

Survey on Body Mass Index, Physical Activity Pattern and Dietary Pattern of the Selected Type 2 Diabetics in Chennai City

T. Sivapriya^{1*} and Sheila John²

¹Department of Clinical Nutrition, SDNB Vaishnav College for Women, Chrompet, Chennai – 600044, Tamil Nadu, India; sivaamanick@gmail.com

²Department of Home Science, Women's Christian College, Chennai – 600006, Tamil Nadu, India

Abstract

Globally, diabetes is among the top 10 causes of death. To investigate about the Body Mass Index, physical activity pattern and dietary pattern often leads to life threatening complications. An Ex post facto, survey was carried out among 500 type 2 diabetes using a pre-tested questionnaire from five diabetes specialty clinics. About 67% of the subjects were of normal weight. Physical activity was calculated based on the formula given by Sharkey and Gaskill and the scores of the all the subjects were below 20 indicating the sedentary activity pattern and very poor fitness. When the calorie intake of the subjects with diabetes was compared with the recommended dietary allowance, it was found that 68% of the subjects were ingesting excess calories, while 32% were consuming less than the recommended calories. The quality of diet of none of the subjects was adequate in calories. Results suggest that type 2 diabetes should be given intensive diet counseling to know about the importance of diet and physical activity in managing their blood sugar levels.

Keywords: Body Mass Index, Dietary Pattern, Physical Activity, Type 2 Diabetes

1. Introduction

Diabetes is a major health problem that has attained alarming levels. Today, nearly half a billion people are existing with diabetes worldwide. In 2019, it is estimated that 463 million people have diabetes and this number is projected to reach 578 million by 2030 and 700 million by 2045. Two-thirds of people with diabetes live in urban areas¹. Diabetes prevalence increases with age and the highest estimated prevalence is in people older than 65. In 2019, the estimated number of people with diabetes aged 65–99 years is 135.6 million (19.3%) and if the trend continues, the number of people above 65 years with diabetes will be 195.2 million in 2030. Thus, there will be a significant increase in the diabetes population of the aging societies in the next 25 years

which will lead to inevitable public health and economic challenges².

Diabetes and elevated blood glucose level are associated with a wide range of cardiovascular conditions that collectively comprise the largest cause of both morbidity and mortality for people with diabetes³. In addition, elevated blood glucose levels are associated with a common set of risk factors, like overweight, low levels of physical activity, faulty dietary habits and smoking. This wide range of risk factors is accompanied by numerous opportunities to reduce risk. By following a healthy diet regimen and physical activity the risk of cardio vascular diseases can be reduced. These goals can be achieved through implementation of health system-based approaches like patient education⁴. In addition, community and population-wide approaches that

*Author for correspondence

facilitate increasing levels of physical activity and diets rich in fresh fruits and vegetables, whole grains, cereal fibres and healthy fats will reduce long-term risk for people with diabetes⁵. With the above background the objectives of the study have been framed to study about the Body Mass Index, physical activity pattern and dietary pattern of the selected type 2 diabetes subjects.

2. Material and Methods

An Ex post facto, survey was carried out among 500 type 2 diabetes subjects using a pre-tested questionnaire. Using purposive sampling technique, from five diabetes specialty clinics 500 subjects visiting as outpatients for a period of 6 months from January 2016 to June 2016 were surveyed.

Inclusion criteria: Male and Female diabetic patients of 40–60 years willing to participate in the survey.

Exclusion criteria: Pregnant and Lactating mothers.

After obtaining informed consent using a validated questionnaire data was elucidated. Institutional ethical clearance was obtained before commencement of the study.

Through the questionnaire, information like demographic profile, life style pattern, physical activity pattern, anthropometric data, personal stress scale and dietary pattern were collected. Body Mass Index was calculated using the body weight and height measurements using the formula $BMI = \text{weight (kg)}/\text{height}^2 \text{ (m)}$. Food frequency questionnaire was used to study about the meal pattern of the subjects. Subjects were requested to complete a 3-day 24-hour dietary recall to analyze total energy intake from carbohydrate, proteins and fats. Instrument validated and used by Sharkey and Gaskill, 2007⁶ was used to elicit physical activity pattern of the participants.

3. Results and Discussion

3.1 Body Mass Index (BMI)

The Body Mass Index of the subjects was assessed using the Quetelet index. BMI, formerly called the Quetelet index, is a measure for indicating nutritional status in adults. It is defined as a person's weight in kilograms divided by the square of the person's height in meters (kg/m^2)⁷.

From Table 1 it is evident that 66.8% of the subjects had normal BMI, 18.2% were overweight while 8.4% and 6.6% were obese and underweight respectively. Despite lower BMI Asian-Indian phenotype have more predisposition to develop type 2 diabetes.

3.2 Physical Activity Pattern

Physical activity improves cardiorespiratory fitness, vigour, glycemic control, lipid profile decreases insulin resistance and maintains weight.

Table 1. Body Mass Index of subjects

| BMI classification (kg/m^2) | Number | Percent |
|---|--------|---------|
| Underweight (Below 18.5) | 33 | 6.6 |
| Normal (18.5–24.9) | 334 | 66.8 |
| Overweight (25.0–29.9) | 91 | 18.2 |
| Obese (Above 30) | 42 | 8.4 |
| Total | 500 | 100 |

BMI classification source: WHO. 2015

Table 2. Percent distribution of subjects based on physical activity

| Pattern of exercising | | Subjects | |
|------------------------------|-------|----------|---------|
| | | N | Percent |
| Yes | | 450 | 90 |
| No | | 50 | 10 |
| Intensity of activity | Score | N = 30 | Percent |
| Sustained heavy breathing | 5 | - | - |
| Intermittent heavy breathing | 4 | - | - |
| Moderately heavy | 3 | - | - |
| Moderate | 2 | - | - |
| Light | 1 | 24 | 80 |
| Duration of activity | Score | N | % |
| More than 30 minutes | 3 | - | - |
| 20–30 minutes | 2 | 11 | 36.6 |
| 10–20 minutes | 1 | 13 | 43.3 |
| Frequency of activity | Score | N | % |
| Daily | 5 | 18 | 60 |
| 3–5 times a week | 4 | 12 | 40 |

*Source: Sharkey and Gaskill, 2007

The formula by Sharkey and Gaskill, 2007 was used for calculating physical activity score among subjects with type 2 diabetes.

$$\text{Physical activity Score} = \text{intensity} \times \text{duration} \times \text{frequency}$$

Evaluation and fitness category given by Sharkey and Gaskill, 2007 is shown in Table 3.

Physical activity was calculated based on the formula given by Sharkey and Gaskill and compared with the evaluation scores. The scores of all the subjects were below 20. Based on Table 3, it could be inferred that all the subjects were found to have sedentary activity pattern and very poor fitness.

3.3 Dietary Pattern

People with diabetes can eat the same food as their family members relish, giving emphasis to the quantity of food. Controlling diabetes doesn't mean living in deprivation. One shouldn't have to give up sweets entirely but tailor according to their calorie intake of that particular

Table 3. Evaluation and fitness category

| Score | Evaluation | Fitness category |
|-----------|--------------------|------------------|
| 100 | Very active | High |
| 80 to 100 | Active and healthy | Very good |
| 60 to 80 | Active | Good |
| 40 to 60 | Acceptable | Fair |
| 20 to 40 | Not good enough | Poor |
| Under 20 | Sedentary | Very Poor |

Table 4. Mean nutrient intake of the selected subjects compared with RDA

| Nutrients | Actual nutrient intake | RDA by API – ICP |
|------------------|------------------------|------------------|
| Energy (Kcal) | 2003.0 ± 427.5 | 1800 |
| Protein (g) | 57.0 ± 22.0 | 110 |
| Fat (g) | 45.0 ± 11.8 | 33 |
| Carbohydrate (g) | 319.0 ± 87.5 | 225 |
| Fibre (g) | 12.0 ± 2.1 | 30–40 |

API, ICP-Association of Physicians of India, Indian Council for Physicians

Table 5. Quality of patient's diet as collected from 3 day–24 hr recall

| Diet quality | Number | Percent |
|--------------|--------|---------|
| Excess | 41 | 68.33 |
| Adequate | - | d- |
| Inadequate | 19 | 31.66 |

day. In the present study, dietary habits of the subjects were assessed by using an interview schedule. Three day 24-hour dietary recall was used to record the mean food intake of the subjects and from this the nutrient intake of the subjects were calculated.

Adherence to diabetic diet was assessed by comparing the mean nutrient intake of the subjects with that of the guidelines of API-ICP, 2007. Table 4 indicates that the carbohydrate intake of the subjects was much higher than recommended. This may be due to higher intake of simple carbohydrates like raw rice, refined flour and sugary foods. The intake of protein, fat and fiber were less than the recommended allowance among subjects.

Table 5 indicates that about 68% of the subjects were ingesting excess calories, while 32% were consuming less than the recommended calories. The quality of diet of none of the subjects was adequate.

4. Conclusion

Improving physical activity reduces the risk of cardiovascular disease. Progress from moderate to vigorous physical activity decrease the incidence of type 2 diabetes and hypertension⁸. Physical activity is significantly linked with sedentary occupation, higher socio-economic status and high calorie consumption. To curtail modern epidemic of lifestyle related disorders sensitization of population for lifestyle modification is recommended⁹.

Habit of consuming fried snacks was widespread among the subjects. Since fried foods increase both the energy and fat content of the diet, fried snacks should be avoided. The intake of dietary fibre among the subjects was found to be low. Subjects were motivated to consume higher fibre millets like horse gram, barnyard millet, pearl millet and fox-tail millet. Through nutrition education, subjects were advised and emphasized the importance of higher fiber, fruits, vegetables and whole grain.

Non-pharmacological therapies like curtailing a high complex carbohydrate diet, inclusion of moderate protein and low fat would help to maintain glycemic control in diabetic patients¹⁰.

Dietary advice given by a professional dietitian is effective in modifying dietary behavior and thus has a great potential for influencing the outcome of treatment. Even among those populations where behavior change is expected to be difficult, understanding of the subjects, their circumstances, their food preferences, customary beliefs and the professional competence of the educator can aid to explore and suggest acceptable and beneficial dietary modifications. The dietary education should be in such a way that it can be put into practice and can result in a clearly positive impact on quality of diet of subjects.

The etiology of type 2 diabetes mainly revolves around body weight, physical activity and dietary intake. People should be provided enough intervention programs to manage and control these risk factors.

5. References

1. International diabetes federation. Diabetes atlas. 9th ed. Brussels; 2019.
2. Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Diabetes Res Clin Pract. 2019. PMID: 31518657. <https://doi.org/10.1016/j.diabres.2019.107843>
3. Gerstein HC. Diabetes: Dysglycaemia as a cause of cardiovascular outcomes. Nat Rev Endocrinol. 2015; 11(9):508-10. PMID: 26215261. <https://doi.org/10.1038/nrendo.2015.118>
4. Alegre-Diaz J, Herrington W, Lopez-Cervantes M, Gnatiuc L, Ramirez R, Hill M, et al. Diabetes and cause-specific mortality in Mexico City. N Engl J Med. 2016; 375(20):1961-71. PMID: 27959614 PMID: PMC5215048. <https://doi.org/10.1056/NEJMoa1605368>
5. Harding JL, Pavkov ME, Magliano DJ, Shaw JE, Gregg EW. Global trends in diabetes complications: A review of current evidence. Diabetologia. 2019; 62(1):3-16. PMID: 30171279. <https://doi.org/10.1007/s00125-018-4711-2>
6. Sharkey BJ, Gaskill SE. Human Kinetics. Health and Fitness. 6th ed. Champaign, IL. 2007.
7. WHO fact sheet. Definition of Diabetes. 2015. <http://www.who.int/diabetes/en/>
8. Abegunde DO, Mathers CD, Adam T, Ortegon M, Strong K. The burden and costs of chronic diseases in low-income and middle-income countries. Lancet. 2013; 370:1929-38. [https://doi.org/10.1016/S0140-6736\(07\)61696-1](https://doi.org/10.1016/S0140-6736(07)61696-1)
9. Hidetaka H. Daily physical activity and type 2 diabetes: A review. World Journal of Diabetes. 2016 Jun 25; 7(12):243-51. PMID: 27350847 PMID: PMC4914832. <https://doi.org/10.4239/wjd.v7.i12.243>
10. Fagour C, Gonzalez C, Pezzino S, Florenty S, Rosette-Narece M, Gin H, Rigalleau V. Low physical activity in patients with type 2 diabetes: The role of obesity. Diabetes Metab. 2013 Feb; 39(1):85-7. PMID: 23159129. <https://doi.org/10.1016/j.diabet.2012.09.003>