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Development of an Android based Mobile Application to Track Nutritional Intake of Young College Students

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Abstract—*In recent years, health has become a major concern of all age groups. A healthy diet provides the body with essential nutrients. Components of the diet must be chosen judiciously to provide all the nutrients to meet the human requirements in proper proportions for the different physiological activities. Mobile platforms provide several advantages over traditional methods of obtaining diet-related information and recommendations. Real-time and continuous communication capabilities, a speedy, flexible, and a user-friendly customizable mobile interface are some of the advantages as compared to traditional dietary recommendation system. Research suggests that interventions using mobile health technologies hold great promise for influencing knowledge, attitudes, and behaviours related to energy balance. Thus it is proposed to develop an android based mobile application to apprise people of their food intake decisions as well as maintain daily track of their targeted calorie and nutrient intake. The suggested app is designed to provide consumers with information about nutritive value of food, combined with tips for healthier choices of eating, accessible through a mobile phone. About 100 dishes from various food groups will be picked up and energy, carbohydrate, protein, fat, fiber, iron and calcium content will be tabulated on the basis of standard household measures like katori, spoon, plate etc. A survey of packaged foods and canteen food will also be done and nutrient content will be tabulated. This will be followed by developing a database on various types of physical exercise and energy expenditure on the basis of time and amount of exercise. Proposed Android app will be developed using incremental approach of software engineering wherein the users will get customized information on their nutritional status, diet profile, energy expenditure in relation to physical exercise, overall nutrient intake and suggestions to improve diet and nutritional status. This app will create health awareness among its users and a continuous usage may lead to gradual improvement in diet behavior of an individual. App will also update its users with health tips thereby discouraging food fallacies. Thus this system will help users to fight most common health issues like obesity, malnutrition and other such problems.*

1. INTRODUCTION

People from all walks of life consider nutritious food intake as their foremost challenge. Humans need a wide range of nutrients to lead a healthy, active and disease free life. A healthy diet provides essential nutrients: fluid, essential amino acids from protein, fatty acids, vitamins, minerals, and adequate calories.

The required nutrients for different physiological groups can only be derived from a well balanced diet. Micro and Macronutrients should be consumed in an appropriate quantity, proportions and levels to satisfy the individual requirements. The amount of each nutrient needed for an individual depends upon his/her age, body weight and physiological status. Nutrients are required for maintaining constant body weight and for ensuring proper body functioning. From a psychological and cultural perspective, a healthier diet may be difficult to achieve for people with poor eating habits [1]. This may be due to tastes acquired in childhood and preferences for sugary, salty and fatty foods [2].

Some of the traditional methods of diet recommendation (i.e. face-to-face diet counselling or information websites) fail to provide proper compositional insight of the food consumed. Just providing the calorie intake of food items is not enough since consumption of right nutrition is more important than low calorie diet. Also the need of hour is not only a food recommender system but something more relevant to individual need which every user can customize.

In recent times, mobile apps have transformed various industries including the healthcare sector. Number of mobile app users especially wellness and health related is growing in leaps and bounds. In 2013 the overall mobile app industry grew 115% in terms of average daily usage, the health and fitness category grew by 49%. This growth accelerated tremendously in year 2014 with 62% increase in usage of health and fitness apps which signifies that this sector is growing at an astounding rate. To further embark, females are more fitness fanatics and thus more readily access fitness related mobile apps (62%) as compared to males (38%) [3].

The ultimate goal of this paper is to propose an android based mobile application which will not just divulge its users about dietary intake decisions but also track their targeted calorie and nutrient need

2. RELATED WORK

In this section, we have described the related work regarding the mobile based health applications. Silva et al have proposed a mobile based health application named SapoFitness for a dietary evaluation [4].

The primary concern of this application is to inspire people to lose weight and increase physical activity. SapoFitness keeps the track of user's record of diet and exercise routine on a daily basis. This mobile based application also provides facility to share individual's achievement on social networking website. Another approach is described in [5] in which Ziyu et al have designed a system, iCare, to monitor the health of the elderly via wireless body sensors and mobile phones. iCare gives the remote monitoring of their health and provide the alert message to the pre-registered people in the iCare application who could be either family members or friends in case of emergency. Hopeful Hearts, another mobile based healthcare application, has been proposed in [6]. Hopeful Hearts recommends intake of food and daily physical activities on the basis of few parameters like BMI (Body Mass Index), Heart rate, working hours etc. They have used Decision Tree approach for recommendation and provide the continuous monitoring of user's health conditions. In [7], researchers have designed and implemented a mobile health consultation application (MHCA) which encourages people to change their unhealthy routines. They have tested their MHCA with the people who have diabetes or care takers of people who had diabetes over a two-week duration. They found that people who used the application regularly had good health regimes than others who had not used application regularly. Health Cloud, a prototype implementation of a mobile healthcare information management system based on Cloud computing and Android OS, has been presented in [8]. Health Cloud enables the management of patient health records and medical images (supporting DICOM format and JPEG2000 coding) and utilizes the Amazon's S3 Cloud Storage Service.

3. PROPOSED MOBILE APPLICATION

Growing popularity of health consciousness and increasing love for Smartphone apps usage has sparked the idea of this project. As shown in fig 1, according to statistical portal Statista "the Smartphone user rate in India as gone up from 3% in 2010 to 25% in 2015 and is expected to reach 32% or more by 2017" [9].

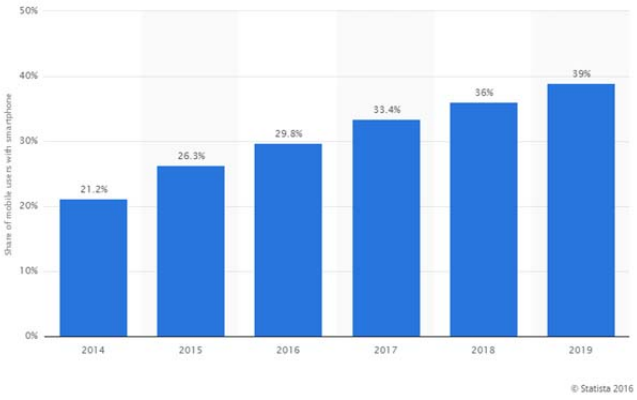

Fig. 1: Survey indicating increasing smartphone users in India [9]

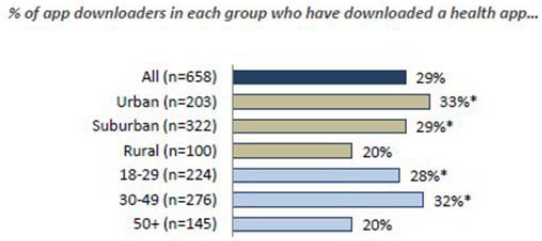

Fig. 2: Demographic Survey indicating percent of health related app users of different age group[10]

Also obesity is a serious worldwide health epidemic and about 30 million Indians are obese [11]. There is a growth in the prevalence of obesity as shown in fig 3

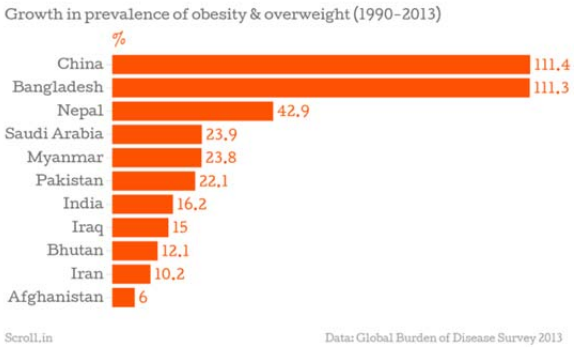

Fig. 3: Growth in prevalence of obesity in various countries. Although India is behind many countries, the increase in obese population in alarming in view of the large number of undernourished people. [12]

Eating habits of teenagers and young adults are changing swiftly. They eat out of home, don't prefer taking packed lunch and mostly prefer fast food. A study done on a population of 1000 females aged between 11-28 years showed that adolescents formed highest percentage of meal skippers and 68.7% of subjects consumed fast foods daily[13]. But at the same time, the young generation is most concerned about health issues. Girls and boys are conscious about their weight. Thus, maintaining an all time check on their daily energy needs using a mobile app is much easier and attractive option for them.

This points to the need of an app that can help to maintain a check on food intake, an app that is customized according to the need of Indians. The system is designed to provide consumers with information about energy density, carbohydrate, fat, protein and fibre content of food. The app may also provide tips for healthier choices of eating just on the mobile screen with an ease of a touch.

The main objective of this project is to develop a mobile app for food recommendation to college going students. This app will create health awareness among its users and a continuous usage may lead to gradual improvement in diet behavior of an individual. Depending upon height and weight of the individual, BMI is calculated which will suggest RDA (Recommended Dietary Allowances) for various nutrients and suggest increase or decrease in calorie consumption and extent of physical exercise. The specific objectives of the project are:

1. Collection of food composition data for cooked dishes according to standard serving size indicating household measures.
2. Nutrient data collection of packaged foods through analysis of nutritional labelling.
3. Collecting data on different types of physical exercise and the energy expenditure while performing them.
4. Development of the app which will include-. Calculation of BMI and waist-hip ratio, suggestion of recommended nutrient intake, calculation of nutrient intake of user on the basis of data entered i.e. name and amount of a particular food eaten and calculation of energy expenditure on the basis of data on physical exercise as user input.
5. Recommendation of ideal food choices for the user on the basis of data generated.

4. RESEARCH DESIGN AND METHODOLOGY

Proposed Android application will be developed using incremental approach of software engineering. Students will conduct a survey to gain insight about existing eating habits of the users on a fixed dataset.

A survey of packaged food, cooked dishes and other processed form of food will be done to tabulate the energy, carbohydrate, protein, fat, fiber and nutrient content. The measure of tabulation will be based on standard household measures like serving bowl, spoon, plate etc. This will be followed by developing a database on various types of physical exercise and energy expenditure on the basis of time and amount of exercise. These will be used for user input.

Once the Software Requirement Document is fixed a software design document will be prepared by students depicting the data flow diagram of functionality, required database design, expected interface design and procedural design of the app.

After completion of this phase, students will proceed to module wise coding and testing. The main features of app that will be implemented are as follows:

1. App will have a user friendly dashboard interface.
2. It will calculate BMI based on height and weight input by the user.
3. It will give Normal/Over-Weight/Obese output based on BMI and waist to hip ratio and WHO classification, recommended cut offs for Indian population will be used.
4. It will suggest the RDA (Recommended Dietary Allowances) to the user based on BMI and ideal weight.
5. It will be able to give complete compositional detail of the food entered by user. It will also maintain the track of user's daily calorie need, indicating exercise requirements for excess calories consumed.
6. App can be customized based on user's preference to lose/gain/maintain the weight.
7. It will suggest user a proper healthy way of losing weight by controlling calorie consumption and increasing physical exercise.
8. A health tip will be placed on the dashboard of the app daily.
9. The interface of the app will be designed to be simple and easy to use.

Once the module wise development and testing is over the android application will be integrated and tested for bugs. Then it will be installed in the phones for beta testing.

When the app is developed, a post survey will be conducted (after one month of app usage) on the same dataset to assess the drift of users from their previous accustomed unhealthy eating habits. Hence these two datasets can be used to deduce the correlation between pre and post eating habits of the users. Statistical tool like SPSS will be used to show the success of this health application.

5. CONCLUSION

A well balanced diet is required to maintain the nutritional status of an individual. Various methods of diet surveys like 24 hour dietary recall, food frequency questionnaire and structured questionnaire are good but may be time consuming and do not provide day to day customized information to the people. In this paper, we have proposed a mobile based health

application which targets mainly Indian youngsters. It will calculate the BMI of an individual and recommend the suitable diet for healthy weight maintenance. It will not only give calorie count of the daily diet but will also track overall nutrient intake of the user in an interesting manner. It will also give daily tips to the user on ways to improve diet and dispelling myths. This application will also suggest the physical activities to the users to maintain or achieve their target weight. In future, we will implement this application using android platform. A pre and post deployment survey will be conducted on a specified group of users. After this, both survey results will be compared to deduce the statistics of their eating habits and to measure the effectiveness of using our health application.

Thus the proposed app may prove to be a useful tool to carry out dietary surveys and also as a help guide for the user to choose best foods for a well balanced diet.

6. FUTURE WORK

Once the app is developed, it can be customized to cater to different people like diabetics and people having high cholesterol. It can be also connected to medical devices like blood glucose sensor which can correlate dietary data with glucose levels. Use of apps in health industry has got huge potential which needs to be tapped to combat problems of malnutrition.

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