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Virtual Diet Assistant

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Abstract - *Diet is biologically defined as the food consumed by a being to perform its day-to-day activities. The amount of food to be consumed depends on a person's height, weight, age and gender. All the mentioned factors are fed as input to generate the amount of food a person can consume per day. A chart of foods to eat according to the calorie limit is generated alongside. The generated calorific and nutrient requirement can be stored and accessed as per the user's wish.*

Key Words: Diet, BMR, Nutrients, Vitamins, Minerals, Calorific requirements

1. INTRODUCTION

For a Robot, machine, automobile or any system to function, the solemn factor is energy. The form of energy varies according to the system. For example, electricity for computer, petrol for aircraft, wind for turbines etc. Human body is also a complex system which needs energy to function. Here; the energy is acquired by consuming food which is biologically termed as Diet. When a car that functions on diesel is powered with petrol; the friction between the parts increases damaging the fuel lines and pump. Likewise; when you put the wrong food or wrong amount of food into the body; the digestive system weakens causing fatal damage. In order to live a healthy long life, one must follow diet according to guidelines and work equally enough to spend the amount of calories consumed. The amount of food to be consumed per day is termed as the daily calorific requirement. This is generated by the average amount of calories required by an individual to maintain its body functionalities and is termed as Basal Metabolic Rate (BMR). The BMR is generated using an individual's height, weight, age and gender. Each and every food particle that is consumed contains numerous nutrients. The nutrients are categorized into two parts, Macronutrients and Micronutrients. The Macronutrients are sub classified as Carbohydrates, fats and proteins. Carbohydrates are used to provide instant energy. Fats are stored in the fat tissues for future use. Proteins aids in the functioning of cells and maintaining muscle health. The macronutrients percentage for an individual varies according to goals. Calories and nutrients per each meal are as important total calorific and total nutrient requirement because either excess or less amount than the required has adverse effects on an individual's health. The total calorific requirement and nutrient requirement is equally distributed throughout the number of meals to retrieve the values confined to each meal.

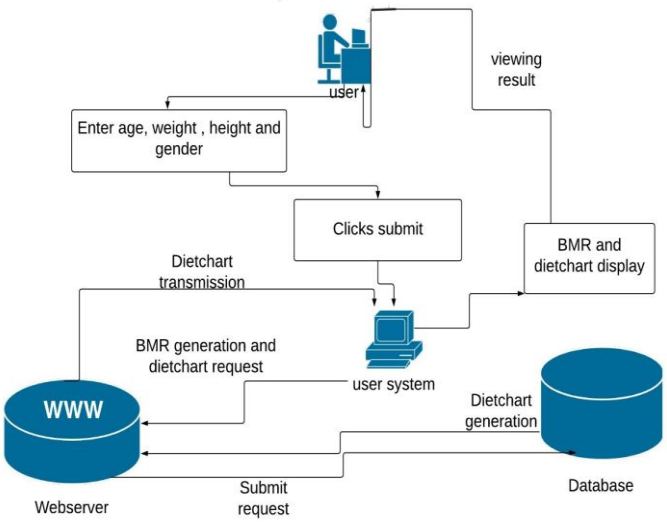

Fig -1: System Architecture

2. IDENTIFY, RESEARCH AND COLLECT IDEA

In [1], Robert E.Ward, Abby D.Benninghoff, Korry J.Hintze stated that diet is essential in shaping the gut microbiome. They described how different fiber sources, oxidation products that result from cooking, and dietary fat emulsifiers mound the composition of the gut microbiome and impact gut health. Humans obtain approximately 10% of their daily energy intake from short-chain fatty acids (SCFAs) derived from microbial fermentation. Many studies have been performed examining the relationship between the gut microbiome and health, and it is now known that symbiosis of the gut microbiome is associated with numerous diseases, including metabolic syndrome, inflammatory bowel syndrome, and colorectal cancer.

In [2], Steven S. Coughlin, Mary Whitehead believed that Smartphone Applications can help Promote Healthy Diet and Nutrition among individuals. Numerous applications provide features such as goal-setting, healthy recipes, grocery or restaurant choices, tracking of energy and nutrient intake, weight report, fitness challenges etc.

In [3], MehnooshSamadi, ShimaMoradi believed that adherence to healthy diet is related to better linear growth with open growth plate in adolescent girls. Nutritional status has various effects on the bone health and growth during puberty by affecting growth plate cells. They hypothesized that there is a relationship between dietary patterns and bone age on girls who have experienced height loss.

In [4], Andreas G. Arens-Vollanda cited that many diet approaches can be stored in computers and electronic devices in correlation to the technological world. For example FFQ or dietary recalls. Both food logs and barcode scanning are offered by most of the mobile applications. Integration with a personal health record or a health care workflow is found in mobile applications.

In [5], Patrick J. Skerrett and Walter C. Willett stated that there are several fundamental strategies for women to inculcate healthy eating. Healthy unsaturated fats, wholegrains, good protein sources and fruits and vegetables serve as examples for good strategies. Avoiding consumption of Trans fats and saturated fats, highly refined grains like plain four and sugary beverages such as sodas. Diet that is based on these principles is healthy through all life stages.

In [6], Fatemeh Azizi Soeliman and Leila Azadbakht reviewed that regaining weight is a common problem for all those obese or overweight who have lost weight recently. Diet therapy, behavioral therapy, exercise or all of them combined have been advised as solutions. Switching to healthy food, lower card, low GI foods, protein rich meals, and moderate fat consumption have resulted in significant results on weight maintenance. Along with these, not being awake late at night, substituting sugar-sweetened beverages, and following a healthy diet pattern play major role in weight maintenance.

3. DIET MECHANISM

Diet is defined as the food practices followed by individuals. The daily calorific requirement also known as BMR is calculated using a particular formula. However the formula varies according to gender. It is proven that the calorific requirements differ according to height, weight, age and gender.

Fig -2: BMR Formula

In addition to the calories; there are nutrients which needs to be taken care of BMR is usually defined as the amount of average energy required to maintain daily activities. Both the above factors can trigger weight accumulation if exceeded. Carbohydrates and proteins when exceeded, are converted into fats. If the calories consumed aren't burnt accordingly, they'll also be converted to fats.

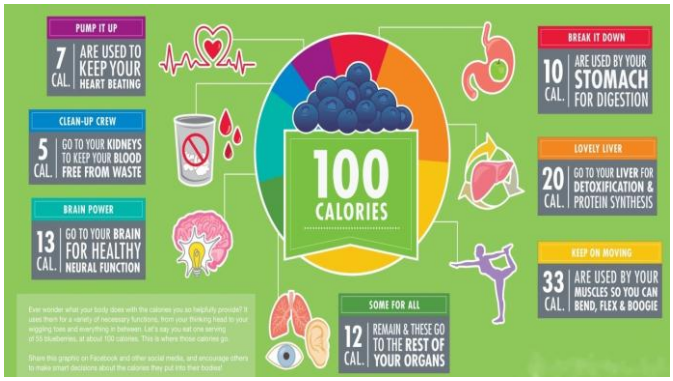

Fig -3: Calorie requirements

3.1 DIGESTION MECHANISM

Digestion is defined as the series of chemical reactions that take place to convert the food that is consumed into essential nutrients. It is also described as the process that takes place right from consuming the food particles to excreting them. Process: It involves six main activates which are described as follows,

1. Ingestion: It is defined as the process of food intake through mouth and chewing it .The food particles get mixed with the saliva to form a semi hard substance called bolus. The process of breaking down nutrients starts right from here by breaking down the carbohydrates into maltose with the help of analyse present in saliva.

2. Propulsion: In this process, the bolus that is swallowed through the mouth enters the stomach through a long tube called esophagus by following peristaltic movements.

3. Churning: In this process, the bolus is churned by the stomach walls which allows it to mix with digestive enzymes and Hydrochloric acid and convert it into a liquid substance called chime. Here, proteins are broken down into peptides which are again broken down into amino acids.

4. Absorption: The chime leaves the stomach and enters duodenum where it is mixed with bile secreted by gallbladder and digestive juices from pancreas. The by product is then moved to small intestine where absorption takes place.i.e the nutrients that are derived are transferred across the body through the blood stream. The lipids which are essentially known as fats are broken down here into fatty acids and monoglycerides by the aid of process known as emulsification.

5. Defecation: The undigested food particles enters the large intestine which is composed of five parts, cecum, ileum, colon, rectum and anal canal. As the undigested particles move through the colon, the water is absorbed leaving semi solid particle known as stool which reaches rectum and is passed through the anus.

• Amino acids are the final products of Proteins.
• Fatty acids and glycerol are the final products of Lipids (Fats).
• Carbohydrates breakdown into simple sugars called as glucose, fructose, and galactose.

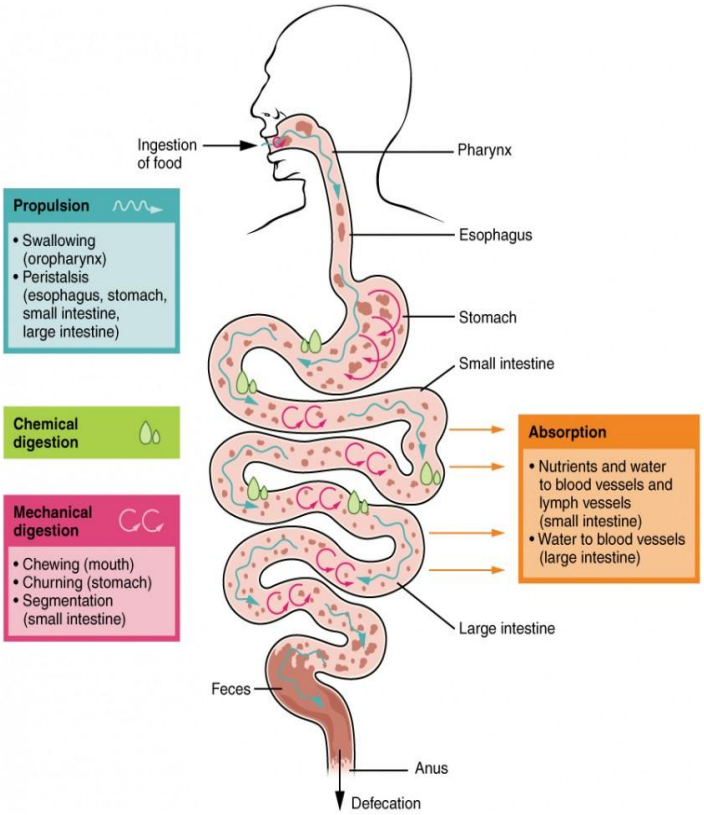

Fig -4: Digestion process

4. NUTRITION THEORY

Each and every edible particle is composed of nutrients. The nutrients are of two main categories, Macronutrients and Micronutrients. The Macronutrients are the nutrients that are needed in larger amounts to function actively. Micronutrients are the nutrients that are required in less and varying amounts. These are necessary for producing energy, immunity, clotting blood, muscle and hair growth, bone health, balancing fluids etc.

4.1 MACRONUTRIENTS

Carbohydrates, Proteins, fats are the three essential Macronutrients. Carbohydrates are again classified into Glucose, Sucrose, Ribose, Galactose, Fructose, Lactose; Proteins into amino acids and fats into saturated fats, Monounsaturated fats, polyunsaturated fats, Essential fatty acids. The foods that contribute to the categories of macronutrients are classified as well depending on the presence of the maximum amount of macronutrient.

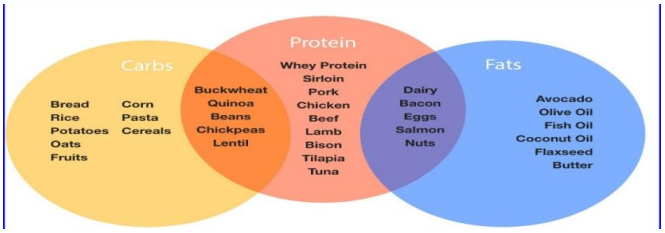

Fig -5: Macronutrient sources

4.2 MICRONUTRIENTS

Micronutrients are mainly vitamins and minerals. Micronutrients are required in smaller quantities relative to macronutrients which is why, "micro." Vitamins are organic compounds made by plants and animals that can be broken down by heat, acid or air. Vitamins are categorized into two types according to solubility namely fat-soluble and water soluble. Minerals are inorganic, which exist in soil or water and cannot be broken down.

Fat Soluble Vitamins
Vitamin A (Retinol)
Vitamin K
Vitamin E
Vitamin D

Water Soluble Vitamins	
Vitamin:	Name:
B1	Thiamine
B2	Riboflavin
B3	Niacin
B5	Pantothenic Acid
B6	Pyridoxine
B7	Biotin
B9	Folate
B12	Cobalamin
C	Ascorbic Acid

Fig -6: Vitamin Table

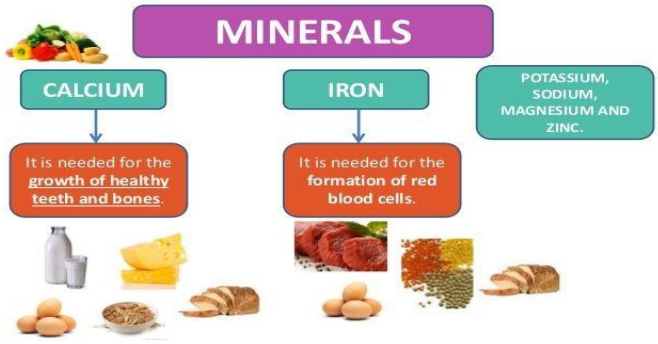

Fig -7: Mineral sources

5. FUTURE WORK

The proposed work in this paper discusses about the generation of daily calorific requirements and macronutrients along with the food list that satisfies the requirement. However; a neat diet chart from time to time and day –to – day can be generated. Also, activity and Workout information to spend the calories according to the consumption can be included.

6. CONCLUSION

In this paper we introduced generating diet requirements for an individual electronically. It is a more efficient and apt method for the current technological world as information today is being stored in electronic devices instead of handwritten papers. It provides user the flexibility to access.

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