Measuring Modified Mass Energy Equivalence in Nutritional Epidemiology: A Proposal to Adapt the Biophysical Modelling Approach

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Abstract: The calculation of net dietary energy is in great triumph on the helm of designing an apt dieting for both the therapeutic and normal diet. There are some procedures in this connection in nutritional science which is relatively time consuming, laboratory tests induced and often the misleading data contributors in view of assuring balanced dieting. The dietician is often at bay to approve an exact dieting to sustain health and nutritional soundness adhering to the existing dietary energy measuring methods because the frequently using methods are not informing the net dietary energy level required at all in correct amount for the sample at a population in a community. The aim of the current study is to make a dot over these ongoing panics exploring an easy and accurate way in prescribing a confounding free diet. The study can divulge an open secret in measuring net dietary energy which is mandatory for dieting practices worldwide to resist the possible health horrors in nutritional epidemiology. The study finding is the Modified Mass Energy Equivalence [equation (xi)] can be an outstanding biophysical model in measuring net dietary energy as a dieting tool in health pedagogy of health science.

1. INTRODUCTION

About 2 billion people around the world suffering from different forms of malnutrition [1]. Malnutrition is an underlying cause of death of about 2.6 million children each year-a third of child deaths globally [2,3].

Childhood malnutrition is leading the stunted growth and increasing mortality and morbidity [4-7] which affect the survival opportunities of adults in their later life [8]. About four of each five malnourished children abide in South-East-Asian region contributing about 83% of their deaths due to mild to moderate malnutrition [9,10]. Malnutrition in developing countries seeing because of to poverty, household food insecurity, gender bias, population pressure, food taboos, health, hygiene and nutritional negligence, famine and man-made disasters [11-17]. Malnutrition also occurring for intra-family feud, lower class livelihood, child abuse, deprivation of schooling opportunity and consequence of faulty family planning practices in their families [18-22]. These nutritional giant is engulfing the world's population [23] and therefore initiatives ahead of proper diet planning for the population is in galore need to shirk these malnutrition facing factors [24].

Therefore, the present was conducted in search of an effective dieting tool which can help the dietician to plan the proper dieting for both the therapeutic and normal diet aiming to turn tail the ongoing malnutrition headache across the globe [25] and the government and different international and national NGOs should organize health and nutritional campaiging to aid the population to practice a healthy diet using the implementing polity of this research discovered Modified Mass Energy Equivalence for health physics.

2. METHODOLOGY

The study was a cross-sectional study conducted using the statistical secondary data analysis technique. The data were collected from the world's most famous equation $E = mc^2$ of the physicist Albert Einstein, unit multiplier, fuel factor and the mass of consuming nutrients. The DIT concept in nutritional field and numeric value of π in mathematical field were also the data to undergo in analyzing all the data using mathematical modeling to hit upon a trendy and time saving biophysical modeling to calculate net dietary energy required for individuals in the communities.

3. RESULTS

Antoine Laurent Lavoisier, a philopher and a chemist discovered the Law of Conservation of Mass

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[26,27] in 1785 stating the matter [28] is neither created nor destroyed in a chemical reaction [29] and Julius Robert Mayer, a physicist discovered the Law of Conservation of Energy in 1842 searching out the First Law of Thermodynamics [30] stating the energy [31,32] is neither created nor destroyed in an isolated system.

Albert Einstein, a German-born physicist announced the Law of Conservation of Mass Energy [33-35] as rule of the combination of the duo laws naming the Law of Conservation of Mass and the Law of Conservation of Energy indicating the total amount of mass and energy in the universe is constant and hence the Law of Conservation of Mass Energy is called Mass Energy Equivalence [36] as a rule of the following mathematical melody,

$$E = mc^2 ;$$

Where,

m = mass of a matter,

c = speed of light in a vacuum (about 3×10^8 ms^{-1}) and

E = energy of an isolated system. .... (i)

The value of c^2 on the right side of the equation (i) is a unit multiplier [37] which take on different gestures in different isolated systems and this equation can steal into the health physics to measure dietary energy [38,39] content of foods taking the puppet in the hand of fuel factors of different components of foods in diet planning.

Let consider the fuel factors of carbohydrate, protein, fat and alcohol be f_c, f_p, f_f and f_a kcal g^{-1} to be responsible to yield $(E_d)_c$, $(E_d)_p$, $(E_d)_f$ and $(E_d)_a$ kcal of dietary energy for corresponding consumption of m_c , m_p, m_f and m_a g of carbohydrate, protein, fat and alcohol respectively in the diet.

So, considering the equation (i) in dieting,

$$(E_d)_c = f_c\, m_c \text{.. (ii)}$$

$$(E_d)_p = f_p\, m_p \text{.. (iii)}$$

$$(E_d)_f = f_f\, m_f \text{.. (iv)}$$

$$(E_d)_a = f_a\, m_a \text{... (v)}$$

Adding the equations (ii), (iii), (iv) and (v),

$$(E_d)_c + (E_d)_p + (E_d)_f + (E_d)_a = f_c\, m_c + f_p\, m_p + f_f\, m_f + f_a\, m_a$$
.... (vi)

The carbohydrate, protein and fat among the six components of foods and alcohol yield the dietary energy through the metabolism [40,41] process and therefore the following biophysical myth is appeared attending to the left side of equation (vi),

$$E_d = (E_d)_c + (E_d)_p + (E_d)_f + (E_d)_a ;$$

Where,

E_d = Dietary energy in the diet .... (vii)

Taking equation (vii) inflowing into the equation (vi),

$$E_d = f_c\, m_c + f_p\, m_p + f_f\, m_f + f_a\, m_a \text{ .... (viii)}$$

The numeric value of fuel factors of carbohydrate, protein, fat and alcohol representing f_c, f_p, f_f and f_a are 4, 4, 9 and 7 kcal g^{-1} [42,43]. Inserting these values into the equation (viii),

$$E_d = 4m_c + 4\, m_p + 9m_f + 7m_a$$

$$= 4m_c + 4\, m_p + 4\, m_f + 5\, m_f + 4\, m_a + 3m_a$$

$$= 4m_c + 4\, m_p + 4\, m_f + 4\, m_a + 5\, m_f + 3m_a$$

$$= 4 (m_c + m_p + m_f + m_a) + 5\, m_f + 3m_a$$

$$= 4 \times 7/22 \times 22/7\ (m_c + m_p + m_f + m_a) + 5 \times 7/22 \times 22/7\ m_f + 3 \times 7/22 \times 22/7\ m_a$$

$$= 1.27\ \pi\ (m_c + m_p + m_f + m_{a)} + 1.6\ \pi\ m_f + \pi\ m_a$$
(Putting the value of π [44-46])

$$= \pi\ [1.27\ (m_c + m_p + m_f + m_a) + 1.6\ m_f + m_a] \text{ ....(ix)}$$

The net dietary energy gained by the body memorizing the DIT concept [47-49] according to the following equation in nutrition,

$$(E_d)_n = E_d \text{-DIT}$$

$$= E_d \text{-10\% of } E_d$$

$$= (1 \text{-} 0.1)\ E_d$$

$$= 0.9 E_d;$$

Where,

$(E_d)_n$ = Net dietary energy .... (x)

So, the following equation is derived through inserting the equation (ix) into the equation (x),

$$(E_d)_n = 0.9\ \pi\ [\ 1.27\ (m_c + m_p + m_f + m_a\ ) + 1.6\ m_f + m_a]$$
.... (xi)

Therefore, the equation (xi) is the Modified Mass Energy Equivalence for health physics applicable to measure the net dietary energy as a dieting tool in health science.

4. DISCUSSION

Human health is the level of function or metabolic ability of individuals or communities to adapt and self-manage during facing physical, mental and social challenges [50]. The WHO defines health in its broader sense in its 1948 constitution as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" [51]. To maintain healthy health is really harder due to different physical, social, economic and environmental affecting factors. The people are often deprived of their country's constitution valid basic health, hygiene, nutritional care and shelter [52]. The population are want of balanced diet in order to the dieting malpractices and the dieticians are in quest of a time saving and easy method in measuring net dietary energy required for the observance of healthy population [51] in the community. Different health and nutritional hotch potch creating factors such as the DIT [53-55], fuel factor and the information gap between dietary energy E_d and net dietary energy $(E_d)_n$ are also in existence in the branch of nutritional epidemiology. The engulfing methods are only considering the fuel factor of the nutrients naming carbohydrate, protein and fat fighting shy of the adherence of the rampantly consumed alcohol in the developed and also in developing countries in vast amount but ample amount in the countries of containing the pauperism curse. The present study result is cut and dried by adding the fuel factor of alcohol along with another energy yielders like carbohydrate, protein and fat. The $(E_d)_n$ measuring technique is cut short using the study result [equation (xi)] for the health and nutritional epidemiologists. The $(E_d)_n$ can be calculated by just inserting the mass of the taking nutrients in the equation (xi) cutting loose the confounding creating parameters and this biophysical modeling can give vent to a new modeling in the branch of health physics. This study proposed Modified Mass Energy Equivalence can be a splashing spatial microsimulation modeling [56-60] to be constructive in designing effective policies for the governments and NGOs for environmental and spatial effects across different countries [61-63] in the world to aid healthy dieting practices for keeping sound health. This health microsimulation modeling [biophysical equation (xi)] gained from the carried out study can be an effective tool at the sector of health pedagogy [64,65] in nutritional epidemiology. The study gained biophysical equation can not in the gesture of nutritional astraphobia and this equation can be in galore application in 1/1 nutrition counseling [66] as a practical application in real life in health science and nutritional biostatistics.

5. CONCLUSION

Malnutrition is one of the greatest burning issue in health science in both the developed and developing countries. The present study outcome can take a serious turn in evading the malnutrition sorry tales across the globe. This study rendering the Modified Mass Energy Equivalence should be taking into action in designing healthy diet at different demographic sites in the country. So the international and national level big bug policymakers should bear the testimony in making awareness about the Modified Mass Energy Equivalence as a part of effective dieting tools. Future research should adopt this hassle free $(E_d)_n$ calculating modeling to explore a new path in health pedagogy for taking intervention in policy designing, analysis and checking spatial effects for health and nutrition condition upgrading bid for all classes' people.

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