Traditional Hyderabadi Foods: Carb Content Analysis

[1]Noorain Fathima, [2] Dr. Khushboo Vyas

[1]Clinical Dietitian,[2]Assistant Professor

[1]Department of Nutrition

[1]St. Ann's College for Women, Hyderabad, India

[1]noorainfathima402@gmail.com

Abstract- Religion significantly influences dietary habits, particularly in Islam, where Ramadan alters food consumption from day to night. Traditional foods, developed over generations, adapt to cultural values and food insecurities. In Hyderabad, renowned for its rich culinary heritage, Hyderabadi cuisine blends Mughlai, Turkish, and native influences, with biryani being a standout dish. During Ramadan, food preferences shift towards traditional delights like biryani and kebabs, reflecting the spiritual significance of the month. Additionally, carbohydrate counting plays a vital role in managing health issues such as obesity and PCOS by promoting glycaemic control and healthier eating habits. The study reveals that in the local traditional foods of Hyderabad the carbohydrate content ranges from 0.16g - 22.08g per serving i.e., 30gm. The foods containing refined wheat flour (Maida) as a major ingredient has the highest carbohydrate content followed by gram flour (chickpea) having greater carbohydrate proportion.

Keywords: Traditional foods, Hyderabad, Carbohydrate counting, Carbohydrate, Type 2 Diabetes Mellitus, Type 2 Diabetes Mellitus, PCOD, PCOS, Glycemic Index, Glycemic load.

I. INTRODUCTION

The objectives include identifying commonly consumed traditional foods, estimating their carbohydrate content, and providing nutritional guidelines for carbohydrate intake during Ramadan. Religion significantly influences dietary habits, particularly in Islam, where Ramadan alters food consumption from day to night. Traditional foods, developed over generations, adapt to cultural values and food insecurities. In Hyderabad, renowned for its rich culinary heritage, Hyderabadi cuisine blends Mughlai, Turkish, and native influences, with biryani being a standout dish. During Ramadan, food preferences shift towards traditional delights like biryani and kebabs, reflecting the spiritual significance of the month. Additionally, carbohydrate counting plays a vital role in managing health issues such as obesity and PCOS by promoting glycaemic control and healthier eating habits**.** Hyderabad is "The city of Nizams," which is known for its rich heritage, culture and traditional food practices which are in practice since ages. The cuisine that flourished in the region is now known as Hyderabadi or Deccan cuisine of India was developed after the establishment of Qutubshahi dynasty by Sultan Quli where along with the native cuisine this dynasty also patronized the Hyderabadi cuisine. Subsequently, Hyderabadi cuisine offered a royal taste of the Nizams on the erstwhile Hyderabad State. The most consumed famous food which is eaten all the time irrespective of the season is Biryani. For instance, it is prepared all over India but the hyderabadi variety is ultimately form of Hyderabadi biryani.

Aside from biryani, other traditional foods such as Til ki chatni, dalcha, tandoori naan, tahari, and sheermal have a strong presence in Hyderabadi cuisine. Eating Traditional Hyderabadi dishes include Biryani, Moghlai, Chicken korma, Sheer korma, Double-ka-meetha, and Gajar-ka-halwa, which were likely served 400 years ago and continue to be served today. The significance of these traditional foods grows even more during the month of Ramadan in Hyderabad. During Ramzan, the culinary scene in Hyderabad undergoes a significant transformation with the emergence of Ramadhan, where various culinary delights are sold, such as fried meatballs, chips, cakes, dahivadas, lemon tea, chicken noodles, grilled chicken, and mohobbat ka sharbat. This period sees a surge in the popularity of traditional dishes like the Hyderabadi Biryani, Kabab and parathas, soft drinks like roohafza etc. which holds a special place in the local cuisine. The frequency of consumption of these foods spikes to higher levels as it is readily available in Hyderabad streets during the spiritual month of Ramadan.

Carbohydrate counting improves glycaemic control. It aids in identifying optimal insulin dosages to maintain stable glycaemic patterns. It gives flexibility to management and encourages compliance. Carbohydrate counting has a significance in the areas of management of Obesity, PCOS, PCOD, weight management and fitness. It also helps in post-partum weight loss. In all these areas carbohydrate counting act as a Holistic Approach in management of calories. Counting carbohydrates has been shown to be an effective management technique for PCOS, especially because of its connection to insulin sensitivity and weight control. By fostering blood sugar stability, encouraging healthier meal choices, and improving nutritional awareness—all of which are critical for healing and general well-being at this time—carb counting can help support postpartum weight loss.

Counting carbohydrates gives you an idea of how many you consume each day and also makes it easier to understand how different kinds of carbohydrates—such as dairy products, starchy and non-starchy veggies, sweets, desserts, and other carbohydrates—affect your blood sugar levels. At each meal and snack, you can modify the kinds and amounts of each of these carbohydrates as needed.

II. MATERIALS AND METHODS:

Data for this study were systematically collected from spiritual and religious gatherings, held at mosques and the residences of spiritual leaders, within the community of Hyderabad. These locations were chosen due to their significance in the local culture, where traditional foods are often prepared and consumed in a communal setting. A structured Food Frequency Questionnaire (FFQ)

was selected as the primary tool for assessing the dietary intake of participants, particularly focusing on the carbohydrate content of traditional foods consumed during everyday meals and special occasions.

To ensure that the study included a broad representation of the community, participants who gave their informed consent were randomly selected to complete the questionnaire. This random selection process aimed to minimize any bias and ensure that a wide spectrum of individuals, with varied dietary habits, were included in the study. The FFQ was carefully designed to capture a comprehensive picture of food consumption, and was divided into five sections: Drinks, Snacks, Fruits, Main Course, and Desserts. These categories were selected based on their prominence in the traditional Hyderabadi diet, encompassing all major meal components.

In terms of data analysis, the carbohydrate content of the foods listed by participants in the questionnaire was calculated using a specific formula from the James Paget University Hospitals NHS Foundation Trust, which was chosen due to its reliability and suitability for this type of dietary study. This formula provided an efficient and accurate method to assess the carbohydrate content per serving size, allowing for a detailed analysis of the diet's composition.

The sample size of the study consisted of 82 participants (n = 82), which was determined to be sufficient to provide meaningful statistical data. With this sample size, the study was able to achieve robust results, and the collected data underwent statistical analysis to identify patterns in carbohydrate consumption across the different food categories. This comprehensive approach allowed for a thorough exploration of dietary habits and their potential impact on health outcomes within the community.

III. RESULTS:

This study examines the carbohydrate content of foods consumed during Ramadan in Hyderabad, focusing on the impact of larger portion sizes on blood sugar levels, particularly for individuals with diabetes. Rice and wheat are identified as primary carbohydrate sources, with traditional dishes like biryani, flatbreads, fritters, Besan, and maida contributing significantly to carbohydrate intake. The study highlights the role of refined grains in increasing the glycaemic index (GI) and emphasizes the importance of incorporating lower-GI foods like lentils and pulses for sustained energy. It links the rise of non-communicable diseases, such as Type 2 diabetes, to shifts toward processed foods. The study advocates for public health initiatives promoting healthier food choices while respecting cultural values, aiming to improve blood sugar management and reduce chronic disease risk. It also revealed that highest consumed foods include Dahi wade, Haleem, boiled chana dal, Kheema samosa, Fruit chaat, Mandi and Dates while moderately consumed are Kababs, Fruit custard, Biryani, tahari, all fruits, mainly apple, papaya, pomegranate, guava and the lowest consumed are Malai paaya, Halwa, Rice kheer, Shirkurma, Bukhari rice.

The formula used for the calculation of carbohydrate content of the foods:

Carbohydrate content was calculated using the formula: Carbohydrates per 100g = (CHO per 100g/100) x weight of the portion.

(Reference: James Paget University Hospitals NHS Foundation Trust)

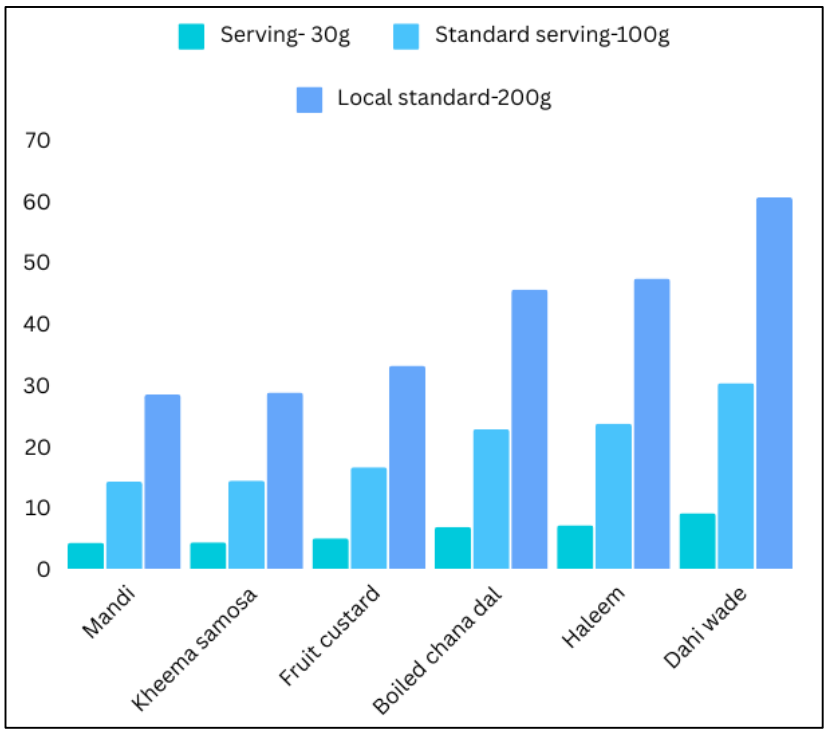
Table 1: Rate of consumption of local traditional foods of Hyderabad by the study population.

Consumption Rate	List of Foods
Highest consumed foods	Dahi wade, Haleem, Boiled chana dal, Kheema samosa, Fruit chaat, Mandi and Dates
Moderately consumed foods	Kababs, Fruit custard, Biryani, tahari, all fruits, mainly apple, papaya, pomegranate, guava
Lowest consumed foods	Malai paaya, Halwa, Rice kheer, Shirkurma, Bukhari rice.

Table 2: Carbohydrate spectrum: navigating from light to loaded

S.no	Food item	Serving size (gm)	Carbohydrate content (gm)
Low carbohydrate foods ***0.16g – 3.99g***			
01.	Gurda Palak	30g	0.16
02.	Kaleji ka salan	30g	0.63
03.	Talava Gosht	30g	0.71
04.	Bhuna Kheema	30g	1.51
05.	Chicken/ mutton Khorma	30g	1.54
06.	Shami kabab	30g	1.70
07.	Pasinday	30g	1.86
08	Mohobbat-ka-sharbat	30g	2.07
09.	Nihari paaya	30g	2.35
10.	Tahari	30g	2.69
11.	Marg	30g	2.73
12.	Boti kabab	30g	2.75
13.	Dalcha	30g	2.89
14.	Kheema	30g	3.38
15.	Biryani	30g	3.54
16.	Double ka meetha	30g	3.66
17.	Mirch ka salan	30g	3.68
18.	Kaddu ki kheer	30g	3.74
Moderate carbohydrate foods ***4.0g – 9.99 g***			
19.	Shirkurma	30g	4.03
20.	Peanut Khatta	30g	4.08
21.	Mandi	30g	4.26
22.	Kheema samosa	30g	4.31
23.	Fruit custard	30g	4.97
24.	Boiled chana dal	30g	6.82
25.	Onion Pakoda	30g	6.90
26.	Haleem	30g	7.10
27.	Khatti dal	30g	8.37
28.	Gulgule	30g	8.93
29.	Dahi Wade	30g	9.09
High carbohydrate foods ***10.0g and above***			
30.	Bagara Chawal	30g	12.28
31.	Qubani ka Meetha	30g	14.13
32.	Khichdi	30g	17.43
33.	Rumali roti	30g	22.80

Figure 1: Carbohydrate content of highest consumed local traditional foods



IV. CONCLUSION:

This study emphasizes the importance of carbohydrate counting for managing blood glucose levels in people with diabetes, particularly for those following a Hyderabadi diet. Hyderabadi traditional foods, such as biryanis, curries, and flatbreads, are complex, containing multiple carbohydrate sources, and are often high in refined carbohydrates and fats, which can cause blood glucose spikes. Effective carb counting in this context requires precise portion control and a deep understanding of local ingredients. The study suggests that culturally relevant food composition tables for Hyderabadi cuisine could improve the accuracy of carb counting and help maintain traditional eating habits while promoting healthier choices. It also highlights the challenges of counting carbs in dishes like biryani and haleem due to their diverse ingredients and cooking methods. Additionally, the study recommends considering the macronutrient balance (carbs, fats, and proteins) when managing blood glucose levels, as fat and protein can affect carb absorption. Flexibility, education, and culturally tailored strategies are crucial for improving adherence to dietary controls in social and celebratory contexts. In conclusion, the foods that contain refined wheat flour (Maida) and Gram flour (chickpea flour) were found to have the highest amount of carbohydrate in it, which in turn spike the blood glucose levels as they are simple carbohydrates and are readily digested and absorbed due to lack of fiber.

V. ACKNOWLEDGMENT

I would like to express my sincere gratitude to Dr. Khushboo Vyas, Assistant Professor Department of Nutrition, St. Ann's College, for her invaluable guidance, encouragement, and continuous support throughout this research. Her expertise and insights have been instrumental in shaping this study. I extend my heartfelt appreciation to Ms. Nasreen Begum, Head of the Department, Assistant Professor, Department of Nutrition, St. Ann's College, for her support and encouragement during this research process. Finally, I am deeply grateful to all the study participants for their willingness to share their experiences, as well as to my family, friends, and colleagues for their unwavering encouragement throughout this journey.

VI. CONFLICT OF INTEREST

The authors declared no conflict of interests.

VII. AUTHORS' CONTRIBUTIONS

Noorain Fathima contributed to the conceptualization, methodology, data collection, data analysis, and manuscript writing. Dr. Khushboo Vyas was involved in manuscript editing, and review. Both authors read and approved the final manuscript.

VIII. FUNDING

It was a self- funded research.

IX. REFERENCES

01. Sharma R, Thakur K, Kalia M, Kalia S, Suvedi D. Traditional cereal-based cuisines from Himachal Pradesh Palampur region and their nutritional profile. Journal of Applied Biology & Biotechnology [Internet]. 2024 [cited 2024 Oct 21];

02. Kathaleen Briggs Early. Value of carbohydrate counting. BMJ nutrition, prevention & health. 2023 May 17;6(1):4–5.

03Lowilius Wiyono, Ghitha N, Clarisa D, Anjani Larasati. Carbohydrate counting implementation on pediatric type 1 diabetes mellitus: systematic review and meta-analysis. Annals of Pediatric Endocrinology & Metabolism. 2023 Sep 30;28(3):206–14.

04. Tandon A, Bhowmik E, Ali Z, Tripathi S, Ajitha BK, Bhatia V, et al. SAT131 Acceptability And Impact Of Basic Carbohydrate Counting On Glycemic Control In Children And Young People With Type 1 Diabetes. Journal of the Endocrine Society. 2023 Oct;7(Supplement_1).

05. Centenaro A, do Nascimento C, Beretta MV, Rodrigues T da C. Carbohydrate counting as a strategy to optimize glycemic control in type 1 diabetes mellitus. Archives of Endocrinology and Metabolism [Internet]. 2023 Feb 13 [cited 2023 May 12];67:385–94.

06. Ibrahim S, Shahat EA, Amer L, Aljohani AK. The Impact of Using Carbohydrate Counting on Managing Diabetic Patients: A Review. Cureus [Internet]. 2023 Nov 18;15(11).

07. Gabriela Correia Uliana, Lediane Nunes Camara, Cristina C, Carvalho J, Daniela Lopes Gomes. Characteristics of carbohydrate counting practice associated with adequacy of glycated hemoglobin in adults with type 1 diabetes mellitus in Brazil. Frontiers in endocrinology [Internet]. 2023 Sep 11 [cited 2024 May 25];14.

08. Sharma R, Upadhyay B, Lal N, Sagar R, Jain V. Carbohydrate Counting vs. Fixed Meal Plan in Indian Children with Type 1 Diabetes Mellitus: A Randomized Controlled Trial. Indian Journal of Pediatrics [Internet]. 2023 Oct 3 [cited 2024 Apr 7];

09. Witkow S, Liberty IF, Goloub I, Kaminsky M, Otto O, Rabia Y, et al. Simplifying carb counting: A randomized controlled study – Feasibility and efficacy of an individualized, simple, patient-centred carb counting tool. Endocrinology, Diabetes & Metabolism. 2023 Feb 7;6(2).

10. Oliveira LM de, Belfort GP, Padilha P de C, Rosado EL, Silva LBG da, Fagherazzi S, et al. Impact of Carbohydrate Counting Method during Pregnancy in Women with Pregestational Diabetes Mellitus: A Controlled Clinical Trial. Revista Brasileira De Ginecologia E Obstetricia: Revista Da Federacao Brasileira Das Sociedades De Ginecologia E Obstetricia [Internet]. 2022 Mar 1 [cited 2023 May 9];44(3):220–30.

11. Deepak B, Radhika P, Baba MA, Chary S. A Study on Financial Feasibility of Cloud Kitchen Firms in Hyderabad Region in Telangana, India. Asian Journal of Agricultural Extension, Economics & Sociology [Internet]. 2022 Jul 23 [cited 2022 Nov 6];342–50.

12. Bawazeer NM, Alshehri LH, Alharbi NM, Alhazmi NA, Alrubaysh AF, Alkasser AR, et al. Evaluation of carbohydrate counting knowledge among individuals with type 1 diabetes mellitus in Saudi Arabia: a cross-sectional study. BMJ Nutrition, Prevention & Health [Internet]. 2022 Nov 28;5(2):344–51

13. Mongiello LL. Carbohydrate Counting Primer for Primary Care Providers. Physician Assistant Clinics. 2022 Oct;7(4):655–63.

14. Sterner Isaksson S, Bensow Bacos M, Eliasson B, Thors Adolfsson E, Rawshani A, Lindblad U, et al. Effects of nutrition education using a food-based approach, carbohydrate counting or routine care in type 1 diabetes: 12 months prospective randomized trial. BMJ Open Diabetes Research & Care. 2021 Mar;9(1):e001971.

15. Chiara Roversi, Vettoretti M, Simone Del Favero, Facchinetti A, Choudhary P, Sparacino G. Impact of Carbohydrate Counting Error on Glycemic Control in Open-Loop Management of Type 1 Diabetes: Quantitative Assessment Through an In Silico Trial. Journal of diabetes science and technology. 2021 May 12;16(6):1541–9.

16. Silva CFM, Saunders C, Peres W, Folino B, Kamel T, Santos MS dos, et al. Effect of ultra-processed foods consumption on glycemic control and gestational weight gain in pregnant with pregestational diabetes mellitus using carbohydrate counting. PeerJ [Internet]. 2021 Feb 1 [cited 2021 Jun 1];9:e10514. Available from: https://peerj.com/articles/10514/

17. Khoiriani IN, Dhiyanti AY, Firmansyah RF, Handayani D. The Benefits of Carbohydrate Counting in Type 1 Diabetes Mellitus : A Scoping Review. Amerta Nutrition. 2021 Nov 25;5(4):395.

18. Di Iorio AB, Orozco Beltrán D, Quesada Rico JA, Carratalá Munuera MC. The Adaptation of the Carbohydrate Counting Method Affects HbA1c and Improves Anthropometric Indicators in Patients With Diabetes Mellitus 2. Frontiers in Nutrition. 2021 Jan 26;7

19. Shatila H, Baroudi M, El Sayed Ahmad R, Chehab R, Forman MR, Abbas N, et al. Impact of Ramadan Fasting on Dietary Intakes Among Healthy Adults: A Year-Round Comparative Study. Frontiers in Nutrition. 2021 Aug 5;8.

20. Bayram S, Kızıltan G, Akın O. Effect of adherence to carbohydrate counting on metabolic control in children and adolescents with type 1 diabetes mellitus. Annals of Pediatric Endocrinology & Metabolism. 2020 Sep 30;25(3):156–62.

21. Gupta DrA, Gupta DrK. A study of diet planning in diabetes using carbohydrate count. International Journal of Advanced Research in Medicine [Internet]. 2020 Jul 1;2(2):170–2. Available from: https://www.medicinepaper.net/article/64/2-2-23-692.pdf

22. Adams I. Carbohydrate Counting [Internet]. UKnowledge. 2016 [cited 2024 Oct 21]. Available from: https://uknowledge.uky.edu/fcs_reports/7/

23. Azeez T, Chimah P, Hassan AF, Moradeyo Y, Umoren U, Eguzozie E. Dietary Recommendation in Diabetes Care: Carbohydrate Counting and Caloric Content of Nigerian Foods. Advances in Food Technology and Nutrition Sciences – Open Journal. 2020 Dec 31;6(2):53–9

24. THIVIERGE MR, WAHEED M, SEEL M, WOLF R. 722-P: Pictorial Carbohydrate Counting: Engaging Youth with Diabetes in Nutrition Education. Diabetes. 2020 Jun 1;69(Supplement_1).

25. Stonestreet J, AR A, Herd K, Matson A, Bell J. Carbohydrate counting accuracy in adults with cystic fibrosis related diabetes. Nutrition & Dietetics. 2019 Dec 22;77(5):508–14.

26. Scott S, Kempf P, Bally L, Stettler C. Carbohydrate Intake in the Context of Exercise in People with Type 1 Diabetes. Nutrients [Internet]. 2019 Dec 10 [cited 2020 Jan 16];11(12):3017.

27. ARSLAN M. Assessment of Carbohydrate Count Method Knowledge Levels and Insulin Types of Individuals with Type 1 DM. Clinical and Experimental Health Sciences. 2019 Dec 31;9(4):345–9.

28. Elise R, Lisa GC, Charles S, Elysabeth BS, Frédérique G, Antoine T, et al. Variation of carbohydrate intake in diabetic children on carbohydrate counting. Diabetes Research and Clinical Practice [Internet]. 2019 Mar [cited 2019 Mar 12];

29. CHRISTENSEN MB, HALLDORSSON TI, GOTFREDSEN A, HOMMEL E, GÆDE P, OLSEN SF, et al. 765-P: Effects of an Advanced Carbohydrate Counting Course on Diet Composition in Insulin-Treated Type 2 Diabetes. Diabetes. 2019 Jun 1;68(Supplement_1).

30. Ewers B, Bruun JM, Vilsbøll T. Effects of basic carbohydrate counting versus standard outpatient nutritional education (The BCC Study): study protocol for a randomised, parallel open-label, intervention study focusing on HbA1c and glucose variability in patients with type 2 diabetes. BMJ Open [Internet]. 2019 Nov 1 [cited 2020 Nov 23];9(11):e032893

31. Tascini G, Berioli M, Cerquiglini L, Santi E, Mancini G, Rogari F, et al. Carbohydrate Counting in Children and Adolescents with Type 1 Diabetes. Nutrients. 2018 Jan 22;10(1):109.

32. Toorabally, B. Z., Toorabally, M. T. A Narrative Review of Food Culture and Eating Behaviors among Mauritian Muslims during the Fasting Month of Ramadan: The Need for Nutrition Education. *Journal of Nutrition,Fasting and Health*, 2017; 5(3): 129-132. doi: 10.22038/jfh.2017.26142.1096

33. Gupta L, Khandelwal D, Kalra S. Carbohydrate counting-1: South Asian framework. JPMA The Journal of the Pakistan Medical Association [Internet]. 2017 Aug 1;67(8):1296–8.

34. Kitajima Y, Mikami N, Toru Hyodo, Hida M, Kawakami J. Carbohydrate Counting: A Simple Method of Dietary Management for Glycemic Control in Japanese Diabetic Hemodialysis Patients. Contributions to nephrology. 2016 Dec 12;262–9.

35. Ojeda MM. Carbohydrate Counting in the Acute Care Setting: Development of an Educational Program Based on Cognitive Load Theory. Creative Nursing. 2016;22(1):33–44.

36. Kawamura T, Takamura C, Hirose M, Hashimoto T, Higashide T, Kashihara Y, et al. The factors affecting on estimation of carbohydrate content of meals in carbohydrate counting. Clinical Pediatric Endocrinology. 2015;24(4):153–65.

37. O'Gorman JR, O'Leary O, Finner N, Quinn A, O'Gorman CS. Knowledge of carbohydrate counting and insulin dose calculations among hospital staff in a regional general paediatrics unit. SpringerPlus. 2015 Nov 24;4(1)

38. Potukuchi T. Hyderabadi Cuisine - The Flavour of Deccan. wwwacademiaedu [Internet]. 2015 Jan 1;

39. Souto DL, Zajdenverg L, Rodacki M, Rosado EL. Impact of advanced and basic carbohydrate counting methods on metabolic control in patients with type 1 diabetes. Nutrition. 2014 Mar;30(3):286–90.

40. Shadman Z, Poorsoltan N, Akhoundan M, Larijani B, Soleymanzadeh M, Akhgar Zhand C, et al. Ramadan Major Dietary Patterns. Iranian Red Crescent Medical Journal [Internet]. 2014 Sep 5 [cited 2022 Mar 20];16(9):e16801.

41. Son O, Efe B, Son NE, Akalin A, Kebapçi N. Investigation on Carbohydrate Counting Method in Type 1 Diabetic Patients. BioMed Research International. 2014;2014:1–8.

42. Marcus JB. Diet and disease: healthy choices for disease prevention and diet management: practical applications for nutrition, food science and culinary professionals. Culinary nutrition. 2013:371-430.

43. Ebron SE, Larsen L. Development and Evaluation of Carbohydrate Counting Tool for Traditional Bhutanese-Nepali Foods. Journal of the Academy of Nutrition and Dietetics. 2013 Sep;113(9):A18.

44. Anand J. Tucking into the Biryani: Hyderabadi Style. SSRN Electronic Journal. 2012;

45. Hegar K, Heiber S, Brändle M, Christ E, Keller U. Carbohydrate counting of food. Swiss Medical Weekly. 2011 Jul 7;

46. Bao J, Atkinson F, Petocz P, Willett WC, Brand-Miller JC. Prediction of postprandial glycemia and insulinemia in lean, young, healthy adults: glycemic load compared with carbohydrate content alone. The American Journal of Clinical Nutrition. 2011 Feb 16;93(5):984–96.

47. Albright A. Carbohydrate counting for athletes. Diabetes Spectrum. 2000 Jul 1;13(3):154.
48. Buethe M. A 10-Step Guide to Teaching Carbohydrate Counting. The Diabetes Educator. 2008 Jan;34(1):67-74.
49. Eckel RH, Hernandez TL, Bell ML, Weil KM, Shepard TY, Grunwald GK, Sharp TA, Francis CC, Hill JO. Carbohydrate balance predicts weight and fat gain in adults. The American journal of clinical nutrition. 2006 Apr 1;83(4):803-8.
50. Kulkarni KD. Carbohydrate counting: a practical meal-planning option for people with diabetes. Clinical Diabetes. 2005 Jun 22;23(3):120