



## Original Research Article

## Energy requirement for sedentarily active women in present life style — An insight

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## ABSTRACT

Recommended dietary allowances are set and revised by Indian council for medical research with a purpose to guide the population by providing direction for a long term management towards a healthy and diet prone disease free life. The present study provides an insight into recommended dietary allowances in respect to the Indian scenario for sedentarily active women. The study focuses attention to over nutrition as well as under nutrition. Sedentarily active women in 45-60 years age group were chosen as subjects covering low income, middle income and higher income groups. The regular life style and diets were observed and recorded using diet journal for a period of 6 weeks. The study revealed that more than 50 percent of subjects were overweight. The results of the mean dietary intakes recorded in the food journals revealed that the self reported energy intake values were much less than the recommended energy intake as per ICMR 2010 recommendations. The study emphasized that the need for reconsidering energy recommendations by assessing specific life style requirements along with balancing the individual psychological, social and biological needs. And the same has been reflected in the revised recommendations by ICMR 2020.

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## 1. Introduction

Humans need energy for basal metabolism which comprises a set of functions necessary for life such as cell metabolism, synthesis and metabolism of enzymes and hormones, transport of substances around the body and maintenance of body temperature and ongoing function of muscle, heart and brain. Energy is not a nutrient but required in the body for metabolic processes, physiological functions, muscular activity, growth and synthesis of new tissues. Growth uses about 35% of total energy needs. This falls to 5% at 12 months, less than 2% in the second year of life, 1-2% until mid-adolescence and zero by 20 years of age.<sup>1</sup>

The energy that is required by the human body to maintain its organic and vital functions is obtained by oxidation of macronutrients from foods. Energy expenditure (EE) can be considered as a process of energy production

from energy substrates (carbohydrates, lipids, proteins and alcohol) combustion, in which there is oxygen consumption and carbon dioxide production. Part of this chemical energy is lost as heat and in urine and the remaining energy is stored in high energy molecules known as adenosine triphosphates (ATP's). Energy is also needed to process food into nutrients resulting in increase in heat production and oxygen consumption which is often described by the terms 'diet induced thermogenesis, or specific dynamic action of food (SDA) or Thermic effect of food'.

The amount of energy needed for this purpose in a defined period of time is called Basal Metabolic rate (BMR) which comprises 45-70% of daily energy expenditure based on age, gender, body size and composition. Basal metabolic rate is perhaps the most widely reported physiological metric. It is studied in relation to body composition and daily energy expenditure for life processes such as maintenance of body temperature, respiration, digestion etc which in turn was measured by means of doubly labelled

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water technique. When this method is applied over a 24-hour period, it includes estimates of dietary-induced thermo genesis and the energy cost of tissue synthesis.

When direct data are not available, factorial estimates based on time allocated to habitually performed activities and knowledge of energy cost of these activities may be used. However, BMI is a critical indicator of good health and an excess BMI is inferred as increased weight which is in turn is an implicative of excessive intake.

Recommended dietary allowance (RDA) or Recommended Energy Intake (REI) is not different for individuals but it is addressing a group. However, these requirements may be influenced by the physiology and metabolism of the individuals and the average energy intake recommended for a defined group cannot be applied for individuals. REI is needed to maintain current body size and level of physical activity which are consistent with good health. Desirable REI recommended may be higher for sedentary active people than needed. This difference might lead to an imbalance and creates a correlation between overweight and inactivity. REI should allow inter and intra variations among the healthy individuals in the group.<sup>2</sup>

There are two terms that fall under REI, these are EER (estimated energy requirement) and ERM (energy requirement for maintenance). There should be a clear distinction between these two terms which is necessary to avoid the risk of excessive desirable energy intake in people who don't follow recommendations for physical activity.

Total energy expenditure (TEE) is the energy required by the organism daily and it is determined by the sum of 3 components: basal energy expenditure (BEE), diet induced thermo genesis (DIT) and physical activity Level (PAL). There are several methods for EE measurement such as doubly labeled water (DLW), indirect calorimetry (IC), direct calorimetry (DC), bio electrical impedance and others.

The present study is conducted as a take-off in the dimension with an insight to validate the ERM (estimated requirement for maintenance) in comparison with EER (Estimated energy Requirement) so as to recommend changes to be adopted in the given group that is sedentarily active women of 45 – 60 years.

### 1.1. The present study throws light on this concept with the following objectives

1. To understand the ERM against EER
2. To Compare the energy requirement through factorial approach (Harris- Benedict Eqn ) to that obtained by electrical impedance and RDA for Indians
3. To have a retrospective record of the various factors seem to be having an impact on BMR and weight gain through an oral schedule.
4. To compare estimated total energy expenditure with that of self reported energy Intake.

5. The study is proposed with a purpose of understanding the reasons for overweight and obesity amongst women during peri menopause to post menopause stages as this period is crucial and origin of many hormone related disorders and lifestyle diseases associated with morbid factors leading to increase in unpredicted mortality.

## 2. Materials and Methods

1. An active participatory approach was adopted using an oral schedule supplemented with retrospective self analysis of the participants.
2. The various heads under which questions were framed includes anthropometric measures, health status, Food consumption pattern, Physical activity, Sleep patterns, Religious, social and cultural practices.
3. Anthropometric measurements were recorded such as height, weight, BMI, BMR, Body fat%, Visceral Fat %, % of water and muscle mass, using bioelectrical impedance (Karodoscan).
4. Computed values of PAL and SF were taken in to consideration to arrive at ERM
5. Approximate energy intake (EI) was calculated from self reported food consumption frequency by using an app developed by NIN- ICMR (NIN-NUTRIFY INDIA NOW version 2.0)
6. A comparison between self reported energy intake (EI) and Recommended energy intake (REI or RDA for Indians 2010.<sup>3</sup> and Nutrient requirements for Indians 2020.<sup>4</sup>) for the age group was made
7. Various co influencing factors such as physiological, psychological, social and cultural aspects along with the physical activity pattern were recorded.
8. Subjects- 54 women with in the age group of 45-60 years from teaching and non teaching positions were chosen.
9. The subjects were given food diaries. The participants were given an orientation towards the standardized portion sizes for various foods and were educated about recording their dietary intake against the standardized measures in the food diaries.
10. This was practiced for a period of 45 days, on the 46<sup>th</sup> day anthropometric measurements were recorded and the variations if any were recorded based on the diet history.

### 2.1. Inclusion criteria

The present study is subjected to women in the perimenopause, pre menopause and menopausal ages who might be married or unmarried, with or without child births and includes the possibilities of known medical history.

## 2.2. Exclusion criteria

Factors like socio-economic status, geographical location, climatic condition, natural food habits and habitat of different countries and continents at a larger front are excluded.

## 3. Results

The results of the study are presented in 2 parts

1. Anthropometry to arrive at ERM using Harris — Benedict Equation.
2. Retrospective participatory approach to assess energy intake.

The anthropometric variables of the study population are presented in Table 1.

It was observed from Table 2 that more than 50% of the study population is having overweight, though the Degrees of obesity may be varying.

The Energy required for maintenance as calculated by the Karodscan was found to be less than the estimated energy requirements as recommended by the National institute of in 2010 and 2020 as shown in the Table 3.

The figures in Table 4 shows a comparison of self reported food intake calculations as recorded by the subjects in the food journal and calculated the energy intake using NIN — Nutrify India now, Version 2.0 and compared against the Energy required for maintenance as predicted by the Karodscan machine

## 4. Discussion

Basal metabolism of an animal is the minimal rate of energy expenditure compatible with life'.<sup>5</sup> In the present study the primary purpose of the various measures of BMR and how to apply the same to the modern time were introspected. The study has considered physiological, psychological, social and cultural influences with the scope for individual variations. A record of self assessment report of energy intake has been made for potential associations with BMI, overweight and obesity. From the schedule generated it was observed that most of the women (36 subjects) were having similar daily chores, they were health conscious and reported to be consuming health supplements. It was also expressed by the subjects that exercise was not taken up as they were thinking that household work can substitute physical activity. Eight subjects have reported to be going for an everyday walking six subjects have reported a practice of weekend walking.

Subjects reported sleep disturbances with an average sleep of 6 hours a day and more than half of the subjects preferred a nap between lunchtime and snack time that is generally during their transit from work place to home. The reduced sleep hours often reflect as one of the key

menopausal symptoms playing a role in weight gain.<sup>6</sup> It has been observed that the self reported energy intake values were much less than Recommended energy intake for the given age groups. This is after the correction value of 300 kcal given to avoid the bias in measuring the food intake in the present study. The total energy is considered but not specific fat and carbohydrate content of the diets.

The perception of individuals towards their body weight has an influence on reporting the energy intake. For example a lean person may be over reporting the values whereas a fat person may be under reporting the value ignoring the fact of calorie density. It has been observed that ERM values were less than EER values in all subgroups

The Desire for weight change Vs physical activity score were compared with both EI and BMR. Our findings indicated that attitudes about one's own body weight influenced reported EI.<sup>7</sup> This may be true as more than 50% subjects in all age groups were either overweight or obese, as indicated by the Body mass indices of the individuals.

The energy intake of the subjects was calculated using food composition tables and mean values are reported for subgroups classified within the sample population. The ERM values were calculated using bio electrical impedance. The values so obtained were compared with EER as per ICMR 2010 recommendations that is 1900 kcal/day and the latest ICMR recommendations 2020 which is 1660 kcal/day. There was no drastic weight loss during the study period. However, RD As cannot form the basis for diet planning and diet assessment at the individual level. But they can be used to plan balanced diets for various age groups.<sup>8</sup> RDA was revised in 2020 but till that time what has been suggested in 2010 was in use as the only aid.

But the recommendations are independent of hormonal variations, sleep variations, psychological, social and cultural influences along with physical activity as well. This leaves us with a thought that decreased BMR for various reasons and sedentary lifestyle might require decreased energy intake. The energy requirements are more in the formative years of life compared to matured physiological requirement. The decrease in metabolism with increase in age highlight the importance of drawing a threshold limit for both men and women after settling down in one's own life with considerable financial status.

This insight is necessary before making policy decisions as thumb rule for the whole population. Individual variations rank very high amongst the list of factors because food intake and the satiety value one get after consumption are absolutely experience based. Balancing the psyche of the individual with EARs requires extensive awareness of wide choices one can exercise in selection, preparation and consumption of foods.

**Table 1:** Anthropometric variable of the subjects

Age (Years)	Height (cm)	Weight (kg)	BMI (kg/m <sup>2</sup> )	BMR	Fat %	Water %	Muscle mass %	Visceral Fat %
46-50 years (N=28)	152.32	67.23	27.5	1156.34	37.56	40.45	35.34	7.99
51-55 years (N=17)	151.54	62.97	26.3	1188.54	38.55	41.01	35.93	8.19
56-60 years (N=9)	151.23	61.91	24.6	1098.56	37.64	41.72	36.23	8.42

**Table 2:** Comparison of Body mass indices of the subject sin different various age groups

Age Group	Normal	Overweight Subjects	Total subjects
45-50	12	16	28
51-55	8	9	17
56-60	3	6	9
Total	23	31	54

**Table 3:** Comparison of ERM of the given age groupagainst

	ERM(Machine )	EER(RDA as per 2010)	EER ( RDA as per 2020 )
46-50 years	1638 (139.7)	1900	1660
51-55 years	1515 (109.3)	1900	1660
56-60 years	1599 (182.3)	1900	1660

\*The figures in parentheses {} gives  $\pm$  S.,D

**Table 4:** Self reported energy intake (ERM) Vs ERM arrived by using Machine

Age Group	ERM ( Food Intake ) Mean	ERM (Machine) Mean
45-50 Years	1264 ( $\pm$ 77.8)	1638 ( $\pm$ 139)
51-55 Years	1250 ( $\pm$ 76.8)	1515 ( $\pm$ 109.3)
56-60 Years	1238 ( $\pm$ 99.1)	1599 ( $\pm$ 182.3)

\*The figures in parentheses {} gives  $\pm$  S., D

## 5. Scope and limitations of the study

1. These types of studies should be conducted for all age groups with induced physical activity of all levels correlating with quantitative food frequency so as to customize energy requirements for individuals with diversified influencing factors such as geographical location rather than Recommending an intake from 18years to hence forth, where in growth ceases after 20 years which accounts to major contributing factor for BMR.
2. The present study confines to women of teaching and non teaching who might be having BMR with minor variations and performing activities of similar kind such as sitting, standing, walking and talking along with the management of daily chores. However, education, occupation, ethnic practices of cooking and consuming foods along with individual variations should be studied and analysed before drawing an inference applicable for whole population.
3. The study calculations are based on the Harris benedict equation for calculating the ERM. This particular equation needs to be counter checked periodically to avoid practical bias wherein individual variations such as physiological status and health.

## 6. Source of funding

None.

## 7. Conflict of Interest

None.

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