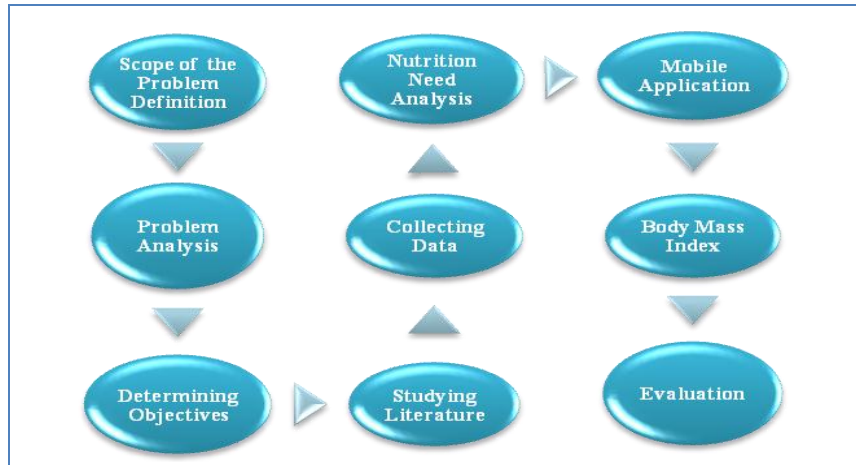

Figure 1. Framework

3. Fundamental Theory

3.1. Nutrition

The term of nutrition has many meanings. In general nutrition is the relationship of food and the welfare of human body. It is based on the principle that food intake and nutritional status [5] affect health significantly [6]. Beside, every food is not only has one type of nutrients. For example, rice contains carbohydrates, protein and energy. In 100 grams of rice, there are 175 kilo calories energy, 4 gram protein, and 40 gram carbohydrates. It is clearly stated there that rice is the main content of rice. Hence, rice is the source of carbohydrates along with other basic food nutrition. Another source of energy is fat. If the burning of 1 gram carbohydrates can produce 4 kilo calories energy, I gram fat will produce 9 kilo calories energy where the fat consumption is limited into ¼ energy needs. Moreover protein is also a source of energy. It is because in 1 gram protein has 4 kilo calories energy. However, protein is used as a building substance (for the growth of cell, recovery, enzymes, *etc.*). The previous example – rice – also has protein and mineral which function as a regulator substance. According List of Food Composition, in 100 gram rice contains some vitamins, especially B1, B6, and E and several minerals. Furthermore, since in one food has different nutrients, it is advisable to consume various food in one meal. Therefore, people should eat various foods that have the source of energy substance (carbohydrates), builder substance (protein) and regulator substance (vitamin and mineral).

3.2. Nutrition Need

$$C = 66 + (13.7 * W) + 5 (H) - (6.8 * A)$$

Calorie need for male [7], where C is calories, W is weight, H is height and A is age.

$$C = 655 + (9.6 * W) + (1.7 * H) - (4.7 * A)$$

Calorie need for female, where C is calories, W is weight, H is height and A is age.

$$C = (NC / 150) * 6.25$$

Protein need for male and female, where C is calories and NC is the need of calories.

$$C = 0.25 * NC$$

Fat need for male and female, where C is calories and NC is the need of calories.

$$C = 0.70 * NC$$

Carbohydrates for male and female, where C is calories and NC is the need of calories.

Based on age group (year), weight (kilogram=kg), height (centimeter=cm), energy (kilocalories=kcal), protein (gram=gr), and activity, the calories needs for male, female and daily menu for household dose and nutritional needs of families in a day can be seen in Table 1, Table 2, Table 3, and Table 4 [8].

Table 1. The Calorie Need for Male

Age group (year)	Weight (kg)	Height (cm)	Energy (kcal)	Protein (gr)	Activity
3 – 9	12	90	1500	35	Normal
10 – 12	30	135	2000	45	Normal
13 – 15	45	150	2400	69	Normal
16 – 19	56	160	2500	66	Normal
20 – 59	62	165	2800	55	Light
20 – 59	62	165	3600	55	Medium
20 – 59	62	165	3600	55	Heavy
60+	62	165	2200	55	Normal

Table 2. The Calorie Need for Female

Age group (year)	Weight (kg)	Height (cm)	Energy(kcal)	Protein (gr)	Activity
3 – 9	12	90	1500	35	Normal
10 – 12	35	149	1900	54	Normal
13 – 15	46	153	2100	62	Normal
16 – 19	50	156	2000	51	Normal
20 – 59	54	156	2050	48	Light
20 – 59	54	156	2250	48	Medium
20 – 59	54	156	2600	48	Heavy
60+	54	54	1850	48	Normal

Table 3. The Calorie Need for Pregnant and Lactacing

Age group (year)	Weight (kg)	Height (cm)	Energy(kcal)	Protein (gr)	Activity
-	-	-	+285	+12	Pregnant
0 – 6 month	-	-	+70	+16	Lactating
7 – 12 month	-	-	+500	+12	Lactating
13 – 24 month	-	-	+400	+11	Lactating

Table 4. Type of Dish Menu

Time	Type of dish	Dose (2500 kcal)	Dose (2500 kcal)	Dose (1700 kcal)
Morning	Nasi	2 tablespoon rice	2 tablespoon rice	1 tablespoon rice
	Daging bumbu semur	1 slice	1 slice	½ slice
	Tumis kacang panjang + tauge	½ cup	½ cup	½ cup
	Teh manis	1 cup	1 cup	1 cup
10.00 - daylight	Bubur kacang hijau	1 cup	1 cup	1 cup
	Nasi	3 tablespoon rice	2 tablespoon rice	½ tablespoon rice
	Ikan goring	1 slice	1 slice	1 slice
	Sayur asem	1 cup	1 cup	1 cup
	Nenas	1 slice	1 slice	1 slice
16.00 - night	Buah	-	-	1 slice
	Nasi	3 tablespoon rice	2 tablespoon rice	1½ tablespoon rice
	Pepes ayam	1 slice	1 slice	1 slice
	Sayur bayam + jagung muda	1 cup	1 cup	1 cup
	Pepaya	1 slice	1 slice	1 slice

In Indonesia, the national adequate energy in average consumption level is 2150 kilo calories per person in a day. The national adequate energy in average supply level is 2500 kilo calories per person in a day. The national adequate protein in average consumption level is 46.2 gram per person in a day. The national adequate protein in average supply level is 55 gram per person in a day. Vitamin is mostly found in vegetables and fruits [9]. A healthy food that needs to be consumed in a day should consist of carbohydrate, protein, vitamin, mineral and fresh milk. In Indonesia, the national adequate energy in average consumption level is 2150 kilo calories per person in a day. The national adequate energy in average supply level is 2500 kilo calories per person in a day. The national adequate protein in average consumption level is 46.2 gram per person in a day. The national adequate protein in average supply level is 55 gram per person in a day. Vitamin is mostly found in vegetables and fruits [9]. A healthy food that needs to be consumed in a day should consist of carbohydrate, protein, vitamins, mineral and fresh milk.

3.3. Body Mass Index

Body Mass Index (BMI) is used to find out if a person is underweight, normal weight, overweight, or obese [10]. Body Mass Index (BMI) is a number calculated from a person's weight and height. BMI provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems. BMI can be considered an alternative for direct measures of body fat. Additionally, BMI is an inexpensive and easy-to-perform method of screening for weight categories that may lead to health problems. However, BMI is not a diagnostic tool [11]. Although the BMI number is calculated the same way for children and adults, the criteria used to interpret the meaning of the BMI number for children and teens are different from those used for adults. For children and teens, BMI is age and sex-specific and is often referred to as BMI-for-age. For adults, on the other hand, BMI is interpreteds through categories that do not take into account sex or age. The formulas of Body Mass Index (BMI) is:

$$BMI = W / H^2$$

where BMI is body mass index, W is weight and H is height.

BMI, classification and nutritional status can be seen in Table 5.

Table 5. Body Mass Index

BMI	Classification	Nutritional Status
<18.5	Under weight	Malnutrition
18.5 - 24.9	Healthy weight	Normal
25.0 – 34.9	Over weight	Over Nutrition
>35.0	Obese	Very Excess Nutrition

3.4. Mobile Device

Mobile Application development is the process by which application software is developed for low-power handled devices, such as personal digital assistants, enterprise digital assistants or cell phones and the others [12]. Mobile Application for mobile devices using by emulator J2ME (Java 2 Micro Edition) with Java-based phones [13]. Mobile Application tool is Java 2 Micro Edition (J2ME) [14]. J2ME is a development environment designed to put Java software [15] on electronics good and other upholders. It is also known as Java ME that is one of three Java programming language used in developing application on mobile devices. The components to be used are:

3.4.1. Connected Limited Device Connection (CLDC): CLDC is used to implement Java programs on hardware devices with a very limited memory about 160-512 kilobytes. As a result the unimportant features that are implemented in handled devices of J2ME should be discarded. It handles only for three class of error (exception) such as class Java.lang.Error, class Java.lang.OutOfMemory and class Java.lang.MachineError.

3.4.2. Connected Device Configuration (CDC): CDC is super set of CLDC that provides broader Java runtime environment than CLDC and closer to J2SE environment. Mobile Information Device Profile (MIDP). MIDP is higher than CLDC. It is because the users cannot write mobile applications only using by CLDC. The users still use MIDP that defines User Interface (UI). MIDP specification device has certain characteristics for instance the minimum screen size 96*54, the bit depth and the sharpness of the display in pixel are about 1:1. MIDP describes application model, UI, a powerful network storage, deployment and provisioning applications over the air.

3.4.3. MIDlet: The running application on a device that supports MIDP is known as MIDlet. MIDlet is an application created by using J2ME with MIDP. MIDP is devoted to handset with CPU ability, Memory, keyboard, and limited screen like deployment of mobile phone, PDA and so forth. The MIDlet life cycle is shown at Figure 2.
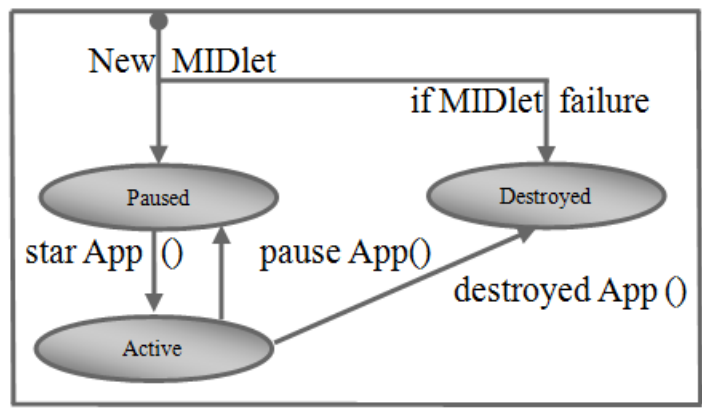

Figure 2. MIDlet Lifecycle

4. Experimental Result
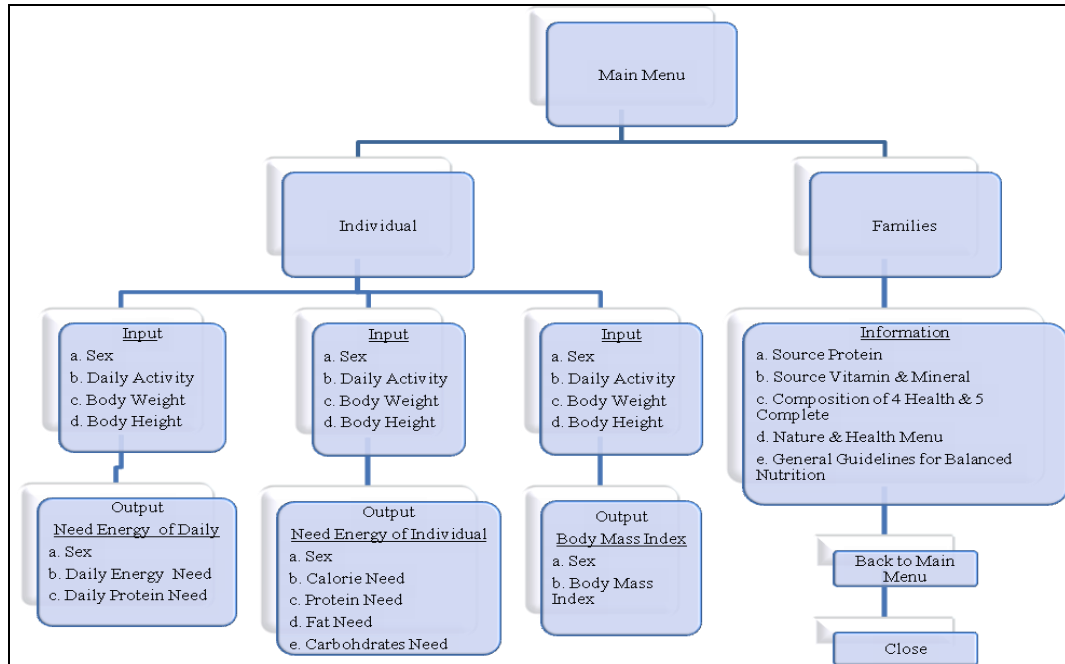
4.1. Structure of Program

Figure 3. Structure of Program

Structure of program can be seen Figure 3. Based on gender, the nutritious needs for male and female can be determine such as calorie, carbohydrate, protein, and fat. The daily nutritious needs are determined by some factors such as the person's age, weight, height, and daily activities. The needs for daily energy and nutrients for male and female are different depends on their age, weight, height, and individual activities. The nutritional status covers under nutrition, normal, over, and very excess nutrition. The first kind is age group that is used to see the daily nutritious needs and nutritional status. Moreover every family member is given the natural healthy information menu at the family level from sources like carbohydrate, protein, fat, vitamin, and mineral. The information about adequate nutrition and energy are given that covers the Guidance of Nutrients Balance where the right amount of nutritious menu and complete information can be taken from the competence nutritionist.

4.2. Application on Mobile Device

When the application runs, window's dialog and then the users can see the tutorial by choosing the tutorial menu as seen in Figure 4.

Figure 4. Main Menu and Tutorial Menu

Next, the user can use this application by selecting the menu of group and there will be a form that has to be filled by the users as seen Figure 5.

Figure 5. Individual Menu and Form Menu

After that the users select the menu that is wanted to be used. There are nutrition need daily menu, energy needs and nutritional status as seen Figure 6.
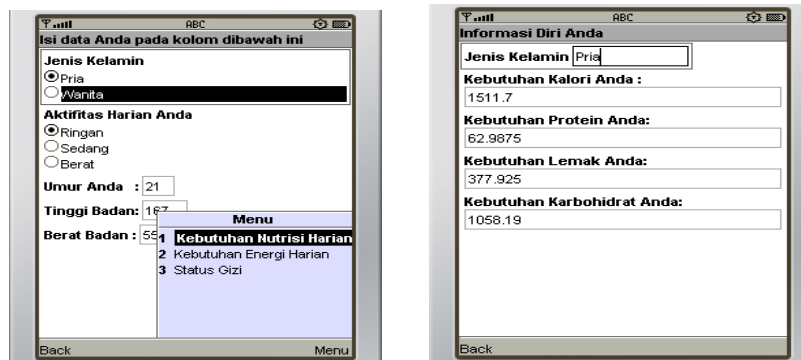

Figure 6. Nutrition Need Daily Menu and Information Nutrition Menu

After that, the users select the menu that is wanted to be used, energy and protein needs as seen Figure 7.
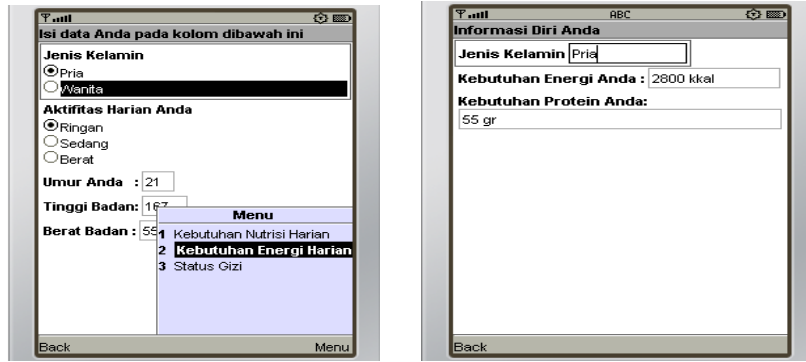
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Figure 7. Energy Need Daily Menu and Energy and Protein Need Menu

Nutritional status menu and to appear BMI (Body Mass Index), it can be seen in Figure 8.

Figure 8. Nutritional Status Menu and BMI Menu

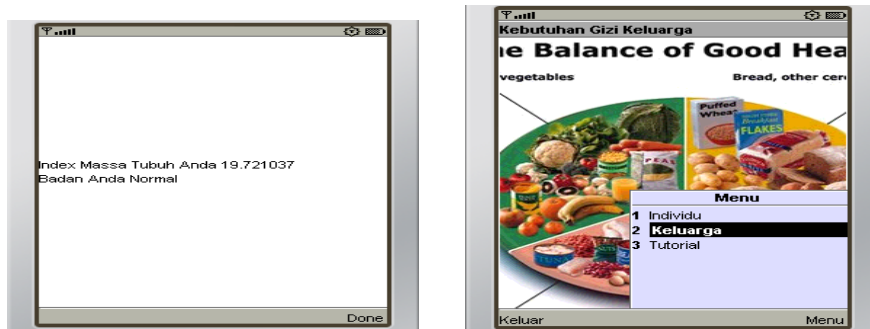Based on BMI, the users know their nutritional needs and the other menu can be seen in Figure 9.

Figure 9. Nutritional Status Menu and Families Menu

The users can see source carbohydrate of needs as seen in Figure 10.

Figure 10. Carbohydrate Menu and Source Carbohydrate Menu

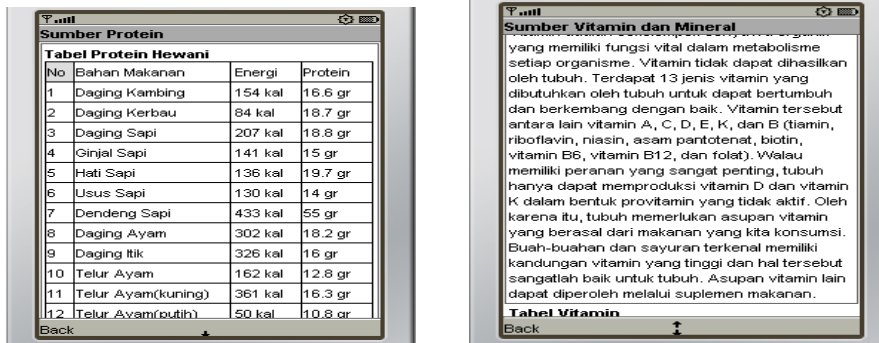To find out the source protein needs and vitamin, can be seen in Figure 11.

Figure 11. Source Protein Menu and Vitamin and Mineral Menu

Composition 4 health and 5 complete, guidance of nutrients balance, nature and health menu, can be seen in Figure 12.
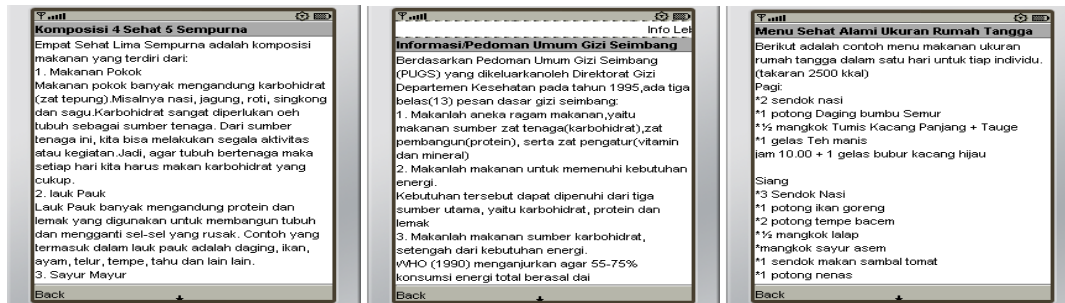

Figure 12. Composition, Guidelines and Household Dose Menu

5. Conclusion

The result of BMI shows that nutritional status can be categorized into four groups: malnutrition, normal, over nutrition and very excess nutrition. The result of BMI shows that nutritional status can be categorized into four groups: malnutrition, normal, over nutrition and very excess nutrition. The needs for nutrition are determined by some

factors such as the adequate calories, carbohydrate, protein, and fat that will produce adequate energy. This research is also shown the example of the nutritious menu – contains sources of carbohydrate, protein, fat, vitamin, mineral and other information about the guidance of a balanced nutrients, for a family in a day in order to overcome their lack in nutrition. Body Mass Index used to determine nutritional needs. Implementation of Mobile Application to cell phone more easily, more quickly, anytime and anywhere. If compared by accessing Body Mass Index Calculator on the web, which requires a connection to the internet. If compared by nutritional counseling and nutrition needs with a doctor needs time, cost and place.

References

[1] R. Almagrhabi, G. Villalobos, P. Pouladzadeh and S. Shirmohammadi, "A Novel Method for Measuring Nutrition Intake Based on Food Image", Proceedings of Instrumentation and Measurement Technology Conference, IMTC, **(2012)**, pp. 366.

[2] M. Phanich, P. Pholkul and S. Phimoltares, "Food Recommendation System Clustering Analysis for Diabetic Patiens", Proc. Conf. on Information Science and Applications, ICSA, **(2010)**, pp. 8.

[3] T. Rismawan and K. Sri, Proceedings of Application of Genetic Algorithm for Determining the Composition of Food Daily, SNATI, **(2007)**, pp. 73.

[4] S. Kusumadewi, Proceedings of Nutritional Content of Food Classification using by Fuzzy C-Means, SNATI, **(2007)**, pp. 53.

[5] C. G. Lis, G. Digant, A. L. Carolyn, M. Murie and G. V. Pankaj, Nut. J., **(2012)**, pp. 289.

[6] M. O. Sinead, F. Anthony, B. Andre and V. B. Jan, J. Nut., **(2012)**, pp. 3166.

[7] S. Almatsier, "Basic Principles of Nutritional Science", GPU Publisher, Jakarta, **(2002)**.

[8] Soekirman, "Healthy Life", GPU Publisher, Jakarta, **(2006)**.

[9] S. A. Hong, K. Kim and M. K. Kim, Euro.J. Clin. Nut, **(2012)**, pp. 123.

[10] F. Hardalac, T.O. Ahmet, B. Necattin, E. Ucman, S. Selami and G. Inan, J. Med. Sys, vol. 28, **(2004)**, pp. 129.

[11] C. Maffeis, Maschio M, Costanzi S, Tommas M, Fasan I, and Morandi A, Eur. J. Clin. Nut, pp.147.

[12] V. L. Divya, Int. J. Sci. Res. Pub, vol. 2, **(2012)**, pp. 225.

[13] L. A. Kumar, ARPN J. Sci. Tech, vol. 2, pp. 221.

[14] T. H. Prabowo, M. T. Reny and N. S. June, Procedings of Designing Application for Tracking Mobile Presence using by J2me Programming Language, AES, vol. 04, **(2010)**, pp. 29.

[15] H. R. Yuliantoro and N. Dini, Procedings of Financial Ratios Calculator Based Application J2me for the Investment Decision Support, AES, vol. 04, **(2010)**, pp. 299.