Nutritional Assessment of Patients with Type-2 Diabetes in a Tertiary Level Hospital in a Low- and Middle-income Country

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ABSTRACT

Background: Diabetes mellitus is a chronic metabolic disorder characterized by higher blood glucose levels. It is a global public health burden. One of the major risk factors for developing diabetes is inadequate dietary knowledge in many diabetic patients. This study was carried out to understand the dietary patterns of diabetic patients so that effective interventions can be taken for the proper management of a disease.

Method: A cross-sectional study was conducted among a total of 266 patients with type 2 diabetes mellitus in a tertiary care hospital in Kathmandu, Nepal from 15 September to 15 December 2024. A purposive sampling technique was employed for the study. Descriptive statistics was used for the statistical analysis using SPSS version 23.

Results: The majority of the respondents were male (54.14%) and 60 years and above in age (59.77%). Most of the patients were overweight and obese (BMI ≥25 kg/m^2; 84.59%). The majority of the patients (65.41%) were taking medicines along with exercise and diet control, however, only 15.04% of patients were following the expert's advice. 21.80% of the respondents were smokers and 19.55% were consuming alcohol even after diagnosis. More than one-fifth (22.55%) of the patients were consuming more calories than they needed.

Conclusion: The study concluded that there was inadequate dietary awareness and compliance among the participants. The non-compliance may lead to complications of disease that significantly impact the healthcare system of the nation. Timely and careful interventions such as patient counseling and monitoring are necessary for the proper management of diabetes mellitus.

Keywords: Compliance; Counseling; Diabetes mellitus; Nutrition

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder causing high blood glucose levels and passage of sugar in the urine. It occurs when the body either doesn't produce enough insulin or can't effectively utilize the produced insulin. Uncontrolled diabetes may lead to irreversible structural and functional changes by seriously harming the body's blood vessels, nerves, and different systems [1,2]. More than half a billion people in the world are living with diabetes and the disease is disproportionately affecting people in low- and middle-income countries (LMICs) [3].

Diabetes is a major health issue in Nepal due to excessive consumption of carbohydrate-rich foods, lack of regular physical exercise, and calorie-dense lifestyles. Urbanization and industrialization have led to sedentary lifestyles and increased risk of developing type 2 diabetes mellitus. One major risk factor for developing diabetes is inadequate dietary knowledge and hence obesity [4]. Therefore, maintaining body mass index (BMI) is equally essential. The global prevalence of this disease is on the rise. Following proper lifestyle modification and dietary measures along with medication, diabetes mellitus can be effectively controlled [5]. Proper guidance and education are necessary for effective diabetes management mainly in LMICs. Reinforcing and addressing the patients' understanding and behavior along with adherence is crucial for successful diabetes management [6].

The studies on assessing the nutrition pattern of diabetes in Nepal are limited. Therefore, this study was conducted to understand the dietary patterns of diabetic patients along with other factors including compliance and clinical features so that effective interventions can be taken for proper management of disease.

METHODS

A questionnaire-based cross-sectional study was conducted among a total of 266 patients with type 2 diabetes, including in-patients, in Shree Birendra Hospital, Chhauni, a tertiary care level teaching hospital from 15 September to 15 December 2024. A purposive sampling technique was employed to include type 2 diabetes patients of age above 30 years, either sex, and mentally stable. The pregnant, mentally incompetent patients, and those taking insulin were excluded from the study.

The sample size was calculated using the Cochrane's formula [Z^2pq/d^2] with standard normal deviation that corresponds to a level of statistical Significance of 1.96 (Z), expected prevalence of diabetes (Global prevalence of diabetes 10.5%) [7] and margin of error which is the precision of results required (5%). Hence the minimum sample size was approximately 139 diabetic patients at the time of study. To achieve the purpose of the study sample size was doubled (n = 278). The 12 patients refused to be participants, therefore, the total sample size was 266 in this study (N = 266).

A structured questionnaire was used as a tool for the data collection. Pre-testing was done for the reliability of the tools among the 10% of the total sample size which was not included in the final data set.

Ethics approval to conduct this study was obtained from the Institutional Review Committee (IRC) of the Nepalese Army Institute of Health Sciences (NAIHS) with registered number 1224. informed consent was obtained from the participants and confidentiality was maintained throughout the study.

The statistical analysis was carried out using a standard package for social sciences (SPSS) version 23.

RESULTS

Among 266 respondents, 144 (54.14%) were male. More than half (145, 54.51%) of the participants were married. A total of 44 (16.54%) participants were illiterate. More than half of the participants were of age 60 and above in years (159, 59.77%). The majority of the participants were earning between four to 10 lakhs (118, 44.36%). Most of the participants were living in joint families (161, 60.53%). A total of 40.98% of the respondents were retired and currently not employed whereas 39.85% people were not employed at all **(Table 1)**.

Table 1: Sociodemographic profile of the study participants

SN	Particulars	Frequency	Proportion (%)
1	**Gender**		
	Male	144	54.14
	Female	122	45.86
2	**Age (Years)**		
	30-59	107	40.23
	≥60	159	59.77
3	**Marital status**		
	Married	145	54.51
	Unmarried	121	45.49
4	**Family structure**		
	Joint	161	60.53
	Nuclear	94	35.34
	Alone	11	4.13
5	**Educational status**		
	Illiterate	44	16.54
	School level	67	25.19
	Intermediate level	113	42.48
	University level	42	15.79
6	**Profession**		
	Employed	51	19.17
	Not employed (Retired)	109	40.98
	Not employed at all	106	39.85
7	**Annual income**		
	<1,00, 000	0	0
	1,00,000- 4,00,000	113	42.48
	4,00,001-10,00,000	118	44.36
	>10,00,000	35	13.16

SN	Body mass index (Kg/m^2)	Participants (n, %)
1	**Underweight** <18.5 Kg/m^2	10 (3.76)
2	**Normal** 18.5-24.9 Kg/m^2	31 (11.65)
3	**Overweight** 25-29.9 Kg/m^2	116 (43.61)
4	**Obesity** Obese I (30-34.9) Obese II (35-39.9) Obese III ≥40	81 (30.45) 25 (9.40) 3 (1.13)

The BMI was calculated based on the criteria laid down by the Centers for Disease Control and Prevention (CDC) [8]. The majority of respondents had a BMI ≥23 kg/m^2 (84.59%) making them overweight and obese, followed by normal BMI (11.65%), whereas around 3.76% were underweight, with a BMI of less than 18.5 kg/m^2 **(Table 2)**.

Table 2: Body mass index of the study participants

The waist-by-hip ratio (WHR) was calculated based on the guidelines given by WHO (≥0.90 cm for males and ≥0.85 cm for females) [9]. The majority of the respondents had a higher WHR (male; 215, 80.83% and female; 248, 93.23%) which substantially increased the risk of metabolic complications (**Figure 1**).
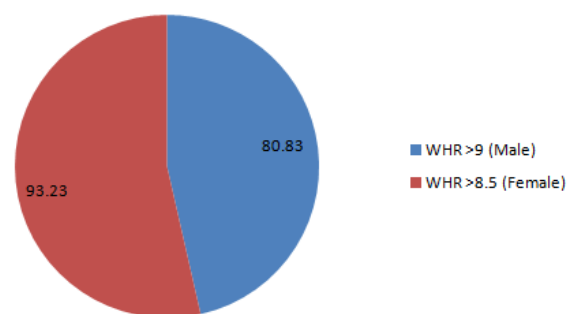
Figure 1: Waist-by-hip ratio of the study participants

Figure 2: Family history of diabetes mellitus
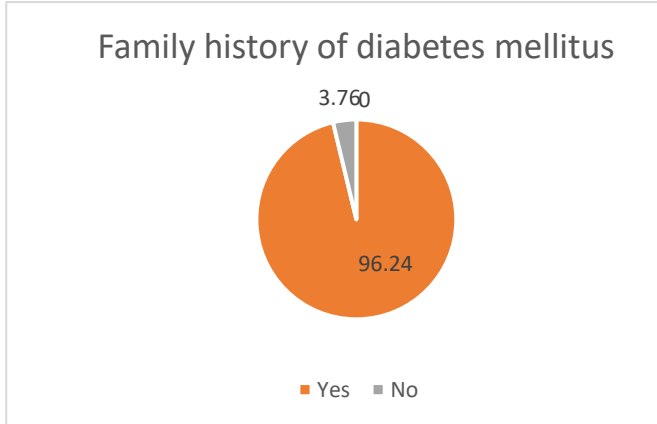
Family history of diabetes mellitus

None of the respondents were following lifestyle modification approaches only. Most of the patients (174, 65.41%) were adopting lifestyle modification and medication approaches; medications, exercise, and diet control measures. Whereas, 70 patients (26.32%) were taking medicines only without any other measures and 22 patients (8.27%) were following approaches of medications along with exercise for disease control (**Figure 3**).
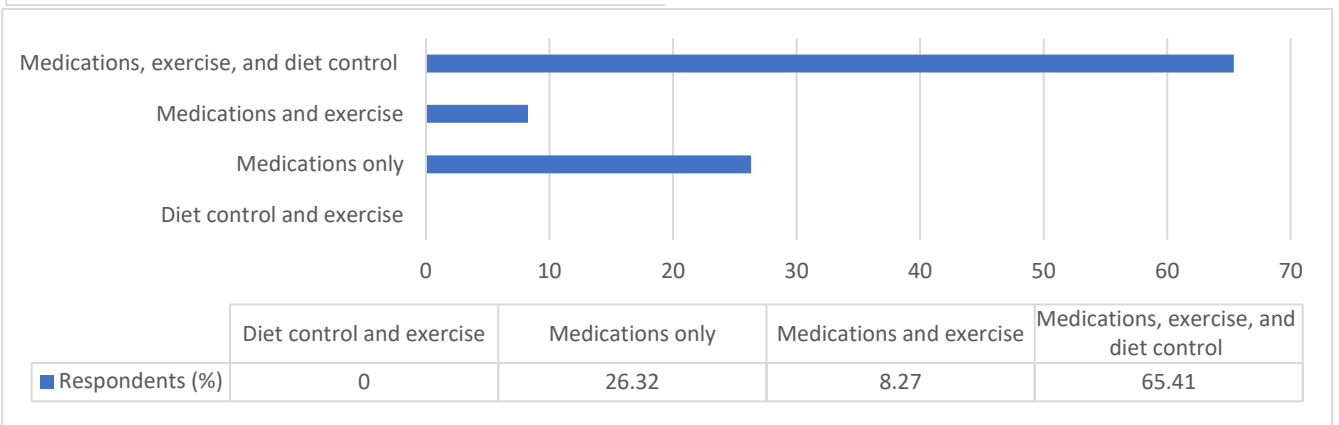

	Diet control and exercise	Medications only	Medications and exercise	Medications, exercise, and diet control
Respondents (%)	0	26.32	8.27	65.41

Figure 3: Approaches used to control diabetes mellitus among participants

Table 3 depicts the responses of patients regarding dietary measures and calorie intake. Majority of the respondents were vegetarian (73.69%). More than half of the respondents were taking meals three times a day (51.88%). Though the majority of the patients claimed that they eat in balance (48.50%), proper adherence to the expert's advice was found to be low (15.04%). Whereas, 36.46% of the respondents were not adherent at all regarding eating patterns according to their response.

Similarly, 21.80% and 19.55% of the patients were smokers and taking alcohol respectively even after diagnosis of diabetes. Almost half of the participants (50.37%) did not take added sugar at all.

More than one-fifth of the participants (22.55%) were found to be consuming a high-calorie diet than needed.

Table 3: Response to the particulars; dietary measures and calorie intake

SN	Particulars	Respondents (n, %)
1	**Dietary pattern**	
	Vegetarian	70 (26.31)
	Non-vegetarian	196 (73.69)
2	**Frequency of main meal**	
	Two times	107 (40.23)
	Three times	138 (51.88)
	Four times	21 (7.89)
	More than four times	0
3	**Food intake (specific meal)**	
	Rice one time	214 (80.45)
	Rice two times	11 (4.13)

	Potato	42 (15.79)
	Sugar	53 (19.92)
	Sweets	31 (11.65)
	Cigarette	58 (21.80)
	Alcohol	52 (19.55)
	No added sugar at all	134 (50.37)
4	**Eating pattern**	
	I eat as much as I wish.	97 (36.46)
	Whenever I eat, I eat in balance.	129 (48.50)
	According to the doctor/dietitian's suggestion.	40 (15.04)
5	**Total calorie consumption (24 hrs)**	
	1500-2000	146 (54.89)
	2000-2500	60 (22.56)
	2500-3000	32 (12.03)
	3000-4000	28 (10.52)

DISCUSSION

Diabetes, being a chronic disease is a global public health burden. It is indicated by hyperglycemia that may occur due to an absolute or relative deficit in insulin production or action. The disease, if left untreated, or not managed properly, may lead to serious complications such as diabetic retinopathy, chronic kidney disease, cardiovascular, and nervous system disorder such as stroke. Lifestyle modification along with proper nutrition are essential approaches to manage diabetes mellitus [5]. Proper adherence to the medication and lifestyle modification along with dietary changes not only control the disease but also prevent the complications that may lead to end organ damage.

In the current study among diabetic patients, more than half were male in gender, equivalent to or more than 60 years of age, staying in a joint family. Less than one-fifth were illiterate and working person. Whereas, most of them were either not working person or retired professionals. These figures are comparable to the various studies similar to the nature conducted in different parts of LMICs. Gautam et al in 2015 conducted a study where more than half were female patients, job holders, and of the age group 40-60 years [10]. Similarly, Banu et al conducted a study in 2019 where the majority of the patients were of age group 30-70 years, not working/retired personnel, and only 7% of the respondents were illiterate [11].

In the present study, diabetes prevalence was higher in males and older age groups, which is similar to the data stated in "Diabetic action now, an initiative of the World Health Organization and the International Diabetes Federation" [12]. More than 90% of the patients had a family history of diabetes in this study. The association of family history and the incidence of diabetes mellitus was demonstrated by different studies [13, 14].

Almost half of the participants in the present study had a BMI in the overweight category. This finding is in line with the result of the study conducted by Shah A. et al in Nepal in 2004, where 33% of diabetic patients were found to be overweight [15].

The majority of patients had limited knowledge about fibrous food, which is similar to the study conducted study in Pakistan by Gul N in 2010 which revealed that knowledge about diabetes and the importance of diet in controlling diabetes was poor [16].

Some of the participants were found to be consuming alcohol, sweets, sugars, and smoking even after the diagnosis of diabetes. Though some participants were taking meals in balance, almost half of the participants were totally non-compliant regarding the counseling of experts on nutrition management and some of them were consuming more calories than they needed. The poor adherence of the patients was depicted by many studies [17,18]. Such types of poor adherence are one of the leading factors for uncontrolled diabetes and hence complications such as target organ damage. Proper counseling and education help manage such types of problems [19].

Though almost one-fourth of the patients were relying upon medicines only, more than half of the patients were adopting the approaches of medications along with lifestyle modification

including diet control. It is essential to follow proper nutrition patterns and physical activity along with medicines for proper management of diabetes mellitus. This fact is supported by the studies conducted in different parts of the globe [20-23].

This was a cross-sectional study which is not devoid of limitations. The response bias, time constraints, single-center, and sampling bias may be considered limitations. Extensive efforts were applied to enhance the generalizability of the study.

CONCLUSION

Inadequate nutritional status along with understanding and awareness are common factors in low- and middle-income countries that may lead to increasing chronic disease burden and diabetes is among them. Therefore, in order to broaden knowledge about diabetes, diabetes awareness programs must be implemented in various sectors, in community and hospitals through the private and government levels. People should be made aware of the importance of lifestyle modification along with dietary changes - nutrition management for a healthy life and for the management of chronic diseases like diabetes mellitus. Large-scale studies should be carried out in the near future among diabetics to find out the solution for mitigating the burden of such type of disease.

Layman summary: Diabetes is a global public health burden. The incidence of this disease is on the rise. Uncontrolled or untreated diabetes may lead to different types of complications that affect the kidney, eye, heart, and nervous system. Proper lifestyle modification including nutrition management and dietary changes along with medication help control such diseases. The inadequate understanding and practice of lifestyle modification and poor adherence to the expert's advice are the main problems associated with proper management of such types of chronic diseases in low- and middle-income countries like Nepal. It is essential to provide proper education and counseling regarding lifestyle modification and medication for the effective management of diabetes mellitus.

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