# A Smart Dietitian using BMR: Focused on Bangladeshi Food Habits

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**Abstract-** As people across the globe are becoming more interested in watching their weight, eating healthier food and avoiding junk food, a system that can measure calories and nutrition in every day meals can be very useful for maintaining our health. Food calorie and nutrition measurement system is very beneficial for dietitians and patients to measure and manage the daily food intake. The proposed system is a responsive application which contains the knowledge and data regarding the fitness of a person. Referred data required to develop the software, form food calories list according to Bangladeshi food habit which makes the software a unique one. This software consists of the user interface which will be publically displayed on the system i.e. the basic information regarding the fitness such as how to maintain good health by including which foods to avoid and some general health tips that should be followed by everyone. The approach presented in this system considers Height, Weight, BMI, Age, Gender, Activity level and various health issues. It acts as a diet consultant similar to a real dietitian by providing required amount of calories and the system processes given data and then calculates the calorie needed to fill up user's need and provides a diet chart which can be printed or saved as a PDF file for further use.

**Index Terms**- BMI, BMR, Calories, Diet-Chart, Health, Smart-Dietitian, TDEE, Waterfall-Model.

## I. INTRODUCTION

Nowadays, people are suffering from many health problems such as fitness problem, maintaining proper diet problem, etc. Therefore, we are developing this software to provide special dietitian information and proper exercise knowledge for normal persons. The effective personal dietary guidelines are very essential for managing our health, preventing chronic diseases and the interactive diet planning helps a user to adjust the plan in an easier way. The user fills the information in the calculator and gets BMI result along with a diet chart. Here, users have to fill personal information including age, weight, height, gender and activity level. For calculating BMI, weight, height, and to calculate BMR gender and activity level are necessary. On the basis of calculated BMI (Body Mass Index) and BMR (Basal Metabolic Rate) will display the proper diet chart for required user.

The objectives of Smart Dietitian System are,

- To help people to calculate their regular calorie need.
- To know their neediness of the type of food and required time to do exercising each day.
- To provide advices about healthy food and the amount of calorie they have to consume.
- To give advices for exercising for different conditions.
- To improve people's awareness about the importance of nutrition, reduces consultation time and makes people care more about their health.

## II. LITERATURE REVIEW

The Smart Dietitian is a software application that provides human diets. It acts as a diet consultant similar to a real dietitian. Dietitians are educated with nutrient value of foods. A dietitian consults a person based on his schedule, body type, height and weight. The system too asks all this data from the user and processes it. The system processes this data and then calculates the calorie value needed and provides a printable diet chart.

*A. Existing System:*

In the previous system diet charts are usually generated using conditioning algorithms and data mining which hypes the use of database and purely depending on the database which leads to entering of data again and again and also it doesn't focus on health condition. Existing system takes in account the user's height, weight and gives a diet chart without taking age, gender, his/her daily routine, health conditions, types of food they can eat into account which was a serious issue.

Drawbacks-

- It does not take user's health condition (like diabetic, allergic or cardiac patients) into account.
- It does not ask user about his/her gender, age, activity level.
- Majority of system don't provide both BMI & BMR.
- There is no existing system that provide diet chart according to Bangladeshi food habit.

### B. Smart Dietitian:

Smart Dietitian is a software application about human diets. It acts as a dietitian consultant similar to a real dietitian. A Dietitian consults a person based on his work schedule, body type, height and weight. The system gathers data from the user such as- gender, age, height, weight, activity type and calculates BMR along with BMI and processes diet chart.

### C. Body Mass Index (BMI):

The body mass index (BMI) is the metric currently in use for defining anthropometric height/weight characteristics in adults and for classifying (categorizing) them into groups. The common interpretation is that it represents an index of an individual's fatness. It also is widely used as a risk factor for the development of or the prevalence of several health issues. In addition, it is widely used in determining public health policies. The BMI has been useful in population-based studies by virtue of its wide acceptance in defining specific categories of body mass as a health issue.[1] The BMI is a convenient rule of thumb used to broadly categorize a person as underweight, normal weight, overweight, or obese based on tissue mass (muscle, fat, and bone) and height. Commonly accepted BMI ranges are underweight (under $18.5 \text{ kg/m}^2$), normal weight (18.5 to 24.9), overweight (25 to 29.9), and obese (30 and above).[2]



Figure 1: BMI Range

### D. Basal Metabolic Rate (BMR):

Basal metabolic rate (BMR) is often used interchangeably with resting metabolic rate (RMR). While BMR is a minimum number of calories required for basic functions at rest, RMR — also called resting energy expenditure (REE) — is the number of calories that your body burns while it's at rest. One popular way to estimate BMR is through the Harris-Benedict formula, which takes into account weight, height, age, and gender. [3]

**Women:**
BMR = 655 + (9.6 × weight in kg) + (1.8 × height in cm) – (4.7 × age in years)

**Men:**
BMR = 66 + (13.7 × weight in kg) + (5 × height in cm) – (6.8 × age in years)
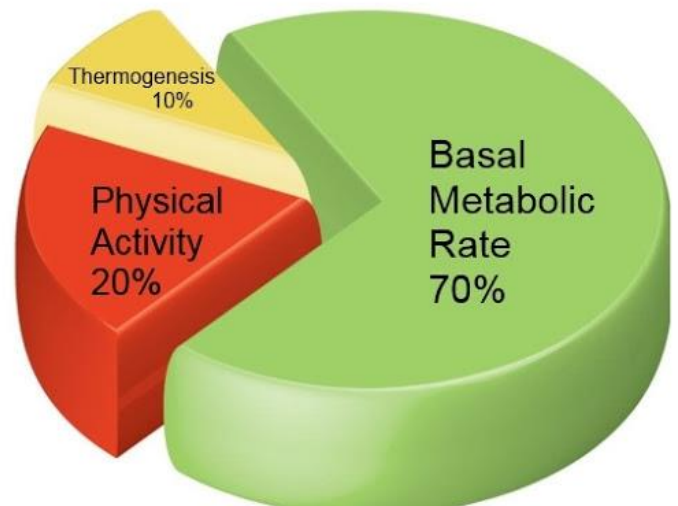


Figure 2: BMR percentage calculation

### E. Processing a Diet Chart:

Diet chart is presented on the basis of the calculation of TDEE. BMR of a person and his regular activity level is then measured to get his regular energy expenditure.

- **TDEE:**

TDEE stands for Total Daily Energy Expenditure. It is the total number of calories you burn in a given day. Your TDEE is determined by four key factors:

  ➢ Basal Metabolic Rate
  ➢ Thermic Effect of Food
  ➢ Non-Exercise Activity Thermogenesis
  ➢ Thermic Effect of Activity (Exercise)

- **Calculating TDEE-**

To get one's TDEE value the activity factor(given below) is multiplied with his/her BMR.

  ➢ Sedentary (little to no exercise + work a desk job) = 1.2
  ➢ Lightly Active (light exercise 1-3 days / week) = 1.375
  ➢ Moderately Active (moderate exercise 3-5 days / week) = 1.55
  ➢ Very Active (heavy exercise 6-7 days / week) = 1.725
  ➢ Extremely Active (very heavy exercise, hard labor job, training 2x / day) = 1.9

**TDEE = activity factor * BMR**

### III. PROPOSED SYSTEM DESIGN

As people across the globe are becoming more interested in maintaining their weight, eating healthier food and avoiding junk food, a system that can measure calories and nutrition in every day meals can be very useful for maintaining our health. Food calorie and nutrition measurement system is very beneficial for dietitians and patients to measure and manage the daily food intake. The proposed system is responsive software which contains the knowledge and data regarding the fitness of a person. This consists of the user interface which will be publically displayed. The basic information regarding the fitness such as how to maintain good health by doing some workouts and by eating proper food.  It acts as a diet consultant similar to a real dietitian. Dietitians are educated with nutrient value of foods. A dietitian consults a person based on his schedule, gender, height and weight. The system too asks all this data from the user and processes it. It asks about his height, weight, age, activity level etc. The system processes this data and then calculates the calorie value to present balanced diet needed to fill up user's need.

#### A. Work Flow Diagram:

In this proposed system of diet consultant, system takes input of required data and suggests a diet chart same as a real dietitian. Here users interact directly with the system which is our admin (static). The user fills the form where, users have to fill personal information including age, weight, height, gender and exercise level. For calculating BMI & BMR age, weight, height, gender and exercise level are necessary. On the basis of calculated BMR (Basal Metabolic Rate) Smart Dietitian will display the proper diet chart for every user.
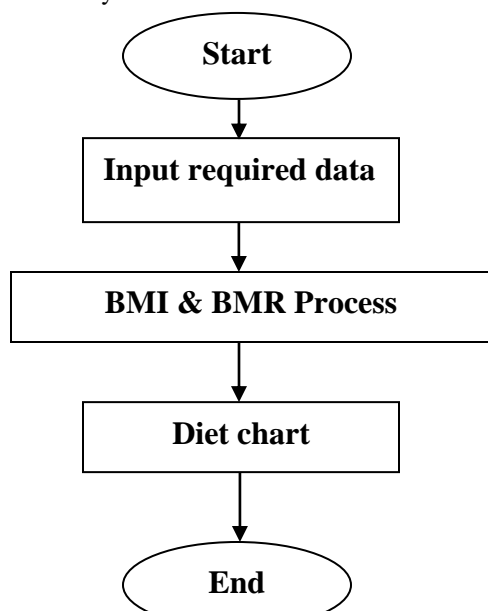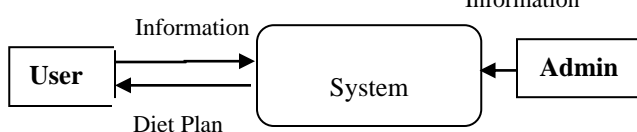


Figure 3: Work Flow Diagram

#### B. Data Flow Diagram (DFD):
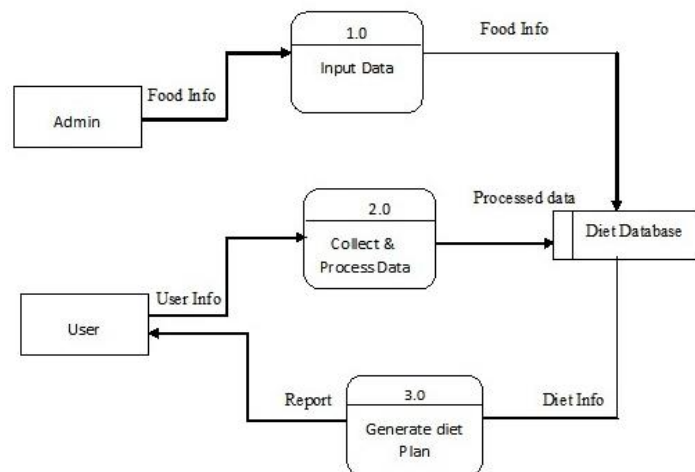- Context Level DFD

- DFD LEVEL 0:
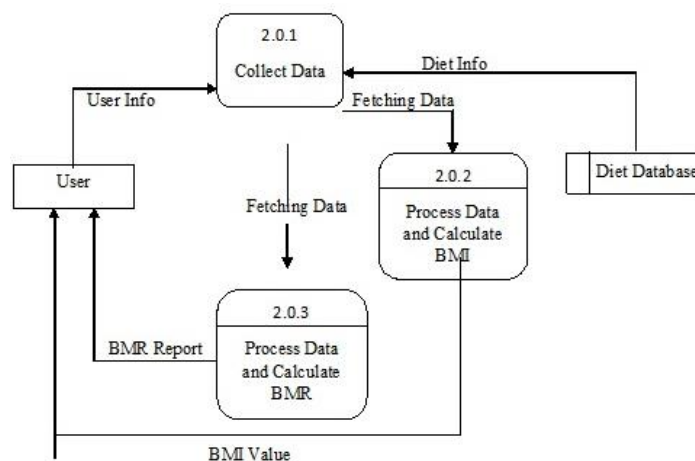


Figure 4: Level-0 DFD

- DFD LEVEL 1:



Figure 5: Leve-1 DFD
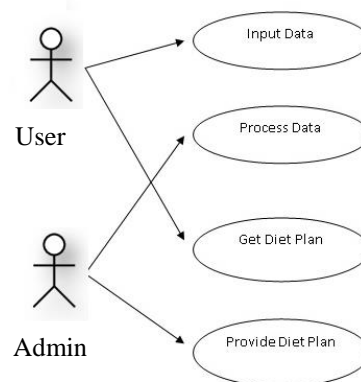
#### C. USE CASE DIAGRAM :



Figure 6: Use Case Diagram

### D. COMPARISON BETWEEN EXISTING & PROPOSED SYSTEM

| EXISTING SYSTEM | PROPOSED SYSTEM |
|---|---|
| It provides diet charts based on BMI. | It provides diet charts based on BMR. |
| Only concerns about height & weight. | It concerns about user's height, weight, age, and gender & activity level. |
| It doesn't consider user's health issues. | It considers user's health issues. |
| Diet plans aren't suitable for Bangladeshi users. | Diet plans are created focusing on Bangladeshi food habits specially for Bangladeshi users. |
| It doesn't provide exercise suggestions. | It provides exercise suggestions. |
| It doesn't provide options to download or print diet charts. | It provides options like downloading in pdf format and also printing. |
| Less accurate. | More accurate. |
| It needs active Internet connection. | It can be used offline. |

### IV. SYSTEM TESTING

Testing is a process of executing a program with the aim of finding error. To make our software perform well it should be error free. If testing is done successfully it will remove all the errors from the software. In this chapter we will take a look at the principles of testing, types of testing and some unit testing of proposed "Smart Dietician" system.

#### A. FUNCTIONAL TESTING

The functional testing does the verification that the software is executing actions as it should. It is a Black-box type testing geared to the functional requirements of an application. Some functional testing are –

- **Unit testing**
- **Integration testing**
- **System testing**
- **Sanity testing**
- **Smoke testing**
- **Interface testing**
- **Regression testing**
- **Beta/Acceptance testing**

#### B. NON-FUNCTIONAL TESTING

The objective of non-functional testing is to ensure whether the response time of software or application is quick enough as per the business requirement. The non-functional testing helps to verify that customer expectations are being met & it should not take much time to load any page or system and should sustain during peak load.

Some non-functional testing are –

- Performance Testing
- Load Testing
- Stress Testing
- Volume Testing
- Security Testing
- Compatibility Testing
- Install Testing
- Recovery Testing
- Usability Testing

### V. UNIT TESTING ON PROPOSED SYSTEM

Unit testing tests an individual unit or group of interrelated units. In developing "Smart Dietician" some unit testing are done. They are given below –
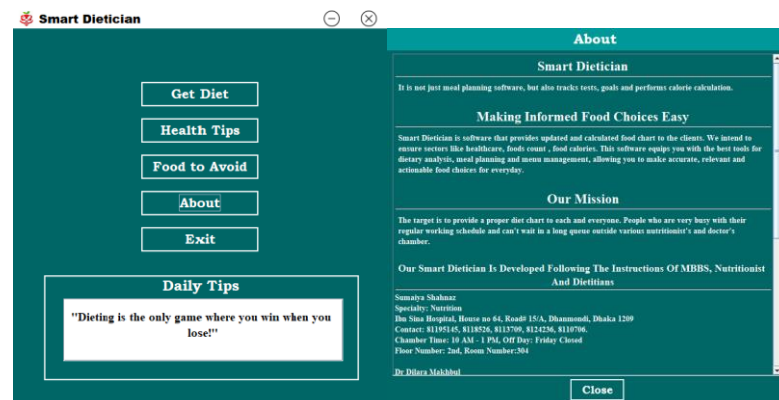
- Software Connection Testing



Figure 7: Testing Software Connection

- **BMI & BMR Calculation Testing**



Figure 8: BMI & BMR Calculation Testing

User provides personal information and the calculator processes information. BMI is calculated taking inputs of height and weight on the other hand BMR is calculated taking all the inputs (gender, height, weight, age). Here, one person's information taken and his BMI & BMR are shown and also his body condition is mentioned.

- **Diet Chart Testing**

A diet chart for the following user is published here. Diet chart is presented according to the BMR value and calculating the activity level. Tips regarding heath issues as mentioned are also provided. Basic 100 calorie burning exercise is also suggested as shown in the screenshots. According to the diet chart our user can also add up to 100 calories (eating any food that supports his health condition) on his regular diet plan. Printing option helps him to get a printed diet plan.



Figure 9: Diet Chart Testing

## VI.  CONCLUSION

"Smart Dietitian" allows the user to know about his/her actual diet information i.e. how much user need calories in their body, on this basis system displays workout and food suggestions. This software reduces the time span and cost for expert advices for diet. This site is exceptionally valuable to wellbeing cares and dietitian. This product diminishes the time compass and cost for master advices for eating routine. This software can be accessed and used easily in any pc. As it is developed following professional's dietary instructions and focused on Bangladeshi food habits, it is proven to be very effective and efficient for Bangladeshi people.

- ➢ Future Scope of the project:
  - o This desktop based application can also be developed as an Android and IOS application.
  - o Website for this can be introduced.
  - o System can be developed where if the user is at a remote place, he/she can send details through SMS and system can send a diet plan to user.

- o The project is easily extensible and can be improved by further incremental releases of the same.
- o Interaction between guider and dietitian through video calling and secure prescription will be focused upon.
- o Better ways to achieve dietitian will be focused.
- o Various features both in calculation and chart section will be installed.

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