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Diabetes management practices among Muslim, Hindu and Christian communities in Hyderabad

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Abstract
Diabetes is the increasingly growing metabolic threat and a leading global public health concern, especially in developing countries. India ranks second in prevalence of diabetes after China. Many people who suffer from diabetes have poor quality of life, as a result of less attention to their self-care and disease management. When self-care is diminished in diabetes, it in turn leads to poor glycaemic control and increased risk of complications. Hence assessment of diabetes management practices is very crucial for health and well being in the long run. It is also important to understand the impact of religion on management practices of diabetes. The study used purposive sampling technique to select 180 subjects taking 60 from each religion aged 30-60 years, having type 2 diabetes for more than 2 years from various hospitals, diabetes centres/clinics, colonies, religious places, friends, family and relatives among Muslim, Hindu and Christian communities in Hyderabad. The results showed that Christians had better diet related practices, greater involvement in physical activity and exercise when compared to Hindus and Muslims while Hindus had greater adherence to medical treatment and more focussed on attaining diabetes control related information compared to other two religions. When compared to females, males had better management practices than females in all religions, with no statistical difference among them. Overall, the total management practices score was highest among Christians followed by Hindus and Muslims. Significant difference was observed among the three religions in terms of physical activity, attainment of diabetes education.

Keywords: Type 2 diabetes, diet related practices, physical activity and exercise, medical treatment

Introduction
Diabetes Mellitus (DM) has become one of the leading causes of premature illness and deaths in most countries due to comorbidities and complications associated with the improper management of diabetes, ultimately leading to poor quality of life. India is known as the "Diabetes capital of the world". More than 61 million people with diabetes live in India, a country that is already facing challenges such as malnutrition, poverty and socioeconomic burden caused by communicable diseases. Treatment of diabetes and its complications was a major challenge in India owing to several issues, including socio-cultural factors, lack of appropriate facilities for diabetes care, an inadequate health system, poor monitoring and follow-up of patients, and problems in implementing effective management and educational strategies (Visvananthan *et al*., 2013) [1].

Eliminating symptoms and preventing or at least slowing down the development of microvascular and macrovascular complications are the main goals in caring of patients with diabetes. Microvascular (eye and kidney diseases) risk reduction is accomplished through control of glycaemia and blood pressure; macrovascular (coronary, cerebrovascular, peripheral vascular) risk reduction, through control of lipids and hypertension, smoking cessation, and aspirin therapy; and metabolic and neurologic risk reduction, through control of glycaemia (Khardori, 2011) [2].

The primary goal in the management of diabetes mellitus is the attainment of near-normal glycaemia. In India, more than half of patients have poor glycaemic control and have vascular complications. The management of diabetes poses unique challenges in terms of modification of dietary practices, weight management, exercise, monitoring of body fluids (blood, urine), foot care, use of drugs, and learning new technical skills such as blood glucose monitoring Rambiharilal *et al*., 2013 [3] found seven essential self-care behaviors in people with diabetes namely healthy eating, being physically active, monitoring of blood sugar, compliant with medications, good problem-solving skills,

healthy coping skills and risk-reduction behaviors to be positively correlated with good glycemic control, reduction of complications and improvement in quality of life.

Material and Methods
The study was carried out in 180 subjects taking 60 (30 males and 30 females) from each religion in the age group of 30-60 years having diabetes for more than 2 years from various hospitals, diabetes centres/clinics, colonies, religious places, friends, family and relatives among Muslim, Hindu and Christian communities in Hyderabad. A purposive sampling technique was used to select type II diabetes patients. The management practices of subjects with diabetes were enquired through a structured questionnaire that consisted of 30 questions scored on a 5 point scale as 5, 4,3,2,1 indicating never, sometimes, often, frequently, always highest score for the best practice and lowest to the poor practice respectively.

Results and Discussion
The management practices were categorised into four subheads: Diet related practices, Physical activity, Medical treatment, Education

Diet related practices
Nutrition intervention is an integral part of type 2 diabetes care. The subjects were asked about their diet related practices and the responses obtained are presented in table 1. About 40-50% of persons with diabetes from all religions followed the advice either 'frequently or always' while the rest 50-60% followed either sometimes or often or never. The response to "whether they are taking all 3 meals regularly and on time" was 'always' among 30-40% of subjects and 'never' in less than 10% of subjects from all three religions. While 32%, 13%, 25% of subjects 'frequently', 22%, 18%, 20% 'often' and 8%, 25%, 15% 'sometimes' took all 3 meals regularly and on time among Muslim, Hindu and Christian groups respectively. Overall, Christians seemed to be more punctual in taking meals on time followed by Muslims and then Hindus.
Consumption of balanced diet was reported as 'sometimes' by 30% each of Hindus reported eating a balanced diet 'sometimes', 'often' and 'frequently' and 8% reported to be always eating balanced diet, while, 33 and 35% of Christians and only 23% and 12% of Muslims respectively reported

eating a balanced diet 'frequently' or 'always'. Among Muslims and Christians, 30% and 10% respectively 'sometimes' had balanced diet and 33% Muslims and 20% Christians 'often' included almost all food groups. The mean scores of "eating a balanced diet" were 3.03 in Muslims, 3.13 in Hindus and 3.88 in Christians in the increasing order of consumption. Christian persons with diabetes were found to be taking a balanced diet on a regular basis compared to Hindus and Muslims.
Habit of "eating fibre rich food everyday" was expressed to be 'sometimes' by 38%, 52%, 30% of subjects, 'often' by 30%, 33%, 12% and 'frequently' by 12%, 5%, 33% and 'always' by 10%, 7%, 22% Muslim, Hindu and Christian groups respectively. Less than 5% subjects in each of the three religion groups expressed that they 'never' take fibre rich foods. The mean scores of "consumption of fiber rich food everyday" were 2.78 in Muslims, 2.6 in Hindus and 3.4 in Christians indicating that the Christians consumed fibre rich foods more frequently compared to Muslims and Hindus.
"Limiting salt from regular meals and processed foods" was practiced 'always' by 1/10 of Muslims and 1/5 of Hindus and 1/5 of Christians, while 1/10 of subjects from each religion 'never' limited salt intake. About 36% of Muslims, 35% of Hindus and 47% of Christians reported to 'often' and 'frequently' set a limit on salt intake while 27% Muslims, 32% Hindus and 18% Christians reported that 'sometimes' they set a limit on taking salt. The mean scores of "limiting salt from regular meals and processed foods" were 2.91 in Muslims, 2.98 in Hindus and 3.33 in Christians in the increasing order of limitation. Persons with diabetes from Muslim and Hindu community need to be cautioned about their salt intake. Salt does not affect blood glucose levels, but it's important to limit the amount as part of diabetes management because too much salt can raise blood pressure.
"Small and frequent meal intake" was a an always or often or frequent habit among 1/2 of the Muslims and Hindus and Christians, which is a good sign while 33% each of Muslims and Hindus and 30% Christians reported small and frequent meal intake 'sometimes'. The mean scores of "taking small and frequent meals" were 3.35 in Muslims, 4.22 in Hindus and 3.75 in Christians. The practice of "small and frequent meals" was better among Hindus compared to Christians and Muslims.

Table 1: Diet related practices of persons with diabetes in religion groups

S. No	Diet related statement /Question	Never n (%)			Sometimes n (%)			Often n (%)			Frequently n (%)			Always n (%)			Mean score		
		M	H	C	M	H	C	M	H	C	M	H	C	M	H	C	M	H	C
1.	Follow the advice given by my physician or dietician in selection of food items	2 (3)	3 (5)	4 (7)	19 (32)	17 (28)	18 (30)	15 (25)	15 (25)	9 (15)	15 (25)	8 (13)	15 (25)	9 (15)	17 (28)	14 (23)	3.17 ± 1.14	3.32 ± 1.5	3.28 ± 1.3
2.	I take all 3 meals regularly and on time	5 (8)	6 (10)	1 (2)	5 (8)	15 (25)	9 (15)	13 (22)	11 (18)	12 (20)	19 (32)	8 (13)	15 (25)	18 (30)	20 (33)	23 (38)	3.67 ± 1.23	3.35 ± 1.42	3.83 ± 1.85
3.	I eat a diet that include almost all food groups like cereals, pulses/egg/meat, milk products, vegetables, leafy vegetables, fruits, nuts and oil.	1 (2)	1 (2)	1 (2)	18 (30)	18 (30)	6 (10)	20 (33)	18 (30)	12 (20)	14 (23)	18 (30)	21 (35)	7 (12)	5 (8)	20 (33)	3.03 ± 1.03	3.13 ± 0.1	3.88 ± 1.04
4.	I take foods containing dietary fibre like whole wheat atta, less polished rice, millets, whole gram pulses / sprouts, whole fruits, raw vegetable, spices like dhania, jeera etc every day.	3 (5)	2 (3)	2 (3)	26 (38)	31 (52)	18 (30)	18 (30)	20 (33)	7 (12)	7 (12)	3 (5)	20 (33)	6 (10)	4 (7)	13 (22)	2.78 ± 1.05	2.6 ± 0.91	3.4 ± 1.22
5	I set a limit on taking salt from regular meals and from processed foods.	8 (13)	8 (13)	8 (13)	16 (27)	19 (32)	11 (18)	17 (28)	11 (18)	7 (12)	11 (18)	10 (17)	21 (35)	8 (13)	12 (20)	13 (22)	2.91 ± 1.23	2.98 ± 1.36	3.33 ± 1.36
7.	I take small and frequent meals, at least five times spaced out.	8 (13)	10 (17)	8 (13)	20 (33)	20 (33)	18 (30)	19 (32)	9 (15)	11 (18)	8 (13)	4 (7)	12 (20)	5 (8)	17 (28)	11 (18)	3.35 ± 1.35	4.22 ± 1.15	3.75 ± 1.16
8.	I eat fresh whole fruits and raw or cooked vegetables at least 5 days in a week	2 (3)	6 (10)	5 (8)	20 (33)	21 (35)	16 (27)	19 (32)	15 (25)	15 (25)	10 (17)	3 (5)	11 (18)	9 (15)	15 (25)	13 (22)	2.7 ± 1.12	2.97 ± 1.5	3 ± 1.34
9.	I have reduced the serving size of cereal-based food items like rice, roti, ravva etc compared to my earlier high intake	4 (7)	6 (10)	3 (5)	17 (28)	23 (38)	12 (20)	18 (30)	14 (23)	18 (30)	14 (23)	7 (12)	17 (28)	7 (12)	10 (17)	10 (17)	3.07 ± 1.12	3 ± 1.35	3.18 ± 1.28
10	I use cooking methods such as boiling, steaming or grilling, but not	7	5	4	36	24	23	8	21	15	9	7	14	0	3	4	3.05 ±	2.87 ±	3.32 ±

		Always n (%)			Frequently n (%)			Often n (%)			Sometimes n (%)			Never n (%)					
	cooking with oil or deep fat frying.	(12)	(8)	(7)	(60)	(40)	(38)	(13)	(35)	(25)	(15)	(12)	(23)		(5)	(7)	0.12	1.36	1.13
6.	I consume high-fat red meat or high fat dairy milk, cheese, khoaetc more than once a week.	10 (17)	3 (5)	4 (7)	5 (8)	4 (7)	6 (10)	11 (18)	4 (7)	7 (12)	22 (27)	15 (25)	27 (45)	12 (20)	34 (57)	16 (27)	2.32 0.87	2.65 ± 0.97	2.85 ± 1.08
11.	I take junk foods, processed baked foods, sweet snacks sweetened drinks.	0	4 (7)	2 (3)	4 (7)	6 (10)	1 (2)	12 (20)	9 (15)	6 (10)	29 (48)	23 (38)	32 (53)	15 (25)	18 (30)	19 (32)	3.92 ± 0.85	3.75 ± 1.9	4.08 ±1.09

Note: Figures in parenthesis indicate percentages

"Consumption of fresh whole fruits and vegetables at least 5 days in a week" was reported to be 'always' in 15%, 25% and 22% and 'never' among 3%, 10% and 8% of diabetic persons from Muslim, Hindu and Christian religion groups respectively. However, from each group consuming fresh fruits and vegetables at least 5 days in a week was reported to be 'sometimes' by 27-35%, 'often' by 25-32%, while 17% of Muslims, 18% of Christians and only 5% of Hindus reported to have eaten fresh fruits and vegetables 'frequently'. The mean scores of "consumption of fresh whole fruits and vegetables at least 5 days in a week" were 2.70 in Muslims, 2.97 in Hindus and 3.00 in Christians in the increasing order of consumption.

An inverse correlation was observed between intake of fruits, vegetables and T2DM as they are rich in nutrients, fiber and antioxidants which were considered as protective barrier against T2DM (Villegas et al., 2008) [4].

"Reduction of serving size of cereal based food items" showed that 28%, 38%, 20% of subjects 'sometimes reduced' and 7%, 10%, 5% of subjects had 'never' reduced serving size in the respective Muslim, Hindu and Christian groups while 75% Christians, 65% Muslims and 52% Hindus reduced the serving size of cereal based food items with a regularity of 'always' or 'often' or 'frequently'. The mean scores of "reduction of serving size of cereal based food items" were 3.07 in Muslims, 3.00 in Hindus and 3.18 in Christians, although the difference was not much. Excess intake of cereal especially as rice in Hindus, demands an urgent need for changing lifestyle among general population and further increase the awareness of healthy diet patterns in all groups.

Low fat food preparation such as, "Usage of cooking methods like boiling, steaming and grilling" had been reported to be 'never' by 12%, 8%, 7% and 'sometimes' by 60%, 40% and 38% Muslims, Hindus and Christians respectively, while 13%, 35%, 25% of subjects 'often used' 15%, 12%, 23% 'frequently used' and boiling, grilling methods of cooking in the respective groups of Muslim, Hindu and Christians. It was seen that none of the Muslims used boiling/ steaming on a daily basis and sporadically some 5% Hindus and 7% Christians 'always' cooked by boiling or steaming. Thus, it can be concluded that usage of non-fat cooking methods was very negligible in all three religion groups. The mean scores of "usage of cooking methods like boiling, steaming and grilling" were 3.05 in Muslims, 2.87 in Hindus and 3.32 in Christians indicating that usage of healthy cooking methods was less among Hindus, when compared to Muslims who were next to Christians in following healthy cooking methods such as boiling, steaming and grilling, instead of deep fat frying or cooking with oil.

"The practice of consumption of high fat red meat and high fat dairy" was found to be always or frequently or often among 1/2 Muslims, 1/5 Hindus and 1/4 Christians, while 1/2 of Muslims and 3/4 each of Hindus and Christians restrained from consumption of high fat red meat and high fat dairy. The mean scores of "consumption of high fat red meat or high fat dairy milk more than once a week" were 2.32 in Muslims, 2.65 in Hindus and 2.85 in Christians in the decreasing order of consumption.

With respect to junk food intake, 73% Muslims, 68% Hindus and 85% Christians sometimes or never consumed junk foods, while 1/4 Muslims, 1/3 Hindus and almost 1/10 Christians consumed junk foods often, frequently or always. The mean scores of "eating junk, processed baked foods" were 3.92 in Muslims, 3.75 in Hindus and 4.08 in Christians indicating that Christians consumed less junk food compared to others and Hindus with least score consumed more junk foods.

Schimdt et al., 1994 [5] reported that a healthful eating lifestyle resulted in low HbA1c levels and was positively related to specific food habits, i.e., limiting the amount of high-sugar foods and portion sizes, eating only an occasional dessert, reducing high-fat foods, eating low-fat foods, eating regularly, planning meals, eating large amounts of vegetables, limiting specific carbohydrate. In contrast, it was negatively related to eating at buffets, fast-food and large-chain restaurants, choosing high-fat menu selections and eating high-fat sources of protein. Deviations in prescribed eating patterns, particularly breakfast skipping and snack additions and deletions, were also associated with poor metabolic control.

Physical activity and exercise
The responses obtained from the subjects in this domain are presented in table 2. Involving in "more than 30 minutes of physical activity at least 5 days in a week, including work related" was reported to be 'always' by 57% of Muslims 50% Hindus and 32% Christians and often by 5%, 17%, 13% subjects and 'frequently' among 3%, 5%, 13% subjects in the respective groups of Muslim, Hindu and Christians, while in the same respective order of religion groups 18%, 22%, 30% 'sometimes' and 18%, 7%, 12% 'never involved' in more than 30 minutes of physical activity, including work related. The mean scores of "engaging in more than 30 minutes of physical activity at least 5 days in a week, including work related" were 3.62 in Muslims, 3.7 in Hindus and 3.23 in Christians.

Around 1/2 of Christians and Hindus and 1/3 Muslims were involved some degree of 'participation in more than 20 minutes of leisure activities at least 5 days in a week, while 2/3 Muslims 1/2 Hindus and 1/2 Christian persons with diabetes rarely participated, indicating that diabetic persons in all religion groups need motivation and strict regime of physical and leisure time activity in order to manage diabetes. The mean scores of "involvement in more than 20 minutes of leisure activities at least 5 days in a week" were 2.32 in Muslims, 2.8 in Hindus and 3.07 in Christians in the increasing order of doing physical activity and Muslims and Hindus need to improve on leisure time activities.

The routine of "practicing Yoga/ Meditation in the morning/ evening" was observed to be 'never' among 80% Muslims, 47% Hindus and 38% Christians, however, 12%, 27%, 20% of subjects in the respective order of religion 'sometimes' practiced yoga/ meditation. While 5%, 15%, 28% of subjects 'often practiced' meditation/ yoga, among Muslims, Hindus and Christians respectively, less than 10% 'frequently' and

less than 5% 'always' practiced yoga/ meditation in all religion groups. The mean scores of "practicing Yoga/ Meditation in morning/ evening" were 1.33 in Muslims, 1.95 in Hindus and 2.22 in Christians in the increasing order of

practice. However, the practice of doing yoga/ meditation was not high among any religion probably due to lack of awareness of the benefits of yoga and meditation on controlling diabetes.

Table 2: Physical activity and exercise of persons with diabetes in religion groups.

S. No	Question	Never			Sometimes			Often			Frequently			Always			Mean score		
		M	H	C	M	H	C	M	H	C	M	H	C	M	H	C	M	H	C
1.	I do more than 30 minutes of physical activity at least 5 days in a week, including work-related	11 (18)	4 (7)	7 (12)	11 (18)	13 (22)	18 (30)	2 (3)	10 (17)	8 (13)	2 (3)	3 (5)	8 (13)	34 (57)	30 (50)	19 (32)	3.62 ± 1.7	3.7 ± 1.44	3.23 ± 1.47
2.	I do more than 20 min of leisure-time physical activity at least 5 days in a week	33 (55)	16 (27)	8 (13)	7 (12)	17 (28)	20 (33)	3 (5)	7 (12)	5 (8)	2 (3)	3 (5)	14 (23)	15 (25)	17 (28)	13 (22)	2.32 ± 1.7	2.8 ± 1.59	3.07 ± 1.41
S. No	Question	Not at all			A little			Moderate			Very much			Extreme amount					
3.	I practice meditation/ yoga in the morning or evening	48 (80)	28 (47)	23 (38)	7 (12)	16 (27)	12 (20)	3 (5)	9 (15)	17 (28)	1 (2)	5 (8)	5 (8)	1 (2)	2 (3)	3 (5)	1.33 ± 0.8	1.95 ± 1.13	2.22 ± 1.49

Note: Figures in parenthesis indicate percentages

Management of medical treatment
The diabetic participants were asked to report the kind of medical treatment they were undertaking and the responses are presented in table 3. The periodicity of "visiting the hospital regularly according to doctor's appointments for examination and treatment of diabetes" had shown that 32% Muslims, 33% Hindus and 25% of Christians 'always visited', while less than 10% of diabetic persons in all three groups 'never visited' the hospital or doctor. However, 20%, 30% and 50% of subjects 'sometimes visited' the hospital; 18%, 23%, 20% 'often visited' the hospital and 28%, 12% and 5% 'frequently visited' the hospital in the respective order of religion groups. The mean scores of "visiting the hospital regularly according to doctor's appointments for examination and treatment of diabetes" were 3.68 in Muslims, 3.45 in Hindus and 3.3 in Christians in the decreasing order of visit.
About 90% Muslims seemed to be more prompt in "taking medication as per prescribed dosage and timings" followed by 85% Christians and 75% Hindus with a punctuality of always or often or frequently, while 1/4 Hindus, 1/10 Muslims and Christians being irregular. The mean scores of "taking diabetes medication as per prescribed dosage and timings"

were 4.3 in Muslims, 3.9 in Hindus and 3.9 in Christians, indicating that Muslims were more punctual in taking diabetes medication, compared to Hindus and Christians.
Adherence to medication, especially insulin is a key contributor to diabetes treatment. Poor adherence results in worse glucose control and increased hospital admissions of patients due to diabetes complications (Cramer *et al.,* 2005) [6]. Factors like medication costs, regimen complexity, patient's emotional well-being, and patient's perceptions of medication side effects and medication-related intrusions on activities of daily living are associated with adherence to any diabetes medication (Rubin, 2005) [7].
The practice of "self blood sugar testing at home" was found to be very less among diabetic participants where, 47%, 38% and 62% reported 'never', 22%, 37%, 15% reported to have done self blood sugar test 'sometimes' while 17%, 18%, 8% of subjects reported to have 'often' done blood sugar test at home from Muslim, Hindu and Christian groups respectively. On a comparative basis, Christians were the least in doing blood sugar test at home followed by Hindus and then Muslims in the increasing order of 2.07 in Muslims, 2 in Hindus and 1.87 in Christians.

Table 3: Adherence to medical treatment among persons with diabetes

S.No	Question	Never n (%)			Sometimes n (%)			Often n (%)			Frequently n (%)			Always n (%)			Mean scores		
		M	H	C	M	H	C	M	H	C	M	H	C	M	H	C	M	H	C
1.	I visit the hospital regularly according to doctor's appointments for examination and treatment of diabetes	1 (2)	1 (2)	5 (8)	12 (20)	18 (30)	15 (25)	11 (18)	14 (23)	12 (20)	17 (28)	7 (12)	3 (5)	19 (32)	20 (33)	15 (25)	3.68 ± 1.17	3.45 ± 1.28	3.3 ± 1.32
2.	I take my diabetes medication, tablets / insulin as per prescribed dosage and timings	0	4 (7)	4 (7)	6 (10)	11 (18)	5 (8)	4 (7)	8 (13)	11 (18)	16 (27)	1 (2)	13 (22)	34 (57)	36 (60)	27 (45)	4.3 ± 0.98	3.9 ± 1.45	3.9 ± 1.26
3.	I do a self blood sugar test at home	28 (47)	23 (38)	37 (62)	13 (22)	22 (37)	9 (15)	10 (17)	11 (18)	5 (8)	5 (8)	0	3 (5)	4 (7)	4 (7)	6 (10)	2.07 ± 1.26	2 ± 1.09	1.87 ± 3.45
4.	I recognize symptoms of hypoglycaemia like tremor, pallor and headache	23 (38)	12 (20)	17 (28)	11 (18)	18 (30)	25 (42)	11 (18)	11 (18)	6 (10)	3 (5)	5 (8)	7 (12)	12 (20)	14 (23)	5 (8)	2.5 ± 1.53	2.85 ± 1.46	2.3 ± 1.24
5.	I carry medicines / insulin whenever I have go to trip	3 (5)	5 (8)	6 (10)	7 (12)	12 (20)	5 (8)	12 (20)	7 (12)	4 (7)	7 (12)	4 (7)	15 (25)	21 (35)	32 (53)	30 (50)	3.93 ± 1.29	3.77 ± 1.48	3.97 ± 1.35
6.	I carry Glucometer to test sugar levels, whenever I go to trip	52 (87)	32 (53)	46 (77)	3 (5)	15 (25)	8 (13)	3 (5)	6 (10)	1 (2)	2 (3)	3 (5)	5 (8)	0 (0)	4 (7)	0 (0)	1.25 ± 0.7	1.87 ± 1.2	1.42 ± 0.89

Note: Figures in parenthesis indicate percentages

The incidence of "recognition of symptoms of hypoglycaemia like tremor, pallor, headache" was 'never' among 38%, 20%, 28% ; 'sometimes' in 18%, 30%, 42% ; 'often recognise' in 18%, 18%, 10% ; 'frequently' in 5%, 8%, 12% while 20%, 23% and 8% were able to 'always recognise' symptoms of hypoglycaemia from Muslim, Hindu and Christian communities respectively. The mean scores of "recognition of

symptoms of hypoglycaemia like tremor, pallor, headache" were 2.5 in Muslims, 2.85 in Hindus and 2.3 in Christians indicating that Hindus were better able to recognise the symptoms of hypoglycemia followed by Muslims and then Christians
The practice of 'always' "carrying medicines/ insulin on any trip" was seen in majority of Hindus (53%), 50% of

Christians and 35% Muslims, while 2-10% of persons with diabetes from each religion 'never' carried medicines. However, 20% of Hindus, 20% of Muslims and 25% Christians carried the medicines in the respective order of 'sometimes', 'often' and 'frequently'. The mean scores on "carrying medicines/ insulin on any trip" were 3.93 in Muslims, 3.77 in Hindus and 3.97 in Christians.

The frequency of "carrying glucometer on trips" had shown that majority of Muslims, Hindus and Christians 'never carried' glucometer on trips in the order of 87%, 53% and 77% respectively. However, 5%, 25%, 13% of subjects 'sometimes'; 5%, 10%, 2% 'often'; 3%, 5%, 8% of subjects 'frequently' carried glucometer while on trips from Muslim, Hindu and Christian groups respectively. Only 7% of Hindus 'always' carried glucometer on trips to test their blood sugar levels. The mean scores of "carrying glucometer on trips" were 1.25 in Muslims, 1.87 in Hindus and 1.42 in Christians.

In general frequent monitoring of blood glucose and use of a glucometer at home were not in the regular practices of diabetic persons in all three religion groups

Diabetes Education
The responses obtained in this domain are presented in table 4. The incidence of "obtaining information on diabetes control from diabetes education programs" was 'never' in 82% of Muslims, 35% Hindus and 38% Christians, while 42% Hindus and 40% Christians and only 15% of Muslims 'sometimes' obtained information. Less than 10% of diabetic persons from each religion tried to obtain information on diabetes control either 'often' or 'frequently' or 'always'. The mean scores of "obtaining information on diabetes control from diabetes education programs" were 1.22 in Muslims, 2.08 in Hindus and 1.88 in Christians.

Table 4: Diabetes education seeking tendency in persons with diabetes

S.No	Question	Never n (%)			Sometimes n (%)			Often n (%)			Frequently n (%)			Always n (%)			Mean score		
		M	H	C	M	H	C	M	H	C	M	H	C	M	H	C	M	H	C
1.	I try to get information on diabetes control by attending various diabetes education programs	49 (82)	21 (35)	26 (38)	9 (15)	25 (42)	24 (40)	2 (3)	6 (10)	2 (3)	0	4 (7)	7 (12)	0	4 (7)	1 (2)	1.22 ± 0.49	2.08 ± 1.15	1.88 ± 1.04
2.	I keep browsing in order to find out new remedies for controlling diabetes	47 (78)	24 (40)	20 (33)	7 (12)	24 (40)	30 (50)	4 (7)	7 (12)	5 (8)	1 (2)	1 (2)	5 (8)	1 (2)	4 (7)	0	1.37 ± 0.82	1.95 ± 1.1	1.92 ± 0.87
3.	I keep myself updated on various measures to control diabetes by reading newspapers/ journals	47 (78)	24 (40)	22 (37)	4 (7)	19 (32)	23 (38)	3 (5)	10 (17)	4 (7)	2 (3)	4 (7)	7 (12)	4 (7)	3 (5)	4 (7)	1.53 ± 1.17	2.05 ± 1.14	2.13 ± 1.22

Note: Figures in parenthesis indicate percentages

Overall Hindus were more into obtaining information on diabetes control followed by Christians and Muslims had least diabetic education.

The tendency to "browse net in order to find out new remedies for diabetes control" was 'never' a practice among 78% Muslims, 40% Hindus and 33% Christians, however, 40% Hindus, 50% Christians and only 12% Muslims 'sometimes' browsed, while less than 12% diabetics from each religion browsed net 'often' or 'frequently' or 'always'. The mean scores of "browsing to find new remedies for diabetes control" were 1.37 in Muslims, 1.95 in Hindus and 1.92 in Christians. Overall the diabetes related information seeking habit from internet was poor in Muslims, slightly better among Hindus and Christians.

The tendency for "keeping updated on various measures to control diabetes by reading newspapers/ journals" had shown that 78% Muslims, 40% Hindus and 37% Christians had 'never' kept themselves updated, while, 7% Muslims, 32% Hindus and 38% Christians 'sometimes' updated themselves on various measures to control diabetes by reading newspapers/ journals. However 15% Muslims, 29% Hindus and 26% Christians kept themselves updated 'often' or 'frequently' or 'always' without much variation in number of subjects in the frequency distribution. The mean scores of "keeping themselves updated on various measures to control diabetes by reading newspapers/ journals" were 1.53 in Muslims, 2.05 in Hindus and 2.13 in Christians.

On the whole, it can be seen that almost 80% of the Muslims never tried to obtain information of diabetes control through any source. This may be because of low education, lack of access to the information sources and mostly physicians were only the primary source of advice for them. Nearly 40% each of Hindus and Christians however tried to obtain some information on diabetes control through various sources, although it was not much.

Shah *et al.,* 2009 [8] reported that 63% of T2DM patients did not know what DM was and majority were unaware of its complications. Awareness about diabetes complications and consequent improvement in dietary knowledge, attitude, and practices lead to better control of the disease (Sami *et al.*, 2017) [9].

Unhealthy eating habits and physical inactivity are the leading causes of diabetes. Failure to follow a strict diet plan and workout, along with prescribed medication are leading causes of complications among patients of T2DM.

Other techniques to manage diabetes
The diabetic subjects were asked to report if they used any other way to control/ manage their diabetes. In terms of diet, it was found that 30% of Muslims took Kalonji seeds powder early morning daily as they believed that eating Kalonji seeds is a cure to all diseases except death. Fifteen per cent Hindus reported that they had eaten tulsi leaf early morning daily with the belief that it may help control diabetes. Green tea consumption was also found among 30% of Hindus and 40% Christians with the belief that it will keep blood sugar levels at normal. Consumption of fenugreek seed powder early morning was also reported by 10% Muslims, 20% Hindus and 25% Christians.

The diabetic subjects also believed that diabetes could be cured spiritually and by religious offerings. Thirty percent Muslims reported to be chanting religious phrases from the Holy Quran with the belief that it may help control or cure diabetes. 10% of Christians also believed that only prayers can help them cope up with their illness and not any diet or lifestyle changes.

Scores of management practices of persons with diabetes
The scores of 'management practices' of persons with diabetes in different domains is given in table 5. The 'diet

related management practices' had 11 statements with a minimum to maximum score of 11 to 55 and among the females of the three religion groups, the total score ranged between 33.17 in Muslims, 34.23 in Hindus and 37.13 in Christians and in males from 34.97 in Muslims, 35.43 in Hindus and 38.7 in Christians indicating that males had an edge over females in diet related practices (Score being high).

Within each of the religious groups, males had better diet related practices than female counterparts but the difference between males and females within the religion and between the religion groups was not significant. Muslim females scored the lowest, while Christian males scored the highest. However no significant difference was found between males and females of Muslim, Hindu and Christian groups.

Table 5: Scores of management practices of persons with diabetes among various domains

Domain of MP	Muslims n=60		Hindus n=60		Christians n=60		F value	P value	CD value
	Females n=30	Males n=30	Females n=30	Males n=30	Females n=30	Males n=30			
1. Diet related practices	33.17± 5.88	34.97± 7.38	34.23± 7.51	35.43 ± 8.64	37.13 ± 8.65	38.7 ± 8.31	2	0.08NS	
2. Physical activity	6.63 ± 2.88^a	7.9 ± 3.23^b	8.23 ±2.51^b	8.67 ± 2.93^b	8.13 ± 2.57^b	8.9 ± 2.44^b	2.47	0.03	1.42
3. Medical Treatment	18.67± 3.67	16.43± 4.47	16.93 ± 4.13	18.73± 4.78	16.83 ± 4.64	16.67 ± 4.76	1.65	0.15NS	
4.Attainment of diabetes education	3.4 ± 1.07^a	4.83 ± 2.67^b	6.3 ±3.13^c	5.87 ± 2.75^{bc}	5.97 ± 2.63^{bc}	5.9 ± 2.97^{bc}	5.14	0.0002	1.34

Note: Means with the same superscripts in each row have no significant difference
Domains with no super script in a row have no significant difference
NS- Not significant

The second domain of 'physical activity' had 3 statements with a minimum to maximum score of 3 to 15 and among the females of the three religion groups, the total score ranged between 6.63 to 8.23 and in males between 7.9 to 8.9 indicating that males had higher physical activity compared to females. Within each of the same religion groups, females had a significantly lower physical activity (p<0.05) than male counterparts; females of Muslim group had significantly lowest score (p<0.05) compared to females and males of other religion groups. No significant difference was found between physical activity of males and females of Hindus, Christians and Muslim males.

The third domain of 'Medical treatment' had 6 statements with a minimum to maximum score of 6 to 40 and among the females of the three religion groups, the total score ranged between 16.83 to 18.67 in females and between 16.43 to 18.73 in males. Females had better frequency of medical treatment than males among Muslims, while Hindu females had low frequency of medical treatment compared to males and among Christians both female and male diabetic persons had similar frequent approaches for medical treatment. However no significant difference was found between males and females within the religion and between the three groups of Muslims, Hindus and Christians.

The fourth domain of 'Diabetes education' had 3 statements with a minimum to maximum score of 3 to 15 and among the females of the three religion groups, the total score ranged between 3.4 to 6.3 in females and between 4.83 to 5.9 in males. Females of Muslim group had significantly lowest (p<0.05) score (3.4) compared to males of Muslim and males and females of Hindus and Christians, while females of Hindu group had significantly higher (p<0.05) score (6.3) compared to males of Muslim group. No significant difference was found in the attainment of education among males of all three religions and between females.

Overall, the scores of management practices in the three religion groups indicated that males had better management practices than females. Among all religious groups, Hindu females scored the lowest and Hindu males scored the highest. However, the difference in the scores of total management practices between Muslims, Hindus and Christians and between males and females was not significant.

Conclusion
Diabetic mellitus being a chronic non-communicable disease, carries with it long term complications and significantly impacts upon the quality of life of the affected patients and calls for proper management through adequate measures. Good quality of life can be achieved if it is managed properly and include self care, self monitoring of blood glucose levels, indulging in physical activity, adhering to medical treatment and dietary restrictions and gaining knowledge on measures to control diabetes and implementing it. Hence diabetes management is very essential to prevent further complications and ensure better Quality of life and healthy well being in the long run.

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