

# Android Based Nutritional Intake Tracking Application for Handheld Systems

Deepali Bajaj, Asha Yadav  
Asst. Professor, Dept. of Computer Science  
Para Dholakia  
Asst. Professor, Dept. of Food Technology  
Shaheed Rajguru College of Applied Sciences for Women  
University of Delhi

Bhawna Jain, Deeksha Sharma, Diksha Tewari, Dinika  
Saxena, Disha Sahni, Preetanjali Ray  
Shaheed Rajguru College of Applied Sciences for Women  
University of Delhi

**Abstract**—In the view of developing technology, changing lifestyles and busy schedules, people often tend to neglect their health. This has led to an outcry about health related issues among all age groups. The youngsters are the major victims of health problem as their uneven schedule makes it difficult to keep the track of nutritional value of their meal intake and maintaining daily health record manually. Since, it is a well known fact that what you eat while you are young is what you will be when you are old. The popularity and usage of Smartphone application leads to the need of an application that can cater to the need of health management amongst youngsters. This paper presents the details of a fully functional Android Application for health management specifically targeting the young people in India. The developed application solves the major practical problems faced during health management and meal intake. Health Buddy, the mobile application, has been designed in such a way that it will not only help to keep track of everything they eat but will also give them suggestions of what they need to include or exclude from their diet. It further provides the supplementary information like daily exercise requirements, interesting food facts and myths, and useful health tips to its users. The application is developed on Android Studio 2.1.3 to provide a robust, user friendly solution. It can be installed on any Smartphone with android OS Version Number 6.0.1 Marshmallow. Health Buddy is available at Google Play Store. It has an average user rating of 4.9 which shows its usability among youngsters.

**Keywords**—Android Studio; Nutritional Intake, Mobile Application, BMI, Health;

## I. INTRODUCTION

Health is a dynamic phenomenon, due to its changing nature. Hence, it persists in being one of the chief concerns among all the age clusters. In the contemporary terms a healthy diet is defined as something that allows one to maintain their health whilst their busy schedule. Maintaining a healthy diet involves consuming necessary nutrients by eating the appropriate amounts from all of the food groups, including an adequate amount of water. Generally, a healthy diet is said to include sufficient calories to maintain a person's metabolic and activity needs, but not so excessive as to result in fat storage [1]. Of course, a balanced diet needs to be combined with regular, full body workouts to get best health results.

The key objective of this project is to develop an android based mobile application to acquaint people about their food intake pattern by tracking their daily intake and to maintain their calorie and nutrient need via graphical representation of the results. Target group for this application would be college students, the most appropriate choice in today's scenario to spread awareness about the need to maintain a good health status.

As per the latest market reports, Android has an 84.7% market share among all users of smart phones. Features like micro SD and removable battery cannot be found on phones running on IOS. This is the reason why we chose to develop our application on Android over IOS [2]. Application is developed on Android Studio 2.1.3 [3] which uses Java JDK Version 1.7 to provide a robust, user friendly solution. It can be installed on any Smartphone with android OS Version Number 6.0.1 Marshmallow supporting Target API level 23 [4].

The section 2 of this paper enumerates the basic idea about how this application works along with its salient features and technical approaches used. Section 3 briefs about the actual implementation of various features of the application including the software tools used during the project. Section 4 concludes the paper and the future aspects of the application are enlisted in the last section.

## II. APPLICATION FEATURES

“Health Buddy”, the android based mobile application, is designed to provide a solution that helps people to keep track of their diet and nutritional intake whilst dealing with their busy lifestyles. The application provides its users the ease and flexibility to keep track of their daily diet and nutritional intake habits anytime, anywhere. The key features of the application are as following:

### i. Graphical Representation

The application comprises of attractive, easy to understand graphical representation of the user's daily nutritional intake and calorie consumption which is supported via an external API file “com.github.mikephil.charting.charts” [5].

### ii. The Traffic Light Approach

The traffic light approach is incorporated in to the application so as to provide the user a clear idea of his/ her dietary habits. The depiction of nutrient consumption is done using the “com.github.mikephil.charting.charts.HorizontalBarChart” API [5]. Any nutrient in the graphical representation turns red if the intake of that particular nutrient exceeds permissible range, amber if it slightly exceeds permissible range or green if it lies within the permissible range.

### iii. Health Tips and Suggestions

The application provides tips and suggestions to reduce or gain weight as per the requirements of the user and daily dietary analysis. [6]

#### iv. Additional Features

The application has additional features like BMI calculator, Waist to Hip Ratio calculator, amazing facts and food fallacies. [7]

### III. METHODOLOGY

The methodology encompasses systematic concepts, theoretical analysis, paradigm and phases of the application developed. The outline of the research strategy is listed below:

1. Conducting a manual as well as online survey using Google forms to collect the required data.
2. Studying and collecting information on the nutritional contents of various food items (including packaged and cooked food stuffs).
3. Identification and finalization of tables required for the database, theoretical formulas to calculate the hip ratio and BMI, and other data required such as health tips and food myths for the app. The database was also extended to include data for minerals such as Sodium and potassium.
4. Updating and implementing the new user Interface of the application.
5. Updating and redesigning the ER diagram, DFD, and data-schema to reflect the changes made in the database and the user interface throughout the software development lifecycle.
6. Implementation and correction of the android code as per the changing requirements and introduction of the new optimization techniques throughout the software development lifecycle.
7. Conducting unit tests on the mobile applications to check for inconsistencies, find bugs and issues, if any [8]. Exhaustive set of 45 test cases were covered, Table1 shows selected few amongst them.
8. A survey questionnaire was framed comprising of questions which compared the health and lifestyle status of the consumers before and after using the application.
9. The application was installed on the phones of the target users who participated in pre application survey.
10. During this phase of application deployment beta testing was also conducted, wherein the application was tested in real environment and the results were recorded.
11. An online post survey was done using Google forms on the target users and accordingly data analysis was carried out.
12. Statistical analysis on the survey was performed to analyzing the effectiveness of the application. The application assisted its user for determining the overall health and dietary pattern.

The Data Schema and Screen Flow Diagrams are given below:

USER PROFILE

Field Name	Age	Gender	Height	Weight	Weight Size	Hip Size	Work Type
USER PROFILE	Age	Gender	Height	Weight	Weight Size	Hip Size	Work Type
MILK AND DAIRY PRODUCTS	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
BEVERAGES	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
EGG PRODUCTS	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
BREAKFAST FOOD	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
ROTI, PARANTHAS AND BREADS	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
VEGETABLES AND PANIER DISHES	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
EGG AND NON-VEGETARIAN DISHES	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
RICE VARIETIES	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
SOUTH INDIAN DISHES	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
CHINESE DISHES AND MAGGI	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
FRUITS	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
NUTS AND DRY FRUITS	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
SWEETS AND DESERTS	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
CAKES	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
SNACKS AND FAST FOODS	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
CHUTNEYS AND SAUCES	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
BISCUITS AND COOKIES	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
CHIPS AND NAMKEENS	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
SALADS, SPROUTES AND RATTAS	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
SOUPS	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
JAM, JELLY, PICKEL AND SQUASH	Energy	Protein	Fat	Carbohydrates	Total Dietary Fibres	Calcium	Sodium
MEAL DEFINE	Meal Type	Meal Food	Quantity	Meal Intake	Meal Energy	Meal Protein	Meal Fat
MEAL INTAKE	Meal Energy	Meal Protein	Meal Fat	Meal Carbohydrates	Meal Total Dietary Fibres	Meal Calcium	Meal Sodium

Fig 1 Data Schema

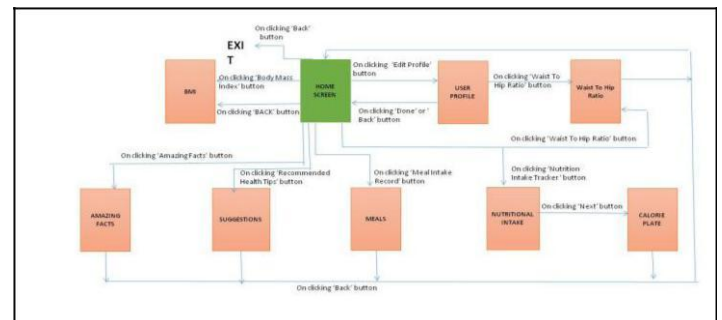


Fig 2 Screen Flow for Home Screen

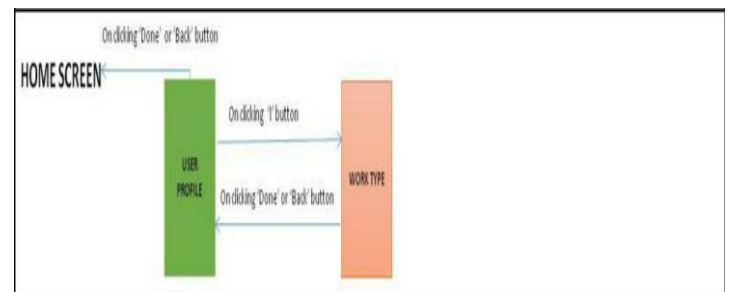


Fig 3 Screen Flow for User Profile

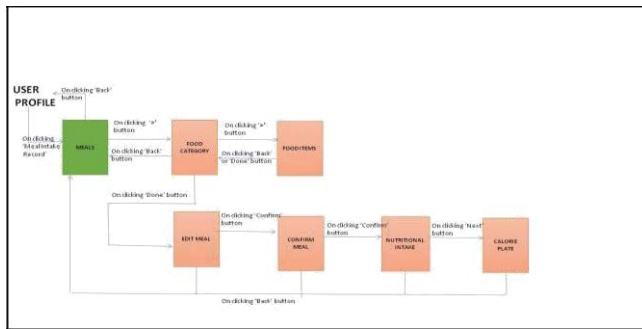


Fig 4 Screen Flow for Meals Screen

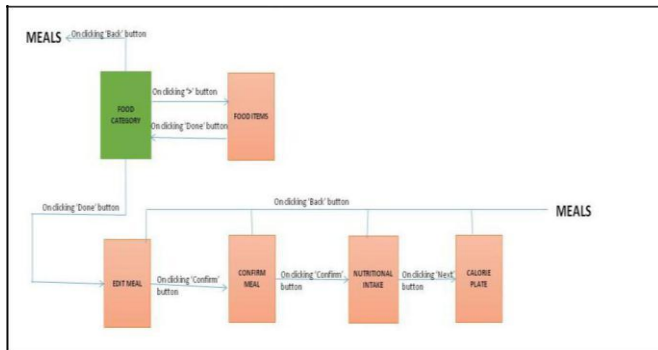


Fig 5 Screen Flow for Food Category Screen

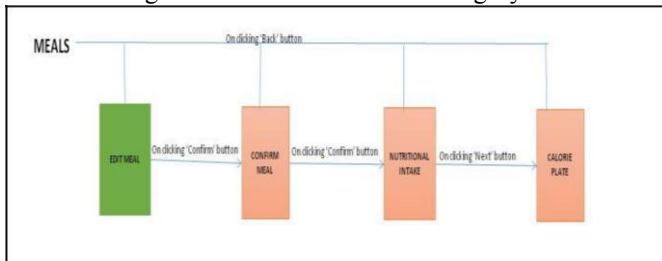


Fig 6 Screen Flow for Edit Meal Screen

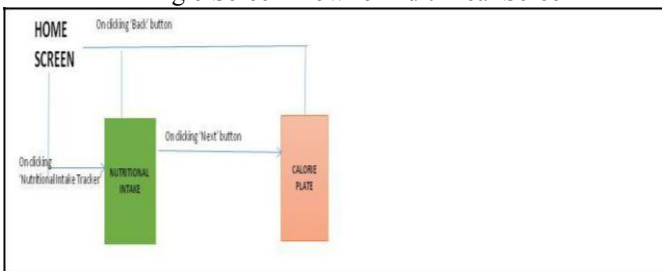


Fig 7 Screen Flow for Nutritional Intake Meal

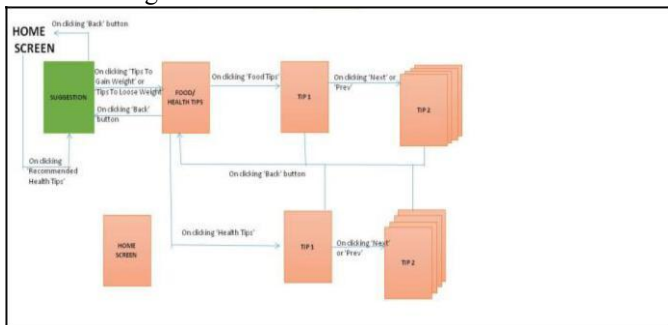


Fig 8 Screen Flow for Suggestion Screen

#### IV. IMPLEMENTATION

The Application was installed in the Android Smartphone of the users by downloading from Google Play Store or by sharing APK files. The Sign up requires user to make his/her profile by providing basic details like name, age, gender, weight, height, work type.

- i. **Meal Intake Record:** The main functionality is to record the meal intake of the user i.e. Breakfast, Brunch, Lunch, Snacks and Dinner. Meal type option displays drop down list of food categories which further expands to food items. Quantity or selection of food items is editable before final submission. A bar graph is displayed showing 24-hour Dietary Intake, Potassium, Sodium, Iron, Calcium, Fibers, Carbohydrates, Fats, Protein, and Energy and a Calorie-Chart.[9][10]
- ii. **Nutrition Intake Tracker:** This option provides the user to view his/her Dietary Intake Graph and the Calorie-Chart anytime during the day.[6]
- iii. **Body Mass Index:** It calculates the BMI of any individual (by default, it shows the Height and Weight of the user whose profile has been created) and also shows the ideal BMI.[7]
- iv. **Waist to Hip Ratio:** It calculates waist to hip ratio of any individual (by default, it shows the gender, waist size and hip size of the user whose profile has been created) and also shows the ideal waist to hip ratio.
- v. **Amazing Facts:** This option provides user some random facts and myths about food items, and eating habits.
- vi. **Recommended Health Tips:** It provides user Food and Exercise tips to gain and lose weight.[11][12]

Screen shots of some screens from the application are shown below:

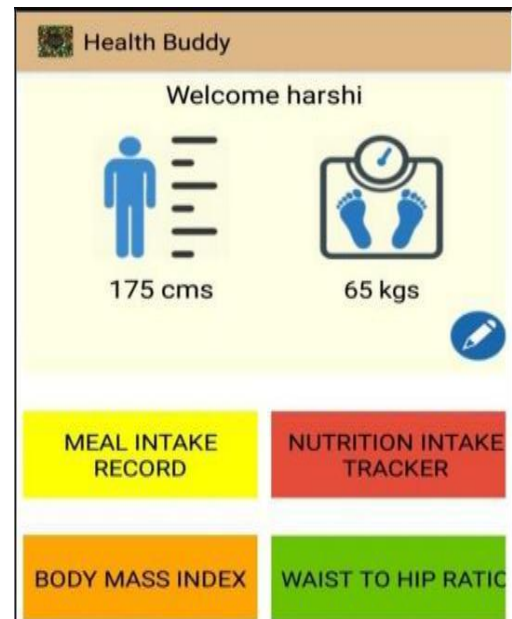


Fig 9 Home Screen

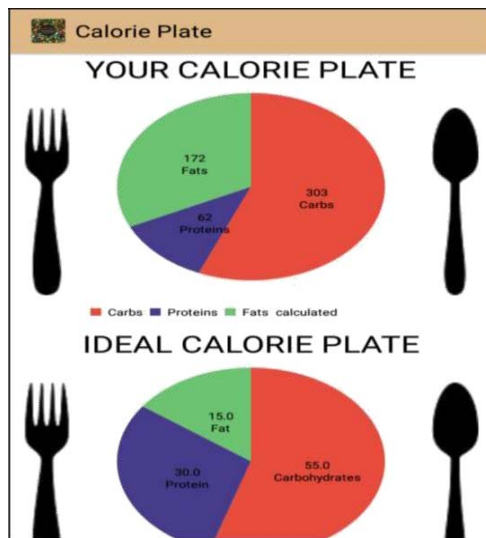


Fig 10 Calorie Plate Screen

**BMI**

HEIGHT (in cms)  
175

WEIGHT (in kgs)  
65

**CALCULATE**

**YOUR BMI**  
21.22449

**IDEAL BMI**  
18.5 to 22.9

**BMI RESULT**  
A BMI of 18.5 to 22.9 is considered **HEALTHY**.

Fig 11 BMI Screen

**Waist To Hip Ratio**

GENDER  
Female

WAIST SIZE (in cms)  
34

HIP SIZE (in cm)  
36

**CALCULATE**

**YOUR WAIST TO HIP RATIO**  
0.9444444

**IDEAL WAIST TO HIP RATIO**  
Below 0.75 in females and below 0.85 in males

Fig 12 Waist-to-Hip Ratio Screen



Fig 13 Screen showing the graph of nutritional intake

## V. RESULTS AND CONCLUSION

In order to evaluate the effectiveness of the application, a survey was conducted on a group of users. Questionnaires were prepared for the pre and post survey analysis. The correlation of the survey results on usability, efficiency and correctness was noted to analyze the application. The pie charts show visual representation of the users' responses.

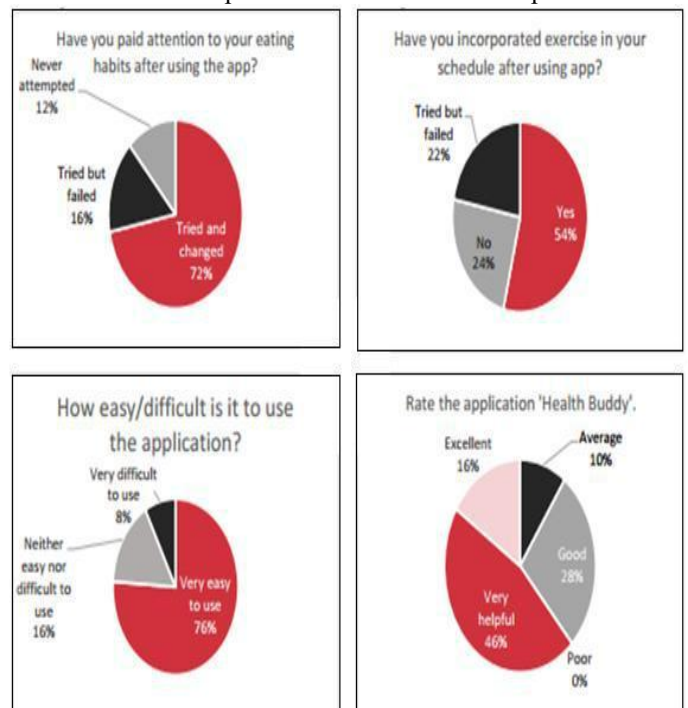


Fig 14 Overall opinions of students on the performance and effectiveness of the application

## VI. INNOVATIONS SHOWN BY THE PROJECT

App is designed to make its users aware about their health and nutritional status. Thus, it can bring out a positive change in the health and lifestyle of people. Following are some of the innovative features of the application:

1. Application is highly customized for Indian users keeping in mind the variety and quantity measures used in Indian servings.
2. App has a unique feature to indicate high levels of Sodium and Potassium in packaged food items
3. Traffic light approach: Along with the statistical representation of the result red, amber and green marks will be shown according to their severity in nutritional aspect.
4. According to their calorie intake per day, approximately 55-60% calories should come from carbohydrates, 20-30% from protein and 15-20% from fats. This is displayed in form of calorie plate along with ideal calorie plate. [6]
5. The app also takes into special account the calcium, iron and dietary fiber of the foods. [13]
6. Additionally, food facts and myths are displayed to make people aware and breaking the stereotypical opinions about certain foods.

## VII. FUTURE SCOPE

The following features may be incorporated to extend the functionalities of the mobile application:

1. The application will be customized to give a personalized interface to the user.
2. Enable multiple users to access their accounts through a single mobile phone with the feature of user login-logout.
3. The application will be modified to cater to a larger audience.
4. The application will be configured to work on a cloud making it light and more efficient.
5. The application will access information (including the menus and recipes) on the nearby restaurants and cafes based on the user's current location and provide the nutritional details.

## VIII. ACKNOWLEDGEMENT

The project was fully funded by Innovation Desk, University of Delhi. The project was also selected for the 'Research Display' on Convocation Ceremony held in Nov 2016, University of Delhi. Selection was based on innovation shown by the project to meet the global challenges in future.

**Table 1: Unit Test Cases Summary**

TEST CASE	MODULE NAME	TEST CASE TITLE	EXPECTED RESULT	ACTUAL RESULT	STATUS
UID_1	Splash screen	Display the splash screen	Splash Screen should be displayed for 1000ms	Splash Screen is displayed for 1000ms	Pass
UID_2	User profile	Checking of radio button for gender	Radio button should be checked either for male or female	Proceeded only when checked anyone of the male or female radio button	Pass
UID_3	User profile	All fields should be filled	Proceed only when all fields are filled	As expected and if any field was left, displayed message "All fields are mandatory".	Pass
UID_4	User profile	Declaration of work type	User must choose work type before clicking "Done" button	Proceeded only when work type was selected else display message "Work type not selected"	Pass
UID_5	Work Type	Selection of at least one work type	User must choose work type before clicking "Done" button	It is necessary to select at least 1 work type else it will display message "Select at least one activity"	Pass
UID_6	Confirm Meal	Check the appropriateness of quantity entered	Quantity must contain numbers with almost one decimal symbol	Quantity can be entered without any special character only except decimal symbol and no alphabets can be entered.	Pass
UID_7	Graph	Check whether user profile is created or not	Display graph only when profile is created	Graph can only be displayed or those users whose profile is created	Pass
UID_8	Waist to hip ratio	Check whether the required fields are filled or not	All the fields should be filled before finding the actual result	All the fields are mandatory for the user and Waist to Hip Ratio can't be calculated if any field is empty	Pass

UID_9	Waist to hip ratio	Check for valid gender format	Either of the gender should be selected	Gender is checked as either male or female before proceeding further	Pass
UID_10	Body Mass Index	Check for valid height format	Height should contain numbers with only one decimal symbol	User is unable to proceed with wrong information and for wrong information displays message "Inappropriate Height"	Pass
UID_11	Body Mass Index	Check for valid weight format	Weight should contain numbers with only one decimal symbol	User is unable to proceed with wrong information and for wrong information displays message "Inappropriate Weight"	Pass
UID_12	Body Mass Index	Compare the BMI value with the ideal value	If Calculated BMI is below 18.5 then it should display UNDERWEIGHT	It displays the result as expected	Pass
UID_13	Body Mass Index	Compare the BMI value with the ideal value	If Calculated BMI is between 18.5 to 22.9 then it should display HEALTHY	It displays the result as expected	Pass
UID_14	Graph	Displaying colors of graph for sodium to follow Red Light Approach	Display red color if value is >3300, yellow if value is between 3000-3300 and green if value is <=3000	Graph colors are displayed according to the ranges	Pass
UID_15	Graph	Displaying colors of graph for sodium to follow Red Light Approach	Display red color if value is >5625, yellow if value is between 5000-5625 and green if value is <5000	Graph colors are displayed according to the ranges	Pass
UID_16	Graph	Displaying coleus of graph for energy and sedentary work type to follow Red Light Approach	Display red color if value is <1200 or >2000, yellow if value is between 1200-1799 and green if value is between 1800-2000	Graph colors are displayed according to the ranges	Pass
UID_17	Graph	Displaying colors of graph for energy and Moderate work type to follow Red Light Approach	Display red color if value is <1200 or >2330, yellow if value is between 1200-2129 and green if value is between 2130-2330	Graph colors are displayed according to the ranges	Pass
UID_18	Graph	Displaying colors of graph for energy and Heavy work type to follow Red Light Approach	Display red color if value is <1200 or >2950, yellow if value is between 1200-2749 and green if value is between 2750-2950	Graph colors are displayed according to the ranges	Pass
UID_19	Graph	Displaying colors of graph for Fat and sedentary work type to follow Red Light Approach	Display red color if value is <40 or >72, yellow if value is between 40-44 or 61-72 and green if value is between 45-60	Graph colors are displayed according to the ranges	Pass
UID_20	Graph	Displaying colors of graph for Fat and moderate work type to follow Red Light Approach	Display red color if value is <40 or >85, yellow if value is between 40-49 or 76-85 and green if value is between 50-75	Graph colors are displayed according to the ranges	Pass
UID_21	Graph	Displaying colors of graph for Fat and heavy work type to follow Red Light Approach	Display red color if value is <40 or >110, yellow if value is between 40-62 or 96-110 and green if value is between 63-95	Graph colors are displayed according to the ranges	Pass
UID_22	Waist to hip ratio	Compare the Waist to hip ratio for gender male value with the ideal value	If user waist to hip ratio less than 0.85 display EXCELLENT	Results are displayed as expected	Pass
UID_23	Waist to hip ratio	Compare the Waist to hip ratio for gender male value with the ideal value	If user waist to hip ratio is between 0.85-0.90 display GOOD	Results are displayed as expected	Pass



## REFERENCES

- [1] Raina U., Kashyap S., Narula V., Thomas S. , Suvira, Vir S. and Chopra S., 2010, Basic Food Preparation: A Complete Manual 4th Ed, Orient Blackswan, 524 pages.
- [2] Lai, RYanne, [2016,Dec,27], "10 Reasons Why Android Is Still Better Than Ios", retrieved from <http://www.androidauthority.com/10-reasons-why-android-is-still-better-than-ios-145370/>
- [3] Android Studio - Downloads. Retrieved from <http://www.tools.android.com:> <http://tools.android.com/download/studio/builds/2-1-3>
- [4] Java SE - Downloads. Retrieved from <http://www.oracle.com/technetwork/java/javase/downloads/index-jsp-138363.html>
- [5] Jahoda, P. [2016, Nov,15]. "MP Android Chart", retrieved from GitHub: <https://github.com/PhilJay/MPAndroidCharttutorialspoint>.
- [6] National Institute of Nutrition, (2009) "Nutritional Requirement and Recommended Dietary Allowance for Indians", ICMR, Hyderabad retrieved from <http://icmr.nic.in/final/rda-2010.pdf>.
- [7] UdayaKumara S., [2013,Apr,12] BMI (Body Mass Index) classification for Asians, retrieved from <http://protectyourhealthtips.blogspot.com/2013/04/bmi-body-mass-index-classification-for.html>
- [8] tutorials point. [2016,Nov, 11]. Test Case. Retrieved from [https://www.tutorialspoint.com/software\\_testing\\_dictionary/test\\_case.htm](https://www.tutorialspoint.com/software_testing_dictionary/test_case.htm)
- [9] Healthaliciousness [2016,Mar] "Top 10 Foods Highest in Cholesterol" , retrieved from <https://www.healthaliciousness.com/articles/foods-highest-in-cholesterol.php>
- [10] Livestrong, [2011,Sep,17], "Top 10 Sources of Protein.", retrieved from <http://www.livestrong.com/article/307814-top-10-sources-of-protein/>
- [11] American Council of Exercise, [2011,JUN,22], " What exercises should I perform if I'm trying to gain weight", retrieved from <https://www.acefitness.org/acefit/healthy-living-article/59/1537/what-exercises-should-i-perform-if-i-m-trying/>
- [12] Klein, B. S. [2016, Mar], Best Superfoods for Weight Loss. Retrieved from <http://www.health.com/health/gallery/0,,20475957,00.html>
- [13] Paul M., Smith M., Lawrence M.A., Robinson, and Segal J., (2017, Apr), "Calcium and Bone Health", retrieved from <https://www.helpguide.org/articles/healthy-eating/calcium-and-bone-health.htm?pdf=true>.