Prevalence of Malnutrition among Patients with Type-2 Diabetes Mellitus in Tertiary Care Hospital in Pakistan

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Abstract

Purpose: To figure out the prevalence of malnutrition among patients with Type-2 Diabetes Mellitus (T2DM) in tertiary care hospital

Methodology: The study adopted a cross-sectional study. The study took place in Endocrine and Medicine Departments of Lady Reading Hospital, Peshawar, Pakistan from September 2019 to March 2020. A total number of 259 patients of T2DM were screened for screened for nutritional assessment with the help of nurse and supporting staff. The data was recorded with the help of question are and Subjective Global Assessment form (SGA). The nutritional risk parameters and malnutrition status was figured out and the data collected was statistically analyzed with the help of MS Excel and SPSS 22.0.

Findings: The results of the current findings revealed that 123 patients out of 259 were at moderate risk of malnutrition, while 136 patients were highly at malnutrition risk. Similarly, 162 patients were sorted out to have the status of moderate malnutrition while 97 patients were severely mal-nourished. Among various categories of BMI the highest frequency has been shown by Obese Class-I with highest risk malnutrition risk and severe malnourished frequency. The Correlation Coefficient R^2 value of 0.923. The Chi-Square value of 187.69 and p-value (1.214e-38) nullifies the Null hypothesis.

Conclusion: Based on the findings of this study, it may be concluded that a wholesome ratio of T2DM are at nutritional risk or having the status of malnutrition in hospitalized patients. Secondly, it may also be inferred that the largest number of T2DM could be assumed at Obese Class-I of BMI distribution.

Keywords: *Prevalence, Malnutrition, BMI, Type-2 Diabetes.*

Introduction

The burden of Type-2 Diabetes Mellitus (T2DM) has been augmenting throughout the world and interestingly the education and awareness regarding the management of T2DM has also been attentively focused by the WHO and health care funding agencies[1-2]. The importance of education and awareness about T2DM is based on the management and prophylaxis of this disease by transforming the life style and dietary intake [3]. A wholesome population of the world goes through malnutrition due to intake of imbalanced diet due to multiple factors. The term "malnutrition" has been defined by WHO as the deficiency of micro and macro nutrients to meet the daily nutritional requirement of an individual. Malnutrition is actually the imbalance of nutrition from under-nutrition to over-nutrition[4]. The imbalance of nutrition may be due to excessive loss or poor absorption of nutrients due to so many factors. The imbalance of nutrition leads to various health anomalies including obesity, weight loss, infections, delayed wound healing, muscles deformity and morbidities, which leads in increased mortality rate of individuals[5-7]. Among various health anomalies, T2DM is more prevalent in individual undergoing malnutrition[8]. T2DM is endocrine disorder, which is affecting the working adults and geriatric population of the world [9-10]

The reports from the previous decades show that a large portion of population suffering from T2DM with complications had their age above 60[11]. From patients' histories, this has been noticeable that a big portion of all the hospitalized patients of T2DM was undergoing malnutrition and the rest were under nutritional risk[12-13]. According to standard procedures, we can easily figure out an individual to be at risk of nutritional deficiency or not. These standard procedures include physical examination, medical examination, laboratory investigations, nutrition assessment and anthropometric measurements[14-16].

Moreover, the American Society of Parenteral and Enteral Nutrition (ASPEN) recommends the Subjective Global Assessment (SGA) for the nutritional assessment of an individual[17-18]. The SGA employs various nutritional parameters to assess the nutritional status of an individual. In SGA, the patient's history, patient's physical examination and appraisal of patient's laboratory investigations are employed to figure out the patient's status in terms of nutrition and to categorize the patients in three groups i.e., Group A (Well nourished), Group B (Moderately/Mildly malnourished) and Group C (Severely malnourished)[19]. The patient's history also make the life style of an individual very clear and based on life style, it could be easily predicted that an individual might be at risk of malnutrition or morbidity.

Based on aforementioned problems and importance of nutrition assessment and management, the implementation of dieticians' role in terms of nutritional assessments at hospitals and community is inevitable. The current investigational study has been designed to figure out the prevalence of malnutrition among patients of T2DM in Lady Reading Hospital, Peshawar, Khyber Pakhtunkhwa, Pakistan.

Materials and Methods

This was a cross sectional study involving patients with T2DM in Endocrine and Medicine Departments of Lady Reading Hospital, Peshawar, Pakistan from June 01, 2020 to November 30, 2020.

Inclusion Criteria

a) Patients having at least 15 years age and above hospitalized within the last 24-72 hours.
b) Patient diagnosed as T2DM based on the criteria of American Diabetes Association (ADA) for diagnosis.

Exclusion Criteria

a) Newly diagnosed T2DM during admission.

b) Patients having the history of long term usage of glucose metabolizing drugs for instance Beta adrenergic agonists and steroids.
c) Patients who have initial presentation of diabetic ketoacidosis.
d) Patients having long term surgical/medical conditions which might affect metabolism of glucose, such as cushing syndrome, acromegaly and post-pancreatectomy.

Patient admitted in hospital and already diagnosed with T2DM were screened for nutritional assessment with the help of nurse and supporting staff. Before undergoing nutritional assessment each patient was informed and consent was taken from each patient. The data was recorded with the help of a questionnaire. The clinical profile of each patient was recorded, which consisted of data regarding duration of T2DM, age, gender, smoking, family history of DM, medication of DM (Oral hypoglycemic or Insulin), level of HbA1C, diabetic complications and past medical history of cardiovascular disease, hypertension, stroke, chronic kidney disease, foot ulcer, hyperlipidemia.

Moreover, the following data was recorded including change in weight over the past 6 months, change in food intake in previous 15 days, change in gastrointestinal function including nausea, vomiting, retching, diarrhea, constipation, anorexia. Similarly, changes in functional capacity (from dysfunction to bedridden) were also recorded. Likewise, depletion of fats below the eyes, depletion of triceps and biceps, depletion of muscular mass in temple, scapula, clavicle, knee, shoulder, calf, shin etc were figured out and recorded. In this way the edema or ascites were also observed and documented. Based on the above parameters the patients were classified in three groups of SGA i.e., A (Well nourished), B (moderately malnourished) and C (severely malnourished). In the same manner the nutritional risk was also assessed by recording the data of BMI, total lymphocytes count and level of albumin. Based on these parameters the patients were classified into low, moderate and high nutritional risks.

Statistical Analysis

The data collected for assessment of nutritional status was has analyzed via Microsoft Excel and Statistical Package for Social Sciences (SPSS) software version 20. The standard error means and P-values were calculated with the help of SPSS. The correlation coefficient was figured out with the help of MS Excel. The Chi-Square distribution analysis was carried out with the help of SPSS.

Results

The data regarding the age, weight, height and body mass index was summarized in table 1. The age of patients ranged from 23 years to 91 years, while the weight ranged from 45 kg to 101 kg. Similarly, the height of patients ranged from 126 cm to 192 cm, while the BMI ranged from 14 to 47. The mode of age was sorted out to be 63 years among 259 patients, while the mode of weight was sorted out to be 55 kg. Likewise, the mode of height was recorded as 156 cm, while the mode

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of BMI was figured out to be 30.38. The data collected from various patients of Type-II diabetes comprised of 146 males, which made 56.37% of the total recorded patients, while the number of female patients recorded was 113, which makes 43.63% of the total population. The able 2 shows the frequency and percent of males and females in recorded patients.

Table 1: Various parameters of patients of Type-II diabetes mellitus

S. No	Parameters	Mean ± SEM	Mode
1	Age	60.01 ± 3.72	63
2	Weight	67.87 ± 4.22	55
3	Height	163.39 ± 10.15	156
4	BMI	26.17 ± 1.62	30.38

Data is represented as Mean ± Standard Error Mean

Table 2: Frequency and percentage of male and female with Type-II Diabetes Mellitus

S. No	Gender	Number	Percent
1	Male	146	56.37
2	Female	113	43.63
Total		259	100

Table 3 represents comprehensive data of various categories of BMI. The frequency of various categories of BMI shows the largest number of patients in Obese Class-I, which represents 129 patients out of the total population of 259. The smallest number of patients has been recorded in underweight category, which shows 5 patients out of 259. The male and female patients were calculated to be the highest in Obese Class-I, which shows 77 and 52 patients respectively. Similarly, the insulin dependent and Oral hypoglycemic drugs consuming patients were also sorted out be highest in Obese Class-I.

Table 3: Data of various categories of BMI

| S. No	Parameters	Underweight <18.5	Normal 18.5-23.5	Overweight 23.5-24.99	Obese Class-I 25-29.99	Obese Class-II 30-39.99	Obese Class-III ≥40
1.	Frequency	5	12	45	129	62	6
2.	Male	4	8	26	77	29	2
3.	Female	1	4	19	52	33	4
4.	Insulin	3	7	21	54	24	2
5.	Oral	2	6	24	75	38	4

The table 4 shows various parameters for assessment of nutritional risk. In nutshell, out of 259 patients, 123 were figured out to be moderately at nutritional risk, while 136 were at high risk of nutritional deficiency. The nutritional risk markers i.e., SGA, TLC and Albumin were thoroughly figured out in all the patients. The SGA categories showed highest number of patients in SGA-C i.e., 41 at moderate risk and 128 at high risk, while the SGA-A didn't contain any patient. Similarly, the very low TLC count (<900 per µl) have been recorded for only 21 patients, who were highly at risk of nutritional deficiency while the highest number of patients were revealed in TLC count >1500 per µl, in which 91 patients were at moderate risk while 86 patients were highly at risk of nutritional deficiency. Moreover, as far as the Albumin level is concerned, the highest frequency of patients were recorded in Albumin group having <2.5 g/dl, in which 51 were at moderate risk, while 71 patients were highly at risk.

Table 4: Frequency for nutritional risk level

S. No	Nutritional Risk		SGA			TLC per µl			Albumin g/dl		
			A	B	C	<900	900-1500	>1500	<2.5	2.5-3.4	>3.4
1	Moderate	123	0	82	41	0	32	91	51	42	30
2	High	136	0	08	128	21	29	86	71	52	13

*SGA: Subjective Global Assessment; TLC: Total Lymphocyte Count*

The frequency of individuals who were at nutritional risk or having malnutrition has been summarized in figure 1. The bars of Obese Class-I shows highest number of individuals in high risk group and severe malnutrition, which shows 40% and 38% of the total individuals. Moreover, the smallest number of patients was recorded in underweight and Obese Class-III. Figure 1 also depicts that patients with moderate risk and moderate malnutrition were almost less than patients with high risk and severe malnutrition in every group of BMI. In nutshell, the highest number of patients was recorded in Obese Class-I with nutritional risk and malnutrition as well.
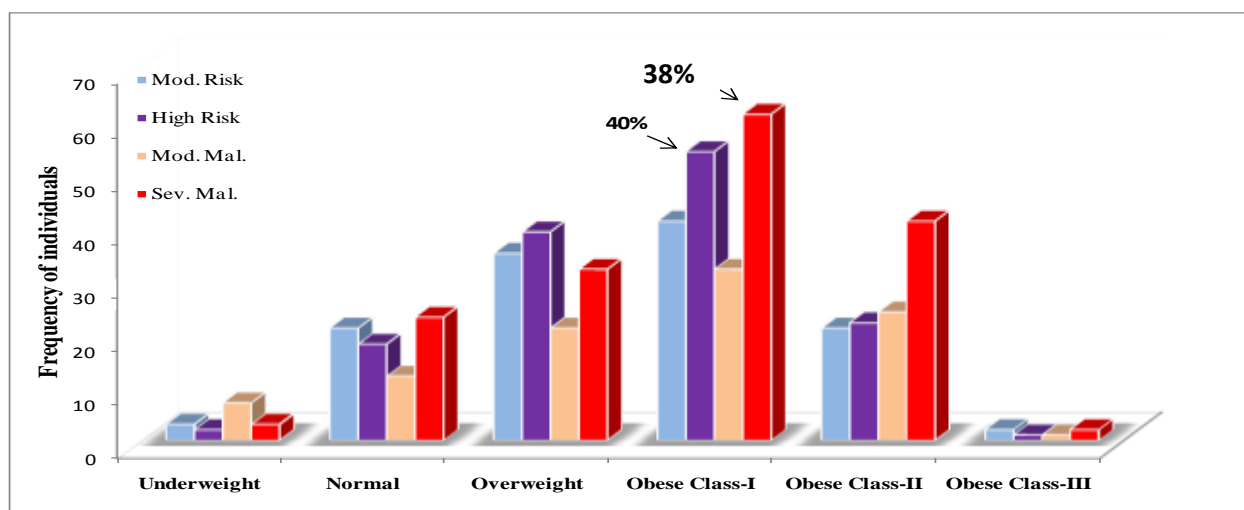
Figure 1: Frequency of individuals at risk or with malnutrition in various BMI categories

Mod.Mal: Moderate Malnutrition; Sev.Mal: Severe Malnutrition

The Correlation of frequency of male versus female in different categories of BMI has been elaborated in figure 2. The slope of the data (y = 0.691x + 2.012) shows a sound correlation between the frequency of male and female. The R^2 value of 0.923 shows the significant correlation between the two variables.
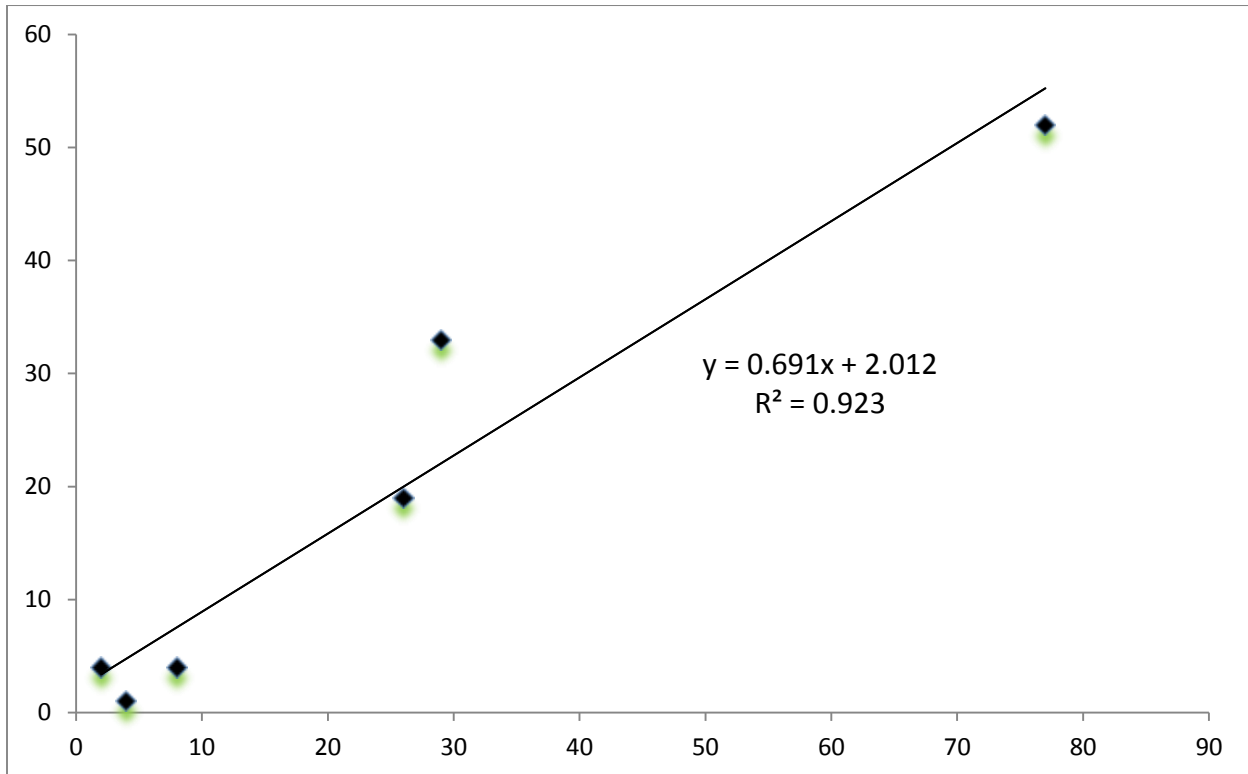
Figure 2: Correlation of frequency of male vs female in various BMI categories

The table 5 shows a very comprehensive and important data, which sorts out the malnutrition status of various patients of Type-II Diabetes Mellitus. The total number of patients having the status of moderate malnutrition were recorded as 162, while those of severe malnutrition were recorded as 97. The weight loss was showed by less number of patients, i.e., 139 patients who were figured out to have the status of moderate malnutrition showed no weight loss, while 68 patients who were sorted out to have the status of severe malnutrition also showed no weight loss. Similarly, No patient, with moderate malnutrition showed more than 10% weight loss. Moreover, table 5 shows that the reduction of oral nutrition were recorded as minimal for majority of patients. Likewise, the GIT symptoms were also recorded to be the lowest for majority of patients. In this way, the functional capacity has been depicted to be decreased in Diabetes Mellitus as the majority of patients have been grouped under dysfunction category/sub-optimal bed ridden, in which 117 were having the status of moderate malnutrition while 12 were having the status of severe malnutrition. Similarly, the physical examination showed highest number of patients in No tissue/muscle depletion and Edema/Ascite have also been observed in less number of patients i.e., 07 patients with moderate malnutrition while only 1 patient with severe malnutrition.

Table 5: Clinical data of various patients showing malnutrition severity

S. No	Parameters	Level	Moderate Malnutrition (162)	Severe Malnutrition (97)
1	Weight Loss	None	139	68
		≤10%	23	17
		>10%	0	12
2	Reduction of Oral Nutrition	Little/None	108	51
		Sub-optimal	54	42
		Starvation for > 5 days	0	04
3	GIT symptoms	None	142	83
		Nausea	12	08
		Vomiting/diarrhea	08	06
4	Functional Capacity	No Change	42	78
		Dysfunction/ Sub-optimal Bed ridden	117	12
		Bed Ridden for >2 weeks	03	07
5	Physical Examination	None/ Little Depletion	138	88
		Moderate Depletion	21	07
		Severe depletion	03	02
6	Edema/ Ascite	None	147	81
		Moderate	08	15
		Severe	07	01

SGA: subjective Global Assessment; TLC: Total Lymphocyte Count

Table 6 shows the contingency table for the patients of Type-II Diabetes Mellitus with different categories of BMI. The observed data shows the highest number of patients in Obese Class-I group i.e, 116, while the underweight and Obese Class-III shows 12 and 5 number of individuals, which shows a big difference in number of patients in each category. Based on the contingency table, the Chi-Square value was calculated as 187.69, which show a very significant difference from critical value i.e., 11.07. The Chi-Square value is very large than the critical value which

nullifies the Null hypothesis and endorse the alternative hypothesis. The Null hypothesis is also rejected by p-value (1.214e-38), which is significantly less than the level of significance i.e., <0.05. The results of Chi-Square distribution has been given in table 7.

Table 6: Contingency table for the Chi-square distribution analysis

S. No	Groups	Observed	Expected	0-E	(O-E)2	(O-E)2/E
1	Underweight	12	43.17	-31.17	971.5689	22.50565
2	Normal	43	43.17	-0.17	0.0289	0.000669
3	Overweight	55	43.17	11.83	139.9489	3.241809
4	Obese Class-I	116	43.17	72.83	5304.2089	122.8679
5	Obese Class-II	28	43.17	-15.17	230.1289	5.33076
6	Obese Class-III	5	43.17	-38.17	1456.9489	33.74911

Table 7: Chi-square distribution data

Degree of Freedom	Level of Significance	Critical Value	Chi-Square Value	P-Value
05	0.05	11.07	187.6959	1.214e-38

Discussion

The transformation of world from rural to urban nature has facilitated the life to considerable extent. As everything good or bad has its pros and cons and the cons of the urban life style has transformed the highly active to a sedentary life style[20]. Secondly, along with the sedentary life style, the consumption of unhygienic food, inhalation of unhygienic air and intake of unhygienic water increases the risks of morbidities in an individual[21]. One of the most important health anomalies is the T2DM[22]. As stated earlier, T2DM has been a burden for the mankind in various aspects. In the current observations, we have figures out some significant points, which have already been endorsed in various reports. For instance, the weight of an individual is very important with respect to height of an individual. We have observed that the large number of patients have been sorted in Obese Class-I having BMI 25-29.99 kg/m^2. By increasing the weight and by decreasing the height, the BMI is increased and so increases the chances of T2DM[23]. Actually this is based on the nutritional requirements. When the nutritional requirements are more than the nutritional intake, the chances of getting morbidity especially T2DM is increased[24]. We have also observed in the current findings that among 259 patients of T2DM, 48% (123) were at moderate risk of malnutrition, 52% (136) were at high risk of malnutrition. It means that no one among all the patients of T2DM were at no risk of malnutrition. This has already reported by multiple investigators that non-diabetic are less prone to malnutrition risk as compared to diabetic individuals[25]. A recent study reports that 63.2% of T2DM patients were at risk of malnutrition while 37.5% were recorded under the status of malnutrition[24]. In the study we have also sorted out that the mode age among 259 patients of T2DM was recorded as 63 and the mean age was calculated as 60.01 ± 3.72, which clearly shows that aged population are more prone to develop

T2DM as compared to the younger population. Numerous reports signifies the relationship of age with T2DM and show a direct relationship of T2DM with age and BMI [26].

As far as the malnutrition severity was concerned, the moderate malnutrition has been shown 162 patients while severe malnutrition has been exhibited by 97 patients, which makes 62.55% and 37.45% of the total population. Secondly, the Table 05, all parameters show high frequency in first category of parameter. For instance, no weight loss was shown by 139 patients with moderate malnutrition and 68 patients with severe malnutrition. Likewise, only 23 patients among moderate malnutrition group exhibited ≤10% weight loss while 17 patients exhibited ≤10% in severe malnutrition group. In this way the >10% group contained no patient with moderate malnutrition and only 12 patients in severe malnutrition. It has been reported by the advanced research teams that weight loss in T2DM is beneficial for patients[27-28]. Due to this reason majority of patients are showing no weight loss in the findings. Same is the case with reduction of oral nutrition and GIT symptoms. While the functional capacity is significantly decreased as shown in Table 05.Out of 259 patients, 117 patients exhibited sub-optimal bed-ridden/dysfunction status among the moderate malnutrition group and 08 patients exhibited sub-optimal bed-ridden/dysfunction among the severe malnutrition group. The decreased functional capacity exacerbates the T2DM, increased functional capacity reduce and manage the symptom associated with T2DM effectively[29].

Conclusion

Based on the findings of current investigations, it is possible to establish that a healthy ratio of T2DM are at nutritional risk or have malnutrition status in hospitalized patients.. Secondly, it may also be inferred that the largest number of T2DM could be assumed at Obese Class-I of BMI distribution and this would be highly at risk of malnutrition and will have highly frequency of malnourished patients.

Conflict of Interest

This study has no conflict of interest to be declared by any author.

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