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Simulating the Ideal Body Weight in Human Populations

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Abstract Estimation of ideal body weight in human samples in a fine located geographic level is vital for effective health promotion programmes, provision of better health services and population-specific health planning and management. Lack of nutritional knowledge and information gap on various health and nutritional tools negatively impacts the ability of local and national agencies to manage serious health issues and related risks in the community. A solution to this challenge would be to develop a method that simulates reliable statistics on assessing the ideal body weight of human populations. This paper provides a significant appraisal of the biophysical methodologies for estimating ideal body weight to mitigate health-related problems of populations at geographical limited areas. There is no procedure in this multidisciplinary area in estimating ideal body weights of human samples in health physics and biostatistics. The dietician is often at bay in the route ahead of perfect dieting to hold up nutritional soundness of the sample at a population in a community. The aim of this current study is making a dot over these ongoing perils simulating a biophysical modeling to be used in prescribing a confounding free diet. The study findings are the equations (7), (8) and (9) in different health plight regarding to age groups in human population can be an outstanding mathematical modeling as a dieting tool in nutritional physics applicable to the study on health and nutritional research and in the branch of biostatistics. Also it can be a uniquely functional biophysical modeling in the branch of health pedagogy in nutritional epidemiology.

Keywords Health Pedagogy, Ideal Body Weight, Nutritional Physics, Malnutrition, Statistical Simulation, Human Populations

1. Introduction

About 2 billion people in the world suffer from various degrees of malnutrition [1, 2]. Malnutrition is an underlying cause of deaths of about 2.6 million children each year-a third of child deaths globally [3, 4]. There are 73.9%, 63.3% and 57.9% overweight populations in North America, Oceania and Caribbean regions respectively in the world [5, 6].

One in every four of the world's children is stunted and in developing countries this is as high as one in three [7, 8]. Under nutrition accounts for 11% of the global burden of diseases and is considered the premier risk to health condition [9, 10].

Childhood malnutrition leads to stunted growth and inflamed mortality and morbidity which lower the survival opportunities of adults in their later life [11-13]. About 4 of every 5 malnourished children live in South-East-Asia region accounting some 83% of their deaths to be liable to mild to moderate malnutrition intensity [14]. These health problems are the giants for the world's population day by day and so health problems are in need of identification to overcome these conditions with a view to meet healthy samples of population in different communities [15-17]. Therefore, the current study is conducted in search of a simple biophysical simulating of ideal body weight to sustain healthy health status shirking the process of malnutrition in the world.

2. Methodology and Data Sources

This is a methodological review study to design an effective biophysical technique for simulating ideal body weight of human samples in a population. A wide range of instruments have been collected from the logarithmic biophysical modulator in nutritional physics, Leffler formula in pediatrics, unit bracket method in biological mathematics, definitions and equations on weight and mass in biophysics. These instruments have then undergone on different mathematical tools to simulate a new look in computational physics for estimating ideal body weight of human samples in a population which can be used to curb the health and nutritional problems in worldwide nutritional epidemiology.

3. Results

Ideal body weight is initially introduced by Devine in 1974 to allow estimation of drug clearances in obese patients [18]. The ideal weights of human populations are in different shape rested with the ages of human samples in different geospatial settings [19-22]. The ideal body weight can be grouped into three sections as (A) ideal body weight of human samples of less than 1 year old, (B) ideal body weight of human samples of 1 – 10 years old and (C) ideal body weight of human samples of greater than 10 years old [23-25].

Let consider $_{i}m_{<1\,y}$ as the ideal body mass in kg of less than 1 year old human samples, $_{i}m_{1-10\,y}$ as the ideal body mass in kg of 1 -10 years old human samples, s_m as the number of months old the human samples and s_y as the number of years old the human samples in a population.

So, we get the following equations in biological mathematics as per the Leffler formula [26],

$$_{i}m_{<1\,y} = \tfrac{1}{2}\, s_m + 4 \quad (1)$$

and

$$_{i}m_{1-10\,y} = 2\, s_y + 10 \quad (2)$$

Let's move with the logarithmic biophysical modulator [27] to assess the ideal body mass in kg of greater than 10 years old human samples where m_{kg} is considered as body mass in kg, h_{cm} as body height in cm and H as modulator of health status,

$$H = \log^{-1}(4 + \log m_{kg} - 2 \log h_{cm}) \quad (3)$$

We can get the ideal body mass using the value of H as 18 to 25 in equation (3) as per the WHO's BMI classification [28]. So, we get the following equation where $_{i}m_{>10\,y}$ is considered as the ideal body mass in kg of greater than 10 years old human samples in a population,

$$\tfrac{1}{8}\int_{18}^{25} H\, dH = \log^{-1}(4 + \log {_{i}m_{>10\,y}} - 2 \log h_{cm}) \quad (4)$$

We get the following equation solving the integral problem [29] in equation (4),

$$\tfrac{1}{8}\,[H^2/2]_{18}^{25} = \log^{-1}(4 + \log {_{i}m_{>10\,y}} - 2 \log h_{cm})$$

$$\text{Or, } \tfrac{1}{8}\,[25^2/2 - 18^2/2] = \log^{-1}(4 + \log {_{i}m_{>10\,y}} - 2 \log h_{cm})$$

$$\text{Or, } \tfrac{1}{8} \times 150.5 = \log^{-1}(4 + \log {_{i}m_{>10\,y}} - 2 \log h_{cm})$$

$$\text{Or, } 18.8125 = \log^{-1}(4 + \log {_{i}m_{>10\,y}} - 2 \log h_{cm}) \quad (5)$$

Taking log [30] in both side of equation (5),

$$\log 18.8125 = 4 + \log {_{i}m_{>10\,y}} - 2 \log h_{cm}$$

$$\text{Or, } 1.27 = 4 + \log {_{i}m_{>10\,y}} - 2 \log h_{cm}$$

$$\text{Or, } \log {_{i}m_{>10\,y}} = 2 \log h_{cm} - 4 + 1.27$$

$$\text{Or, } \log {_{i}m_{>10\,y}} = 2 \log h_{cm} - 2.73$$

$$\text{Or, } {_{i}m_{>10\,y}} = \log^{-1}(2 \log h_{cm} - 2.73) \quad (6)$$

The body weight is mathematically the product of body mass and the magnitude of gravitational acceleration g [31, 32]. Therefore, the ideal body weights of human samples in a population are on the following gesture whereas $_{i}W_{<1\,y}$, $_{i}W_{1-10\,y}$ and $_{i}W_{>10\,y}$ considerable as ideal body weight in Newton of less than 1 year old human samples, ideal body weight in Newton of 1 – 10 years old human samples and ideal body weight in Newton of greater than 10 year old human samples respectively in a population.

$$_{i}W_{<1\,y} = [\,_{i}m_{<1\,y}]g \quad (7)$$

$$_{i}W_{1-10\,y} = [\,_{i}m_{1-10\,y}]g \quad (8)$$

$$_{i}W_{>10\,y} = [\,_{i}m_{>10\,y}]g \quad (9)$$

4. Discussion

Simulation reproduces the behavior of a system using a mathematical model. Simulations have become a useful tool for the mathematical modeling of many natural systems in physics, astrophysics, climatology, chemistry and biology, human systems in economics, psychology, social science and engineering. It can be used to explore and gain new insights into the new technology and to estimate the performance of systems too complex for analytical solutions [33]. This study can introduce an anew simulation modeling in the branch of nutritional physics in simulating ideal body weight of human samples in different populations [34-38] for sustaining healthy population status in different countries. There is big confusion on using body mass or body weight as mass is a scalar quantity of unit meter while the weight is a vector quantity containing the unit Newton. The purpose of this study is to simulate the way to get ideal body weight in unit Newton as there is no methodological issue of getting ideal body weight in unit Newton according to the proper definition of weight in pure and applied physics. It is tried to represent weight accordingly as it is an ideal indicator or health status in human samples in a community [39-41]. The study results can take a new turn in simulating ideal body weight of human populations evading all the previous faulty procedures [42-45]. This biophysical simulation can be a spatial health micro simulation modeling constructive to design effective policies and see the governments and NGOs, environmental and spatial effects across different countries to bear up against the health and nutritional perils to make sure for ending malnutrition by 2020 [46-53]. This health micro simulation modeling [equation (7), (8) and (9)] can be a super active tool in health pedagogy [54-59] to resist nutritional victimization through using nutrition counseling in nutritional epidemiology in the branch of health science and biostatistics [60-63].

5. Conclusions

Malnutrition is one of the bold public health panics in both the developing and developed countries. The current study outcomes are the three biophysical equations to simulate ideal body weights branding $_{i}W_{<1\,y}$, $_{i}W_{1-10\,y}$ and $_{i}W_{>10\,y}$ applying the equation (7), (8) and (9) in biological mathematics. The national and international big bugs should popularize this health and nutritional simulation to reduce malnutrition bulk as degree as possible. Future research should adopt this cozy biophysical simulation modeling in health pedagogy. This simulation modeling should also be explored in further study for policy designing, analysis and checking spatial effects for childhood, adulthood and geriatric health and nutritional condition upgradation.

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