

Prevalence of *Ziabetas Shakari* (Type 2 Diabetes Mellitus) and Dietary Habits among Senior Citizens Attending NIUM Hospital, Bengaluru

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Abstract Prevalence of type 2 diabetes mellitus is increasing rapidly around the world. The study was designed with the objectives to study the prevalence of type 2 diabetes mellitus among the elderly and to assess the dietary habits among them. This hospital based, cross sectional study was conducted among the elderly aged 60 years and above, including of either sex, newly diagnosed and known cases of type 2 DM attending NIUM hospital, during stipulated period of study. Prevalence of *Ziabetas shakari* was assessed among varied socio-demography. The Chi Square (χ^2) test was used to find association between dietary habits and *Ziabetas shakari*. Pearson correlation coefficient had used to evaluate the relationship between variables by using 95% confidence level. The prevalence of *Ziabetas shakari* (type 2 diabetes mellitus) was found 45.6% as a whole. The highest and lowest prevalence of type 2 DM found among 60-65 years and above 75 years, respectively. Prevalence among Males was 30% and Females was 15.6%. More meal quantity exhibited strongly significant relationship with $FBS \geq 126\text{mg/dl}$, $PPBS \geq 200\text{mg/dl}$ and $HbA1c \geq 6.5$ ($p=0.000^{**}$). Increased 3 times main meal frequency showed strongly significant correlation with $FBS \geq 126\text{mg/dl}$ ($p=0.002^{**}$) and $PPBS \geq 200\text{mg/dl}$ ($p=0.001^{**}$). South Indian meal pattern showed strongly significant relationship with $PPBS \geq 200\text{mg/dl}$ ($p=0.01^{**}$). Results confirmed an increased prevalence of *Ziabetas shakari* among senior citizens. These results concluded association of dietary habits. Dietary modifications are an integral part of diabetic care and geriatrics. Meal quantity showed significant correlation with FBS, PPBS, and HbA1c. Newly screened cases of type 2 DM showed paramount importance of extension of screening programme in elderly.

Keywords *Dietary Habits; Elderly; Ziabetas Shakari*

1. Introduction

Diabetes mellitus is an important public health problem, worldwide. The global increase in the prevalence of diabetes is due to population growth, ageing, urbanization, an increase of obesity and physical inactivity [1, 2, 3].

The number of cases of diabetes worldwide in the year 2000 among adults (more than 20 years) was estimated to be 171 million and will rise to 366 million by 2030 [3, 4, 5, 6, 7].

The International Diabetes Federation (IDF) estimates the total number of people in India with diabetes to be around 50.8 million in 2010, rising to 87.0 million by 2030 [2, 6].

According to the 2011 census, percentage of Indians above the age of 60 years is 8.3% as compared to 6.9% in 2001 census. In terms of numbers, according to the provisional data of census 2011, this comes to an estimated 99.87 million [8].

The word diabetes is derived from Greek word of, “*diabanein*” which means to “passing through” or “run through” or “siphon” in reference to the excessive urine produced as a symptom of this disease. In Unani system of medicine, diabetes described by various Greek and Arabic vernaculars as synonyms of diabetes are “*Ziabetas*”, “*Ziasaqus*”, “*Qaramees*”, “*Dawar*” (giddiness), “*Dolab*” (water wheel) and “*Zalaqul kulliya*” (slippery nature of the kidneys or diarrhoea of the kidneys) [9, 10, 11, 12, 13].

Greco-Arab and Islamic healers treated patients through a scheme starting with physiotherapy and diet; if this failed, drugs were used. *Rhazes's* treatment scheme started with diet therapy, he noted that “if the physician is able to treat with foodstuffs, not medication, then he has succeeded” [14].

Type 2 diabetes mellitus is closely related to lifestyle factors including diet, physical activities, alcohol and smoking as well as obesity and a family history of diabetes [15, 16]. Available data suggest that diet is the main culprit.

A change in dietary habits and dietetics have a greater potential to improve type 2 diabetes, because many persons with type 2 diabetes are overweight and insulin resistant, medical nutrition therapy should emphasize lifestyle changes which result in reduced energy intake and increased energy expenditure through physical activity.

According to Unani physicians, old age is dominance of *buoodat* and *yaboosat*; therefore *Tadabeer e Ghiza*, *Musakkin* and *Murattib* diets advocated [17]. According to their lesser digestion and to their physical strength the aged should be served with small amount of food at a time and thus fed two to three times a day [18]. Unani system of Medicine lays rules for a balanced lifestyle, which revolves around six essential factors (*Asbab e Sitta Zarooriya*); these are atmospheric air, dietetics, rest and physical activities, psychological activities and rest, sleeping patterns and wakefulness and eliminations and retentions. Modification and moderation of these six essential factors in an individual prevent diseases and promote optimal health in any age category [19].

It was envisaged that this study would help to determine the prevalence of type 2 diabetes mellitus and their dietary habits so as to focus on the important issues that need to be addressed concerning their diet in old age.

This study was conducted with the objectives of investigating the prevalence of type 2 diabetes mellitus and to assess the dietary habits among senior citizens. This study was carried out among most vulnerable and respectable group of senior citizens. Thereby it will help in health planning and resource allocation for the prevention and intervention of type 2 diabetes mellitus in Unani system.

2. Materials and Methods

This hospital based cross sectional study was conducted at hospital of the National Institute of Unani Medicine, Bengaluru; under the Department of *Tahaffuzi wa Samaji Tib*. After ethical clearance of Institutional Ethical Committee (IEC) of National Institute of Unani Medicine, study was started by enrolling eligible subjects from January, 2014 to January, 2015. 250 patients as per recommendation of IEC were enrolled including known cases of type 2 diabetes mellitus as well as newly diagnosed cases of type 2 diabetes mellitus. Newly diagnosed cases of type 2 diabetes mellitus were studied as special populace as they had other risk factors of type 2 diabetes mellitus or either they had some other chief complaints for which they had come to the hospital. Patients aged 60 years and above were included. Patients were informed complete details about the nature of the study, investigations etc. Patients those who agreed to participate in the study were also requested to sign the informed consent form.

The patients were inquired about their name, age, sex, marital status, address, religion, and occupation. Anthropometric variables measured were height, weight, BMI, waist circumference (WC), hip circumference (HC), and waist to hip ratio (WHR).

Dietary habits were assessed by using the established tool known as 24 hours dietary recall diary that include; meal type (vegetarian/ mixed), main meal frequency/ meal timing (2 /3 main meal frequency), meal pattern (North Indian/ South Indian) and meal quantity. Meal quantity of each patient was measured by calculation of approximate calories of 24 hours diet by using National Institute of Nutrition Calories Chart of Indian Foods [21]. According to the calories consumption of patient's 24 hours diet, meal quantity was categorized less, modified, normal, typical and more of north Indian diet and south Indian diet separately by using the American Association of Physicians of Indian Origin (AAPI's) Guide to nutrition, health and diabetes [20].

Determination of holistic *mizaj* was done on the basis of assessment of ten different morphological, physiological, and psychic determinants known as *Ajnas e Ashra* mentioned in classical Unani literature.

Investigations (FBS, PPBS, HbA1c and VPT) were done at the laboratory of hospital of the National Institute of Unani Medicine. The participants of the study were requested to fast for 8-10 hours before the sample collection.

The prevalence of type 2 diabetes mellitus among senior citizens was analyzed according to socio-demography. The Chi Square (χ^2) test has been used to determine whether there is a significant association between two categorical variables. Pearson correlation coefficient has used in to evaluate the relationship between two variables by using 95% confidence level.

3. Results and Discussion

The prevalence of diabetes increases with age, and is highest in those older than 60 years. Older adults are at high risk for the development of type 2 diabetes mellitus due to the combined effects of increasing insulin resistance and impaired functions of islet cell with ageing.

The prevalence of type 2 diabetes mellitus was found to be 45.6 %. Among the study population 99 were found to be known cases of type 2 diabetes mellitus, 15 were newly detected with type 2 diabetes and 136 elderly were normoglycaemics.

The present study showed the highest prevalence among 60-65 years age group and the lowest prevalence among age above 75 years. Our results related with the prevalence of type 2 DM among age distribution are in accordance with the findings of Ramachandran et al. in 2012, in the Asian Indian population, prevalence of type 2 DM peaks at 60-69 years. Steyn et al. in 2004 found a decrease in prevalence of type 2 DM among oldest age group (75+) because of higher mortality rates in those with the disease [1, 22].

The prevalence of type 2 DM among male population was 30% and female population was 15.6%. The results suggested the male preponderance among the subjects of type 2 DM, which is in conformity with the results of the study conducted in 2008 by Vijayakumar et al. [6].

Occupation wise distribution showed maximum number of type 2 DM (16% and 12%) were in unemployed and pensioners; second largest group was home maker (8.4%) and next to that group were belonged to unskilled and Professional (3.6% and 2.4%). These groups were doing comparatively lesser physical activity to other occupational categories. Vigorous exercise is required to improve insulin sensitivity mentioned by Steyn et al. in 2004 [22].

In this study out of 114 type 2 diabetes mellitus, 65 type 2 DM patients had positive family history of type 2 DM and 49 type 2 DM patients had no family history of type 2 DM. A previous study conducted by Vijayakumar et al. in 2008 also concluded the same results with regard to family history of type 2 DM [6].

Out of 99 (39.6%) known cases of type 2 DM, 38 (42.2%) cases were overweight, 18 (40.9%) cases were obese, 41 (40.6%) were normal and only 2 (13.2%) cases were under weight as per their BMI. Subramani et al. in 2014 reported significant association between BMI and type 2 diabetes mellitus. [23]

Among all 250 senior citizens, 90 subjects were having BMI 25-29.9 Kg/m² and 44 subjects were having BMI > 30 Kg/m². Almost more than half of the senior citizens were having BMI>25 Kg/m² (either overweight or obese).

Waist circumference is more sensitive for the prediction of risk as well as co-morbidities of cardiovascular disease and diabetes mellitus, according to waist to hip ratio 196 senior citizens were obese and 54 were normal. Present study findings showed obesity and overweight were more prevalent among all senior citizens. Study conducted by Singh et al. revealed that overweight and obesity highlight an emerging health problem amongst elderly [24].

Diabetic Peripheral Neuropathy (DPN) is one of the microvascular complications of diabetes, and is responsible for most of the amputations in diabetes. Among people with diabetes, 60-70% suffers from peripheral neuropathy; Measurement of Vibration Perception Threshold (VPT) is useful in assessment of peripheral neuropathy even in early state. Regular screening and its extension up to older age for diabetic peripheral neuropathy is critically important, because patients of all stages of neuropathy are at a greater risk of developing insensitive foot ulceration [25, 26].

Out of 250 senior citizens, 125 (50%) senior citizen showed normal VPT and 116 (46.4%) showed abnormal and 9 (3.6%) very abnormal VPT. Present study results related with the Vibration Perception Threshold findings among senior citizens in accordance with the findings of Lakshmana Kumar et al. in 2013. Diabetic Peripheral Neuropathy (DPN) increases with age and 50% of type 2 diabetes cases aged over 60 years have DPN [25].

70 of 116 showed abnormal VPT and 5 out of 9 showed very abnormal VPT among cases of type 2 DM. This finding was in concordance with the statement of Lakshmana Kumar et al. stated. Impaired prolonged glycaemic control plays definite role in development of DPN and other microvascular complications. The study found most suitable in screening the new cases of abnormal and very abnormal VPT [25].

Assessment of holistic *Mizaj* was based on ten morphological, physiological, and psychic determinants known as *ajnas e ashrah*. 196 (78.4%) out of 250 studied senior citizens were *Saudavi (Barid wa Yabis Mizaj)*, rest of the senior citizens belonged to other *Mizaj (Balghami (Barid wa Ratab), Damvi (Har wa Ratab) and Safravi (Har wa Yabis)*. This study finding showed close relationship between *Barid wa Yabis (Saudavi) Mizaj* and senior citizens. Available ancient Unani text mentioned that elderly (*Mashaikh*) have *saudavi (Barid wa Yabis/ cold and dry mizaj)* [17, 27, 28, 29].

Out of 114 type 2 DM enrolled cases, there were 80 (70.2) *Saudavi*, 23 (20.2) *Balghami*, 8 (7.0) *Damvi* and 3 (2.6) *Safravi*. Our result showed that higher prevalence of type 2 DM cases also observed holistic cold temperaments (*saudavi* and *balghami*) which was in concordance with the statement of *Jurjani* who told the four causes of diabetes include *sue mizaj barid e aam* (generalized holistic cold temperament) [30, 31].

In this study distribution showed 23 (20.2%) type 2 DM patients were vegetarians and 91 (79.8%) type 2 DM patients were taking mixed meal. The distribution suggested the mixed meal type preponderance among the subjects of type 2 DM, which is in conformity with the results of the study conducted in 2009 by Tonstad et al. Another study conducted by Alrabadi et al. in 2013 also concluded the same results with regard to meal type of type 2 DM.

South Indian meal pattern showed increase in the postprandial blood sugar level significantly in our study ($p=0.010^{**}$). Southern populace is rice-eating and eats preparations made from rice for all the meals during the day [32]. Rice is the staple food of south Indians and rice is incorporated in various ways. Wheat is the staple food of north region of India [20].

The study results suggested high prevalence of type 2 DM found in where rice is traditionally consumed more and low prevalence found in wheat eating community. The study conducted by Mitra et al. in 2009 concluded the same statement [32].

Present study result showed statistically and strongly significant association between 3 times (more than 2 times) main meal frequency with $FBS \geq 126$ mg/dl and $PPBS \geq 200$ mg/dl ($P=0.002^{**}$ and 0.001^{**} , respectively). The study conducted by Kahleova et al. in 2014 concluded the same findings that eating two main meals a day may be more beneficial for patients with type 2 diabetes mellitus than more than two main meals per day [33].

Meal quantity plays major role in controlling blood sugar levels in type 2 diabetes. Postprandial blood sugar levels mainly depend on meal quantity and glycaemic index of the consuming food. This study results showed strongly significant association between more quantity of meal in 24 hours dietary recall with $FBS \geq 126$ mg/dl, $PPBS \geq 200$ mg/dl and $HbA1c \geq 6.5$ ($P=0.000^{***}$). The study conducted by

Jyothi et al. in 2013 revealed there is significant decrease in the PPBS levels in those, who followed split breakfast i.e. less quantity of meal in breakfast decrease the PPBS level [34].

Results of present study showed strongly significant association between more quantities of meal in 24 hours dietary recall with type 2 DM and lesser or normal meal quantity with normoglycaemics (P=0.000**). More quantity meal was observed in maximum number of type 2 diabetes mellitus in contrast normal and then lesser quantity of meal was observed in maximum number among normoglycaemics.

Arab and Islamic healers treated patients through schematic principles that start with prevention including *ghizai tadhabeer* and *riyazat* (dietetics, physical activity and exercise); if it got fail then drugs were prescribed together with *ghizai tadhabeer*.

Type 2 diabetes mellitus is a multifactorial disease. We can prevent, control and delay onset, complications and disability by life style modification. Mainly, smaller meal quantity and lesser main meal frequency control high blood sugar level along with proper physical activity.

Table 1: Distribution of Ziabetas Shakari (Type 2 Diabetes Mellitus) among Senior Citizens According to their Age and Glycaemic Status (n=250)

Age	Known cases of type 2 DM (%)	New cases of type 2 DM (%)	Total cases of type 2 DM (%)	Normoglycaemics (%)	Prevalence of type 2 DM in different age groups
60-65	48 (48.5)	10 (66.6)	58 (50.9)	76 (55.9)	23.2
66-70	36 (36.3)	3 (20)	39 (34.2)	35 (25.7)	15.6
71-75	8 (8.1)	1 (6.7)	9 (7.9)	15 (11.0)	3.6
Above 75	7 (7.1)	1 (6.7)	8 (7.0)	10 (7.4)	3.2
Total	99 (100)	15 (100)	114 (100)	136 (100)	45.6
Inference	The highest and lowest prevalence of type 2 DM were observed among 60-65 years age group and above 75 years, respectively.				

Table 2: Distribution of Senior Citizens According to BMI and Glycaemic Status (n=250)

	BMI (Body Mass Index) Kg/m ²				Total
	Normal	Overweight	Obese	BMI	
	(19-25) (%)	(25-29.9) (%)	(above 30) (%)	(Less than 19) (%)	
Senior citizens					
Known cases of type 2 DM	41 (40.6)	38 (42.2)	18 (40.9)	2 (13.3)	99 (39.6)
New cases of type 2 DM	4 (4.0)	5 (5.6)	5 (11.4)	1 (6.7)	15 (6.0)
Normoglycaemics	56 (55.4)	47 (52.2)	21 (47.7)	12(80.0)	136 (54.4)
Total	101 (100)	90 (100)	44 (100)	15 (100)	250 (100)
Inference	43 of the overweight and 23 of obese had type 2 DM.				

Table 3: Distribution of Senior Citizens According to their Mizaj and Glycaemic Status (n=250)

Senior citizens	Mizaj				Total (%)
	Balghami (%)	Damvi (%)	Safravi (%)	Saudavi (%)	
Type 2 DM	23 (20.2)	8 (7.0)	3(2.6)	80 (70.2)	114(100)
Normoglycaemic	4 (2.94)	12 (8.83)	4 (2.94)	116 (85.29)	136(100)
Total	27 (10.8)	20 (8.0)	7 (2.8)	196 (78.4)	250 (100)

Inference Maximum number of senior citizens showed *Saudavi mizaj* (196). In general *Balghami mizaj* showed highest prevalence among diabetics.

Table 4: Correlation of Blood Sugar Levels with 24 Hours Dietary Recall among Senior Citizens

24 Hours Dietary Recall		FBS \geq 126mg/dl (%)	PPBS \geq 200mg/dl (%)	HbA1c \geq 6.5 (%)
Meal type	Vegetarian	19 (7.6)	20 (8.0)	95 (38.0)
	Mixed	59 (23.6)	65 (26.0)	26 (10.4)
	P values	0.246	0.317	0.569
	Inference	There was no statistically significant association between meal types (vegetarian or mixed) with blood sugar levels.		
Meal pattern	North	16 (6.4)	19 (7.6)	22(8.8)
	South	62 (24.8)	66 (26.4)	99(39.6)
	P values	0.064	0.010**	0.099
	Inference	There was statistically strongly significant association observed between south Indian meal patterns with PPBS \geq 200mg/dl.		
Main meal frequency	2 times	0 (0)	0 (0)	7(2.8)
	3 times	78 (31.2)	85 (34.0)	114(45.6)
	P values	0.002**	0.001**	0.294
	Inference	3 times main meal frequency showed strongly significant association with FBS \geq 126 mg/dl and PPBS \geq 200 mg/dl.		
Meal quantity	Typical	2 (0.8)	2(0.8)	2 (0.8)
	Modified	2 (0.8)	2 (0.8)	3 (1.2)
	Less	11 (4.4)	11 (4.4)	28 (11.2)
	Normal	40 (16)	45 (18)	62 (24.8)
	More	23 (9.2)	25 (10)	26 (10.4)
	P values	0.000**	0.000**	0.000**
	Inference	There was statistically strongly significant association was observed between more meal quantity (calorie consumption wise) and FBS \geq 126mg/dl, PPBS \geq 200mg/dl, and HbA1c \geq 6.5, respectively.		

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