

Dietary Consumption Practices and Its Associated Factors among Type 2 Diabetes Patients in Pokhara MetropolitanDipendra Kumar Yadav,¹ Rajesh Kumar Yadav,² Sarmila Baral,¹ Sushila Baral,³ Pragya Bastola,¹ Sulaksha Paudel¹¹School of Health and Allied Sciences, Faculty of Health Sciences, Pokhara University, Nepal²BNMT Nepal, Kathmandu, Nepal³Provincial Health Training Centre, Gandaki Province, Pokhara, Nepal**ABSTRACT**

Introduction: Diabetes mellitus is a major worldwide public health problem. A healthy diet has been the best measure for preventing the diabetic condition of patients. This study aimed to assess the dietary practice and its associated factors among type 2 Diabetes Patients in Pokhara Metropolitan.

Methods: A health facility-based cross-sectional study was conducted among 390 diabetic patients in Pokhara, Nepal. A proportionate sequential sampling technique was used to make the sample representative from four different health facilities. A structured questionnaire was used to collect the data and food measurement for daily energy intake was calculated. The P-value of <0.05 was considered as a cut-off for statistical significance.

Results: This study revealed that more than half (55.6%) of participants were female. Nearly three-fifths (57.2%) of participants were overweight and 16.2% were obese. In this study, 49.5% of diabetic patients had adequate calories and 37.4% had good dietary practice. The study showed that the variables like family type, type of oil used, BMI, and duration of diabetes mellitus were associated with food consumption practices among type 2 diabetic patients.

Conclusion: Findings of this study indicated that nearly two third of the patients had poor dietary practices. Family type, the oil used, duration of diabetes and BMI level were associated factors for the dietary practices among type 2 diabetes patients. Nutrition education and counseling on healthy dietary practices among newly diagnosed diabetes patients and malnourished by BMI measurement need to be emphasized by health workers while providing health care services to diabetes patients.

Keywords: *Dietary practice, Type 2 diabetes, Health facility*

INTRODUCTION

Diabetes mellitus (DM) is a major worldwide public health problem. The prevalence is on the rise in many parts of the developing world due to an increase in sedentary lifestyle styles.¹ Dietary management of Type 2 diabetes among patients is one way to prevent or delay the long-term effect of the condition. Diabetic individuals worldwide are routinely advised to adopt healthful eating behavior, which requires modification in habits, beliefs, and meal patterns on a lifelong basis.²

Dietary nutrients are the substances that the person needs to consume for growth and development and healthy life. A proper diet as per the body's condition is needed to supply the nutrition and energy for maintaining body cells, tissues, and organs and for growth and development. Diet is a lifestyle behavior that has been reported as a management domain with very little compliance among diabetics.³

Early childhood nutrition affects the risk of type 2 diabetes in future life.⁴ Excess body fat, a summary measure of

numerous aspects of diet and physical activity, is the strongest risk factor for type 2 diabetes both in terms of clearest evidence-based and largest relative risk. Being overweight and obese, together with physical inactivity, are estimated to cause a large proportion of the global diabetes burden.⁵

Studies indicated the role of appropriate dietary intake to control type 2 DM. Consumption of adequate amounts of energy and nutrients is important to decrease high blood glucose levels and slow the progression of the disease. However, dietary practices of type 2 diabetes patients differ within and across countries. Dietary practice is culture and context-specific, so, there is the limited study about the dietary practice of type 2 DM patients in the study area.⁶

Food-based dietary guidelines (FBDGs) are widely used for putting into practice nutrition education goals in

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developing and developed countries. Departing from the dietary guidelines commonly applied in the past which were more based on nutrient requirements and food groups, FBDGs promote mainly locally available foods and traditional cuisines, emphasizing local adaptation and application.⁷

The dietary guidelines and dietary advice for the management of the diabetic population to promote overall nutritional well-being, glycemic control, and prevent or ameliorate diabetes-related complications is crucial.⁸ So, appropriate dietary practices are a basic and integral part of treating and improving the clinical and metabolic outcomes among diabetic patients.⁹

Appropriate balance diet supplement is an important part of controlling the diabetic condition of patients. A healthy diet has been the best remedy for controlling the diabetic condition of patients. Understanding the association of local diet with Diabetes 2 can play a vital role in developing strategies to prevent and control the rising burden of Diabetic patients in Nepal. The study aimed to assess the dietary practice and its associated factors among type 2 diabetes patients in Pokhara Metropolitan.

METHODS

A health facility-based cross-sectional study was conducted among type 2 diabetic mellitus patients. Patients who had been diagnosed with type 2 diabetes for more than one-year time duration and had aged above 18 years were included in the study.

A proportionate sequential sampling technique was used to make the sample representative from different health facilities. All the public hospitals and private hospitals/diabetic care centers in Pokhara metropolitan city were listed. At the time, there was 1 public hospital and 10 private/diabetic care centers where diabetic patient care services were provided. Four hospitals/diabetic care centers were selected by simple random method. From the selected hospitals, participants were selected depending on the proportion of Diabetic patients by sequential sampling. Using the Cochran formula, with a p-value of 0.486 and a desirable error of 0.059, the total sample size was 390.

Data were collected through a quantitative approach using a structured questionnaire and the locally available cup was used for measurement of food consumed. Participants were made clear about the purpose of the study, the benefits of the study to them, and assuring them about the confidentiality of the information. The

face-to-face interview, review of the treatment card, and measurement of food were carried out. Enough time was given to recall the information and to respond to questions. Food consumption practices were measured by using weekly food consumption questionnaires and 24-hour dietary recall questions were used to measure daily calorie intake.¹⁰ Amount of food was measured by using locally available dishes. Firstly, for a total of 11 questions, the score was recorded from 0 to 1. Value 1 was given for good practice and 0 for poor practice. Components were computed by taking the mean value to classify the participants as "good" and "poor". That is, those who scored equal and above the mean value were classified as good, and those who scored below the mean value as Poor dietary practices. The questionnaire was constructed after the review of the related literature; reference to various research papers was taken. For male, calories less than 2425 represents inadequate energy but calories more than 2425 represents adequate energy. For female, calories less than 1875 represents inadequate energy but calories more than 1875 represents adequate energy.

Data was entered in the EPI-DATA version 3.1 and all the entered data were transferred to SPSS Version 22 for using descriptive and inferential statistics. The size of dishes used to measure the amount of food was 250 ml which was equivalent to the standard cup size. Through this reference amount of food was converted into standard serving size and daily energy intake was calculated by Nutrition facts and food tables.⁶

Ethical approval was taken from the IRC, Pokhara University (113/2076-77), and permission from the selected Hospitals/care centers was also obtained.

RESULTS

Out of 390 interview schedules, all the participants respond to the questionnaire. The mean age of the participants was 55.70 ± 10.027 years. More than half (55.6%) of the participants were female and two-thirds (67.9%) of the participants had four or fewer family members. More than one-third (37.4%) of the participants had secondary education. One-fifth (21.5%) of the participants were homemakers. About half (50%) of the participant's income is less than and equal to NRs 13500 (Table 1).

Table 1: Socio-demographic characteristics of the respondents (n=390)

Variables	Frequency	Percentage (%)
Age groups		
31-40	13	3.3

41-50	124	31.8
51-60	124	31.8
61-70	98	25.1
≥70	31	8.0
Mean ± SD (years) = 55.70 ± 10.027, Min=33, Max=85		
Sex		
Male	173	44.4
Female	217	55.6
Religion		
Hindu	318	81.5
Buddhist	70	17.9
Muslim	2	0.5
Ethnicity		
Brahmin and Chhetri	214	54.9
Janajati	139	35.6
Dalit	37	9.5
Marital status		
Unmarried	9	2.3
Married	335	85.9
Widow	46	11.8
Family type		
Nuclear	252	64.6
Joint	138	35.4
Education		
Illiterate	71	18.2
Informal	24	6.2
Basic	92	23.6
Secondary	146	37.4
Bachelor	47	12.1
Master's and above	10	2.6
Occupation		
Unemployed	62	15.9
Homemaker	84	21.5
Service	71	18.2
Business	67	17.2
Agriculture	49	12.6
Pension	27	6.9
Foreign Service	20	5.1
Labor	10	2.6
Family income (NRs)monthly		
≤25000	112	28.7
25000-35000	106	27.2
35000-45250	75	19.2
>45250	97	24.9
Median NRS. 34000±20000 IQR, Min=0 and Max=150000		

A majority (58.6%) of the participants consumed roti followed by rice (58.1%). A majority (85.1%) were non-vegetarian. A majority (91.3%) of the participants consumed refined oil. A majority (67.9%) consumed junk food in a week. A majority (74.9%) consume food prepared at home. A majority (93.5%) have eaten energy-giving food in the morning for breakfast. A majority (99.5%) of the participants have eaten a morning meal. More than half (58.2%) have eaten energy-giving food in a morning meal. A majority (99.7%) of the participants have eaten dinner. More than half (51.7%) have eaten energy-giving food in a dinner (Table 2).

Table 2: Distribution of participants based on dietary habit (n=390)

Variables	Frequency	Percentage (%)
Diet		
Roti	228	58.6
Rice	226	58.1
Dhindo	61	15.7
Bitten rice	3	0.8
<i>*Multiple Responses</i>		
Types of food		
Non-vegetarian	332	85.1
Vegetarian	58	14.9
Oil or fat is mostly used for preparing food		
Mustard oil	34	8.7
Refined oil	356	91.3
Weekly consumption of sweet		
Yes	115	29.5
No	275	70.5
Weekly consumption of junk food		
Yes	265	67.9
No	125	32.1
Weekly consumption of food not prepared at home		
Yes	98	25.1
No	292	74.9
No. of meals in last 24 hours		
1	13	3.3
2	6	1.5
3	42	10.8
4	329	84.4
Morning breakfast		
Yes	353	90.5
No	37	9.5

Type of food in morning breakfast		
Energy giving	330	93.5
Body building	11	3.1
Energy giving and body building	6	1.7
Protective	5	1.4
Energy giving, bodybuilding, and protective	5	0.3
Morning meal		
Yes	388	99.5
No	2	0.5
Type of food in the morning meal		
Energy giving	227	58.2
Energy giving and bodybuilding	119	30.5
Energy giving, bodybuilding, and protective	39	10
Bodybuilding	5	1.3
Day breakfast		
Yes	377	96.7
No	13	3.3
Type of food in day breakfast		
Energy giving	280	74.3
Energy giving and bodybuilding	51	13.5
Protective	25	6.6
Bodybuilding	12	3.2
Energy giving, bodybuilding, and protective	9	2.4
Dinner		
Yes	389	99.7
No	1	0.3
Type of food in dinner		
Energy giving	201	51.7
Energy giving and bodybuilding	91	23.4
Energy giving, bodybuilding, and protective	84	21.6
Bodybuilding	9	2.3
Protective	4	1

About half (50.5%) of the participants consumed inadequate calories. A majority (87.1%) of the female consumed adequate calories. A majority (97.1%) of the male consumed calories (Table 3).

Table 3: Calories taken in the last 24 hours

Variables	Frequency	Percentage (%)
Classification of calorie		
Adequate calorie	193	49.5
Inadequate calorie	197	50.5
Calories in Female		
Adequate	189	87.1
Inadequate	28	12.9
Calories in Male		
Adequate	5	2.9
Inadequate	168	97.1
Food consumption Practice		
Good dietary practice	146	37.4
Poor dietary practice	244	62.6

A majority (84.5%) of participants don't forget to plan their meals. About two-thirds (68.2%) of participants didn't miss their dietary plan. More than one-third (36.2%) of participants take their dietary plan properly in the past two weeks. Around two-thirds (64.4%) of participants forget to comply with a dietary plan for everyday life (Table 4).

Table 4: Food consumption practice of participants concerning the eleven variables

Variables	Frequency	Percentage (%)
Forgetting to plan the meals you eat ahead		
Yes	60	15.4
No	330	84.6
Did you miss your dietary plan yesterday?		
Yes	124	31.8
No	266	68.2
Over the past two weeks, were there any days when you did not take your dietary plan properly?		
Yes	249	63.8
No	141	36.2
Do you sometimes forget to comply with your dietary plan in everyday life?		
Yes	251	64.4
No	139	35.6
When you feel like your DM is under control, do you sometimes stop taking your dietary plan?		
Yes	170	43.6
No	220	56.4
Do you ever feel hassled about sticking to your dietary plan?		
Yes	131	33.6

No	259	66.4	Do you forget to cut down on butter and fat intake in your food?		
Did you have feelings of dietary deprivation?					
Yes	122	31.3	Yes	53	13.6
No	268	68.7	No	337	86.4
Are you rigid, instead of flexible eating to control your DM?			The family type was significantly associated with food consumption practices (P<0.05). Socio-demographic variables such as age, sex, religion, ethnicity, marital status, no. of family members, education, employment status, and family income were not found to be associated with food consumption practices. BMI was found to be associated with food consumption practices (Table 5).		
Yes	183	46.9			
No	207	53.1			
Forgetting to include fruits in your food daily					
Yes	275	70.5			
No	115	29.5			
Do you forget to include vegetables in your food daily?					
Yes	271	69.5			
No	119	30.5			

Table 5: Association between food consumption practice and independent variables

Variables	Food consumption practice		p- value	OR	95% CI
	Good practice	Poor practice			
Age					
≤55 Years	75(37.1%)	127 (62.9%)	0.897	0.973	0.64-1.46
>55 Years	71 (37.8%)	117(62.2%)			
Sex					
Male	68 (39.3%)	105 (60.7%)	0.496	1.154	0.76-1.74
Female	78 (35.9%)	139 (64.1%)			
Religion					
Hindu	126(39.6%)	192 (60.4%)	0.061	1.706	0.97- 2.99
Others	20 (27.8%)	52(72.2%)			
Ethnicity					
Brahmin/ Chhetri	80(37.4%)	134(62.6%)	0.981	0.995	0.65-1.50
Others	66(37.5%)	110(62.5%)			
Family type					
Nuclear	83(32.9%)	169(67.1%)	0.013	0.585	0.38-0.89
Joint	63(45.7%)	75 (54.3%)			
Family number					
≤4	93(35.1%)	172(64.9%)	0.164	1.361	0.88-2.10
≥5	53(42.4%)	72(57.6%)			
Education					
Illiterate	25(35.2%)	46(64.8%)	0.668	0.889	0.52-1.52
Literate	121(37.9%)	198(62.1%)			
Employment status					
Employed	123(37.5%)	205(62.5%)	0.952	0.983	0.56- 1.72
Unemployed	23(37.1%)	39(62.9%)			
Family income					
≤30000	68(36.6%)	118(63.4%)	0.733	0.931	0.61-1.40
>30000	78(38.2%)	126(61.8%)			

BMI					
Normal	55(50.9%)	53(49.1%)	0.001	0.459	0.29-0.72
Malnourished	91(32.3%)	191(67.7%)			
Weekly consumption of sweet					
Yes	46(40.0%)	69(60.0%)	0.499	1.167	0.74- 1.82
No	100(36.4%)	175(63.6%)			
Weekly consumption of junk food					
Yes	92(34.7%)	173(65.3%)	0.106	0.699	0.45- 1.08
No	54(43.2%)	71(56.8%)			
Weekly consumption of meals that are not prepared at home					
Yes	30(30.6%)	68(69.4%)	0.107	0.669	0.41-1.09
No	116(39.7%)	176(60.3%)			
Days of fruits intake in a week					
≤3	56(37.1%)	95(62.9%)	0.910	0.976	0.64-1.48
>3	90(37.7%)	149(62.6%)			
Days of vegetable intake in a week					
≤5	123(35.9%)	220(64.1%)	0.082	0.583	0.31- 1.07
>5	23(48.9%)	24(51.1%)			
Duration of diabetes					
≤5 Years	90(33.7%)	117(66.3%)	0.025	0.608	0.39-0.94
>5 Years	56(45.5%)	67(54.5%)			

*p-value significant at <0.05

The adjusted relationship of explanatory variables showed that BMI (AOR 2.021; CI 1.274-3.207) was significantly associated with food consumption practice (Table 6).

Table 6: Adjusted relationship of explanatory variables

Variables	Food consumption practice		p- value	UOR	95%CI	p- value	AOR	95%CI
	Good practice	Poor practice						
Family type								
Nuclear	83(32.9%)	169(67.1%)	0.013	1.710	1.11-2.61	0.051	1.155	0.998-2.41
Joint	63(45.7%)	75 (54.3%)		1			1	
Duration of Diabetes Mellitus								
≤5	90(33.7%)	117(66.3%)	0.026	1.644	1.06-2.54	0.093	1.473	0.93-2.317
>5	56(45.5%)	67(54.5%)		1			1	
Oil or fat is mostly used for preparing food								
Mustard oil	24(70.6%)	10(29.4%)	0.001	4.603	2.13-9.93	0.829	1.06	0.58-1.94
Refined oil	122(34.3%)	234(65.7%)		1			1	
BMI								
Normal	55(50.9%)	53(49.1%)	0.001	2.117	1.386-3.424	0.003	2.021	1.27-3.2
Malnourished	91(32.3%)	191(67.7%)		1			1	

DISCUSSION

In this study, 37.4% of the participants had good dietary practices which is similar to the findings of the study done in Ethiopia which shows 35% of type 2 diabetes patients had good dietary practice.⁸ Another study done in Addis Abba, Ethiopia showed 48.6% diabetic patients had good dietary practice. In the present study, 58.1% of participants consumed rice which is slightly higher than the study done in Sri Lanka which shows 45% consumed rice mixed meals.¹¹ In this study 38.7% had an intake of fruits for three or less than three days which contrasts with the findings of the study done in Sri Lanka which shows 67% of participants had an intake of fruits at least once a day.⁶ The present study showed 87.9% consumed green vegetables for five or less than five days a week which contrasts with the findings of Sri Lanka which found 64% consumed green vegetables daily.

The present study showed a significant association between BMI and dietary practice (OR 2.02; CI 1.27-3.21) which corresponds with the study done by Shamsi N et al.¹² In our study, age ($p=0.897$), marital status ($p=0.469$), education status ($p=0.668$) was not found statistically significant with dietary practice which contrasts with the findings of the study done by Shamsi N et al which shows statistically associated with dietary practice ($p<0.001$). It might be due to the differences in lifestyle and dietary patterns. Gender and occupation were not found statistically significant with dietary practice in our study which is similar to the study done by Shamsi N et al.¹² In our study, education was no statistical association with dietary practice which contrasts with the study done by Mohamed BA et al which shows statistical association ($p=0.001$).¹³

In our study, the duration of diabetes was statistically associated with the food consumption practice. Participants who were diabetic for less than 5 years were 60% less likely ($p=0.025$, OR=0.608, 95%CI=0.393-0.941) to have good dietary practice in bi-variate analysis which contrasts with the study done in Indonesia by Primanda Y et al which shows no association between duration of diabetes and dietary practice. This difference might be due to the longer duration, and more knowledge gained about dietary behavior by Nepali patients.¹⁴ In multi-variate regression analysis, the duration of diabetes (wasn't found statistically associated with food consumption practice which contrasts with the findings of the study done by Mohamed B.A. et al in Saudi Arabia which shows statistical association with a p -value of 0.03.¹³

CONCLUSION

The study concludes nearly two third of the diabetes

mellitus patients had poor dietary practices. Family type, duration of diabetes mellitus, the oil used for preparing food, and BMI were found statistically associated with dietary practices among type 2 diabetes mellitus patients. Health practitioners should give more attention to newly diagnosed diabetic patients through nutrition educational and counselling programs in hospitals/care centers. Providing information on lifestyle changes is the essence of good dietary practices.

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REFERENCES

1. Al-Kaabi J, Al-Maskari F, Saadi H, Afandi B, Parkar H, Nagelkerke N. Assessment of dietary practice among diabetic patients in the United Arab Emirates. *Rev Diabet Stud RDS*. 2008;5(2):110–5.
2. Omondi DO, Prof. Walingo MK, Mbagaya GM, Othuon LOA. Predicting Dietary Practice Behavior among Type 2 Diabetics Using the Theory of Planned Behavior and Mixed Methods Design. 2011 [cited 2021 Mar 14]; Available from <http://localhost:8080/xmlui/handle/123456789/1569>
3. Nutrition: Nutrients and the role of the dietitian and nutritionist [Internet]. 2020 [cited 2021 Mar 14]. Available from: <https://www.medicalnewstoday.com/articles/160774>
4. WHO. Global Nutrition Targets 2025: Childhood overweight policy brief [Internet]. WHO. World Health Organization; [cited 2021 Mar 14]. Available from: http://www.who.int/nutrition/publications/globaltargets2025_policybrief_overweight/en/
5. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections. *Diabetes Care*. 1998 Sep;21(9):1414–31.
6. Demilew YM, Alem AT, Emiru AA. Dietary practice and associated factors among type 2 diabetic patients in Felege Hiwot Regional Referral Hospital, Bahir Dar, Ethiopia. *BMC Res Notes*. 2018 Jul 3;11(1):434.
7. Ge K, Jia J, Liu H. Food-Based Dietary Guidelines in China – Practices and Problems. *Ann Nutr Metab*.

- 2007;51(Suppl. 2):26–31.
8. Asif M. The prevention and control of type-2 diabetes by changing lifestyle and dietary patterns. *J Educ Health Promot* [Internet]. 2014 Feb 21 [cited 2021 Mar 14];3. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3977406/>
 9. Sami W, Alabdulwahhab KM, Hamid MRA, Alasbali TA, Alwadani FA, Ahmad MS. Dietary habits of type 2 Diabetes patients: frequency and diversity of nutrition intake – Kingdom of Saudi Arabia. *Prog Nutr*. 2020 Jun 12;22(2):521–7.
 10. Park K. Park's. *Textbook of Preventive and Social Medicine*. 25th ed. Jabalpur: Banarsidas Bhanot; 2019.
 11. Nana A, Zema T. Dietary practices and associated factors during pregnancy in northwestern Ethiopia. *BMC Pregnancy Childbirth*. 2018 May 25;18(1):183.
 12. Shamsi N, Shehab Z, AlNahash Z, AlMuhanadi, S, Nasir FA. Factors Influencing Dietary Practice among Type 2 Diabetics. *Bahrain Med Bull*. 2013 Sep;35(3).
 13. Sami W, Alabdulwahhab KM, Hamid MRA, Alasbali TA, Alwadani FA, Ahmad MS. Dietary Knowledge among Adults with Type 2 Diabetes—Kingdom of Saudi Arabia. *Int J Env Res Public Health*. 2020;17(3):858.
 14. Yanuar P, Charuwan K, Ploenpit T. Dietary Behaviors among Patients with Type 2 Diabetes Mellitus in Yogyakarta, Indonesia, Primanda. *Nurse Media Journal of Nursing*. *Nurse Media J Nurs*. 2011 Jul;1(2):211–23.