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Original Research Article

Patient Profile of Diabetic Individuals, Attending Primary Care Diabetic Clinic, In Karimnagar, Telangana

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ABSTRACT

Background: *To determine the clinical profile of diabetic patients its significance for diabetic management. Karimnagar is the fourth largest urban area in the newly formed state of Telangana, and its diabetic burden is presumably on the higher side.*

Material and Methods: *Diabetic patients in the study were analysed for various components like duration of diabetes prevalence of complications pattern of drug use and associated non diabetic co-morbidities over the study period.*

Results: *Musculoskeletal symptom, neuropathy, fatigue predominated the health need of diabetics in the study. New diabetics were also detected highlighting the need of frequent screening camps. Thyroid disorders were also found to be more associated in diabetics along with hypertension and dyslipidemia.*

Conclusion: *The Diabetic profile in the study area is characterised by high CV risk, low penetration of statins usage, high association of hypertension, suboptimal sugar control and very high level of dyslipidemia, implying of a lack of awareness and a need for renewed strategy.*

Introduction

Burden of the Disease

The World Health Organization estimates, for the year 2000 suggests India had 32 million diabetic subjects, with this number further set to rise to 80millionby the year 2030 [(1)]. The International Diabetes Federation (IDF) reports for the year 2006 suggests the number of diabetic subjects to an alarming 41 million in India, with the number set to rise to 70 million by the year 2025[(2)]. The eleven million rise in the number of diabetics in the span of just six years suggests to certain inherent predisposition to Indians which has been suggested by certain studies which studied migrant Indian and found a higher propensity of Insulin Resistance, and CAD as compared to other ethnic groups[(3-5)]. Such observation has led to conceptual terminology; "Asian Indian Phenotype" referring to the peculiar clinicalandbiochemical abnormalities observed in Asian Indians; like, visceral fat excess, low HDLc raised TGc, increased small dense LDLc, with its resultant premature CAD, that in turn being regarded as one of the major factors contributing to increased prevalence of type 2 diabetes in Asian Indians [(6,7)]. The point to be noted is the fact that Indians have low prevalence of Obesity as defined by the conventional BMI index, despite

the higher incidence of insulin resistance and diabetes--which have led many authors to define Indian Obese with a much less BMI index of 27 or further low. Asian Indians on the contrary tend to have a greater central obesity depicted by greater waist circumference and waist to hip ratios [8]. Certain studies have suggested, Asian Indians have more visceral fat for any given BMI [9] and they tend to have greater insulin resistance in comparison to other groups for any given body weight [10]. Such estimates and casual suggestions are fearsome considering the fact that Indian health needs are already less met, be it infectious disease, malnutrition related or other chronic disease, and the health care provider needs to be particularly thorough regarding the pertinent problems in the setting of increased diabetes prevalence. This epidemiologic challenge in middle income countries like India has been described as a case of 'double burden', as noted in the figure used in various literature.

Prevalence of Diabetes Indian Studies

Although exact prevalence studies are hard to get by the available studies suggest the prevalence could well be above 15% and no more the luxurious 2-5% reported a few decades ago [11,12,13].

The Era of Fewer than 5 Percent Prevalence

The prevalence studies done in India have been many ranging from hospital based survey to population based surveys, studying the landmark studies like ICMR 1972 through 1975 revealed the prevalence of Diabetes being 3% in urban areas and 1.3% in rural areas [11]. Of note is the fact that this study had used a level of 170mg/dl casual capillary blood glucose as defining of Diabetes, which considering the modern circumstance of >200mg/dl as a criterion being a bit harsh even then the prevalence was a luxurious low. The early wind of a "Diabetic Storm" was detected in Tenali in 1984 a small town in Andhra Pradesh where a study conducted found a prevalence of 4.7% then quiet unknown [14].

A further study in a small Karnataka town Kudremukh, revealed a prevalence of 5% [15]. A similar study from Daryagang a locality in the affluent Delhi suggested a prevalence of 3.1% [16]. Another study from a rural village in Andhra Pradesh Eluru suggested a prevalence of 1.5% [17]. As is visible the passing decade almost saw a doubling of prevalence of Diabetes. Further signs of the "Diabetes Storm" intensifying were suggested in the same Eluru Study which suggested the prevalence of Diabetics among individuals aged in excess of 40 to 6.1% [17].

Rapid rise Phase (1990 onwards)

In the late 1990s many studies suggested the gradual rise in prevalence to 8-11% [18, 19]. A kerela study for the first time suggested a alarming prevalence of 16.3% in 1999 [20]. Studies from Mumbai and Delhi using ADA criteria for the Diagnosis contrasting the earlier studies using the Casual blood sugar as a means of Diagnosing suggested the prevalence to 7.5% in Mumbai and 11.2% in a Delhi slum [21, 22]. The Chennai Urban Population Study (CUPS) suggested a prevalence of 12% in population aged above 20 years [23].

The National Urban Diabetes Survey (NUDS) presented a even more overt warning with prevalence ranging from 16.6% in Hyderabad, followed by Chennai (13.5%), Bengaluru (12.4%), Kolkatta (11.7%), New Delhi (11.6%) and Mumbai (9.3%) [24]. Of note, this study used WHO criterion in individuals over 20 years including all socio-economic groups over 11,000 individuals were tested the Hyderabad region were the present study is being done (Karimngar) hence holds importance.

Few other studies suggesting a double digit prevalence are cited here; of note, The Chennai Urban Rural Epidemiology Study (CURES) showed a prevalence of 15.5% in Chennai in 2006(25). The Amrita Diabetes and Endocrine Population Survey (ADEPS), a community based cross- sectional survey done in urban areas of Ernakulam district in Kerala has revealed a very

high prevalence of 19.5% (26). Of concern is this alarming number nearing 20% to put things into perspective many Rhuematological disorders are having a prevalence of around 2.5% yet the burden of disease being so big, if the number of diabetics reach 20% and above the pressure on the Health sector can just be imagined, and as diabetics have special needs the health care providers can be found lacking.

Another study showed a sanguine prevalence which is worth noting, The Prevalence of Diabetes in India Study (PODIS) done in 108 centers of India reported a prevalence of 5.9% in the urban and 2.7% in rural areas according to theWHO criteria [(27)]. According to the ADA criteria, the prevalence rates were 4.6% and 1.9% in urban and rural areas respectively [(28)]. But other areas don't share such a rosy view and the prevalence of in excess of 10 is found from even from the rural areas of Andhra Pradesh Chow et al [(29)].

Another concerning factor is the fact that diabetes in India involving young individuals is on the rise, for example, the Daryaganj study cited above noted no individuals with diabetes in individuals less than 30 years, on the other hand, the NUDS study cited above revealed the prevalence in individuals less than 30 years age being 5.4% [(16,24)].

To add insult to the injury, prediabetic states-IGT and IFG are at high risk of conversion to Diabetes, not just that, they too have a high CV Risk and its resultant disease burden. The estimation of the Prediabetic burden have been variously between 10-30%, 29.8% reported in Hyderabad in the NUDS study, similarly high figures were also noted in Chennai 16.8%, Bengaluru 14.9%, Kolkatta 10%, Mumbai 10.8% and New Delhi 8.6%. Of note is another peculiarity in Indian patients; of the IGT diagnosed individuals y the WHO criteria, only 51% would be diagnosed as having IFG [(24,26)].

Complications Burden

Diabetes Complication Various Study based estimates of Prevalence are illustrated in the following table and by all estimates various complications of diabetes are high and they add to the disease burden and morbidity to the patients certain peculiar features of complications are worth mentioning and that being that musculoskeletal manifestations and neuropathy are the predominant morbidities in Indian set up which some studies found mention and our study also highlights on such observation in the below mentioned discussion sections. The summary and highlights are mentioned in the Table.

Type of Complication	Author	Year of study	Type of study	Place of Study	Prevalence observed`
Retinopathy					
	Rama et al (30)	1996	Clinic	Chennai	34.1
	Ramachandran et al(31)	1999	Clinic	Chennai	23.7
	Rama et al (32)	2005	Population	Chennai	17.6
	Dandona et al (33)	1999	Population	Hyderabad	22.6
Nephropathy					
	John et al (34)	1991	Clinic	Vellore	Microalb-19.7, Nephropathy-8.9
	Gupta et al (35)	1991	Clinic	New Delhi	Microalb-26.6, Nephropathy-23.0
	Mohan et al (36)	2000	Clinic	Chennai	Overt Protenuria with

					Retinopathy-6.9
	Unnikrishnan et al (37)	2006	Population	Chennai	Overt Nephropathy with DR-2.2, Micralb-26.9
Neuropathy					
	Chanda et al (38)	2006	Clinic	Bangalore	64.1
	Ramachandran et al (31)	1999	Clinic	Chennai	27.5
	Pradeepa et al (39)	2008	Population	Chennai	26.1
CAD					
	Chadda et al (40)	1990	Population	New Delhi	9.7
	Mohan et al (41)	1995	Clinic	Chennai	17.8
	Ramachandran et al (31)	1999	Clinic	Chennai	11.4
	Mohan et al (42)	2001	Population	Chennai	21.4

Material and Methods

Cross-sectional evaluations of various individual attending Usha Khandal Hospital with diabetes were evaluated in details in karimnagar. A total of 115 patients were studied over a period of 4 months of march to July 2012 and analysed for various variables outlined below.

This town of karimnagar were the study was done, has the following population details; 35 million population distributed over urban and rural areas with almost a 28 million population – Over 60% -- distributed in the rural areas, a male and female distribution almost equal [43]. The population had a decadal growth of around 15% from 1991 census to 2001 census, although recent census data was not available the expected population now would be around 45-50 million considering the same growth rate of 15%. This district has a huge rural pockets distributed over 56 mandals, the health care over which pockets leaves a lot to be desired. Special needs for this diabetic population if any hence holds importance, another important factor being a lack of female literacy which is lower than the national literacy rate, and a diabetic morbidity can have telling impact in such a situation.

The study area is a reference centre for a large proportion of Mandal and its adjoining rural pockets. This District Headquarter town Karimnagar has few peculiarities of being the only district Headquarters in the entire undivided AP as having 2 medical colleges which reflects the reliance of the entire rural population heavily on Karimnagar for their health needs.

Variable Details

The study had the following nineteen variables, well defined prior to the study: 1). Duration of Diabetes; In this study Denovo Diabetes were defined as patients who presented with Diabetic Range sugars as per the ADA criteria [44]), and had no awareness of their diabetic status, other grouping were done viz.,<5 years since diagnosis, 5-10 years, 10-15 years, 15-20 years, 20-30 years and greater than 30years. 2). Gender, 3). Age, it was subdivided into the following groups: i) <20, ii) 20-30, iii) 30-40, iv) 40-50, v) 50-60, vi) 60-70, vii) >70. 4). Type of Diabetes: i) Type-1-DM, ii) Type-2-DM, iii) LADA, iv) GDM, v) MODY vi) Pancreatic Diabetes. 5). Weight, i) optimum, ii) overweight, iii) obese, iv) under weight. 6). Thyroid status: was evaluated by ELISA reader using PAN Bio TSH ELISA kit and the patient

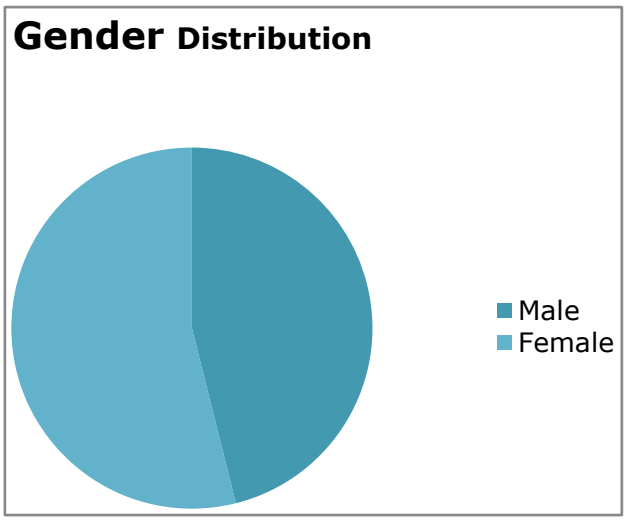
groups were divided into the following groups: i) not known, ii) SCH, iii) hypothyroid, iv) hyperthyroid. 7). Microalbuminuria: absent or present. 8). CKD defined as per Professional Practice Committee for the 2013 Clinical Practice Recommendations Diabetes Care January 2013 [50]. And was divided into 2 groups presence of overt nephropathy and absent of it. 9). CVA history was noted by its absence and presence. 10). Microalbuminuria patient were categorised into two groups by its absence and presence, those presence were rechecked at 12 weeks and those having persistence at 12 weeks were grouped as presence of microalbuminuria. Microalbuminuria was tested by Immunochromatographic Card Test of Immunospark s.r.l, Rome Italy, as per their user manual. 11). Hypertension was grouped into two groups as present or absent, the group defined as present were those if they were already on hypertension treatment or had persistent hypertensive range BP checked over 3 weeks was >130/80mmHg according to Joint National Committee-7 (JNC-VII) criteria [51]. 12). Dyslipidemia, were divided into two groups based on the result of Raised TG and Low HDL as present or absent, the test of TG and HDL were done by Nicholas Kit on ERBA Chem 5 as per the user manual recommendations. 13). Sugars were tested on semi automatic biochemistry analyser ERBA Chem 5 with required biochemical reagent as per the user manual and were divided into the following groups: i) optimum <180, ii) suboptimal 180-250, iii) uncontrolled 250-300, iv) severe hyperglycaemia 300-400 and higher. 14). No of Drug used, a subgroup was created to see how many drugs were needed and used in individual patients such that it can be analysed vis-à-vis the duration of diabetes and the level of sugar control they were divided as follows: i) one OHA use, ii), two OHA use, iii), three OHA use, iv) four OHA used, v), use of insulin's only, vi) use of insulin's and OHAs. 15). Neuropathic Symptoms were divided into three groups: i), absent, ii), mild symptoms, iii) severe symptoms. Such inclusions was done for the ease of differentiation and to highlight of the patient needs in the rural area where neuropathic symptoms and aches and pain along with fever is the prime reason for visiting a hospital rather than sugar control and routine follow up. 16). Musculoskeletal symptoms were studied by their subdivision into several groups: i) no pain ii) periarthritis or frozen shoulder iii) polyarthralgia nonspecific iv) rheumatoid arthritis v) degenerative joint disease vi) polymyalgia rheumatica symptoms. 17). Weakness presence or absence, as many patients had this need to visit the doctor in at this place, it was further studied if it was associated with any particular association as level of sugar control, number of drug used, duration of diabetes. 18). Statin use as present and absent was kept as one variable as it has been noted that level of statin use is suboptimal in rural areas and the associated weakness symptom and neuropathic and musculoskeletal symptoms make statin use compliance a issue in rural setting. 19). Detail history was taken as for the presence or absence of CAD and it was divided into two groups as presence or absent.

Observation Method and Analysis

All the nineteen variables were analyzed by SPSS 17 software; the qualitative variables were studied by frequencies and percentage, histograms. Quantitative data by mean and standard deviation, certain hypothesis were tested by chi-square test and correction by likelihood Ratio when needed and linear by linear association, like thyroid status and diabetes, neuropathic symptoms and duration of diabetes, hypertension state and likelihood of microalbuminuria and so on. Bivariable analysis was done by Pearson correlation coefficient when necessary to check association between variables, like musculoskeletal symptoms and duration of diabetes, age, gender etc.

Observation Proper

The following observation was made vide individual variables which are shown herewith.

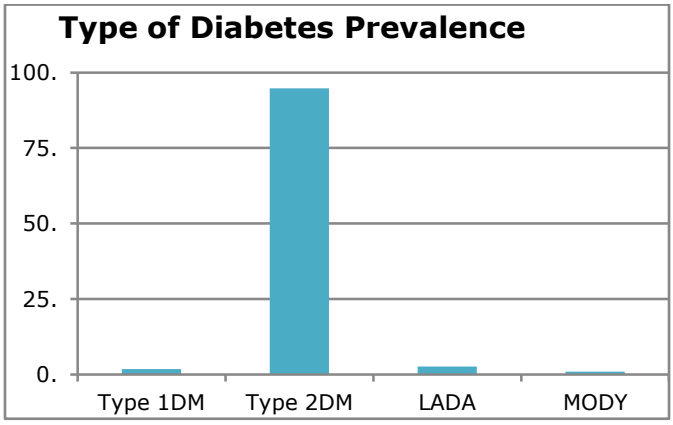


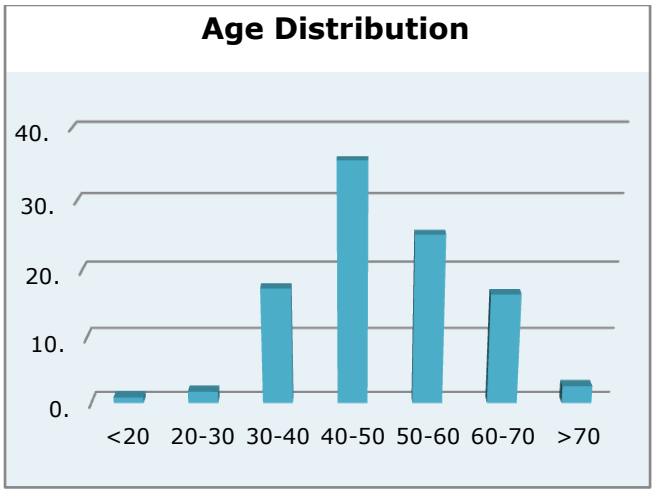
Age

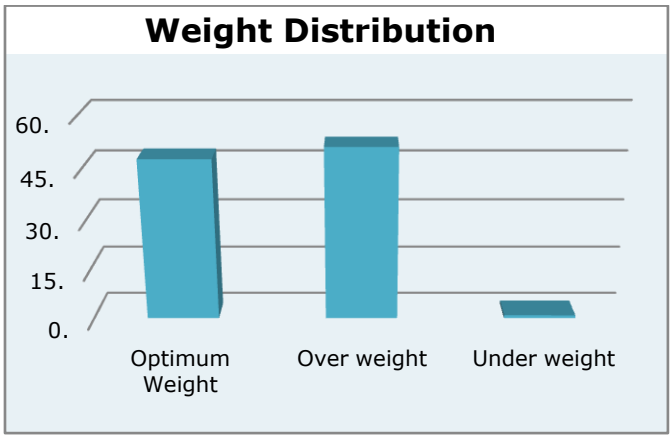
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<20	1	.9	.9	.9
	20-30	2	1.7	1.7	2.6
	30-40	20	17.4	17.4	20.0
	40-50	41	35.7	35.7	55.7
	50-60	29	25.2	25.2	80.9
	60-70	19	16.5	16.5	97.4
	>70	3	2.6	2.6	100.0
	Total	115	100.0	100.0	

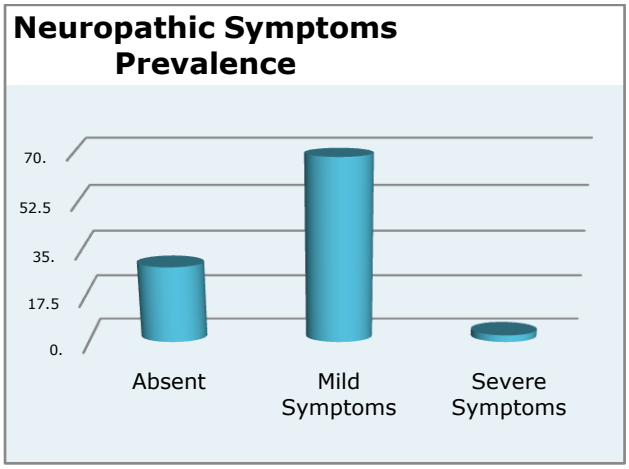
Gender

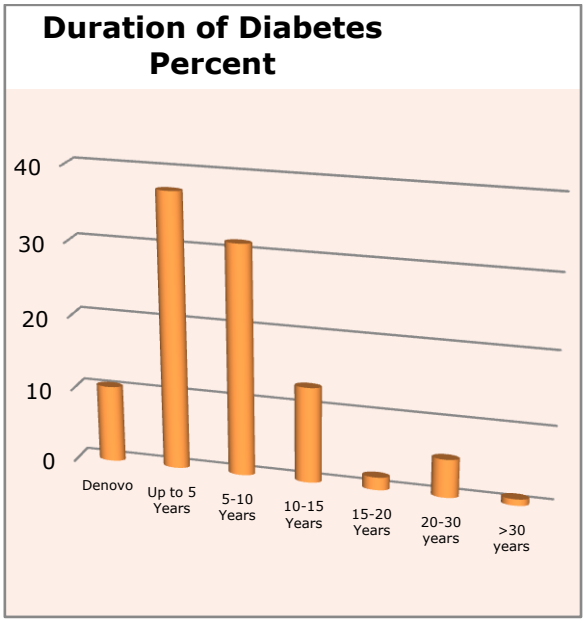
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	53	46.1	46.1	46.1
	Female	62	53.9	53.9	100.0
	Total	115	100.0	100.0	

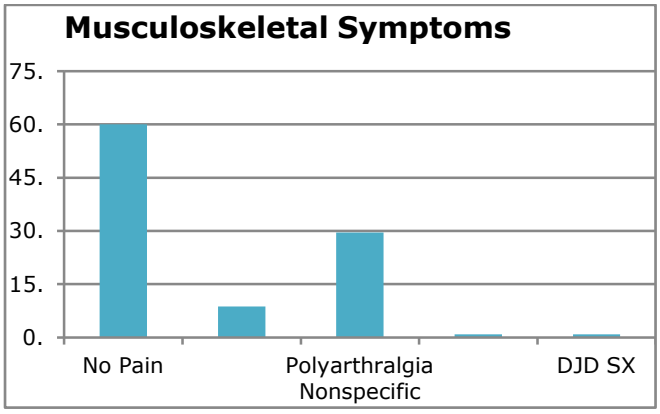






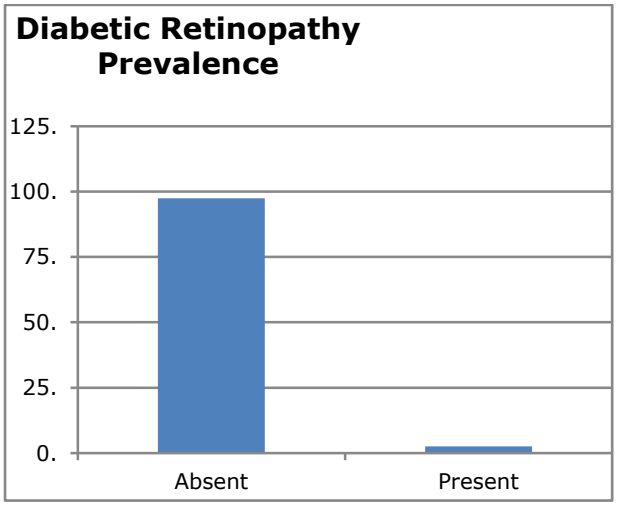


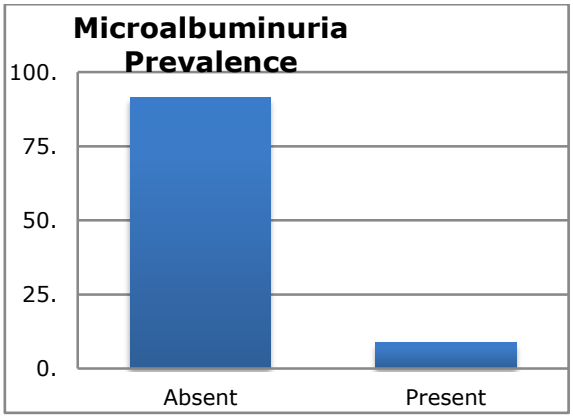


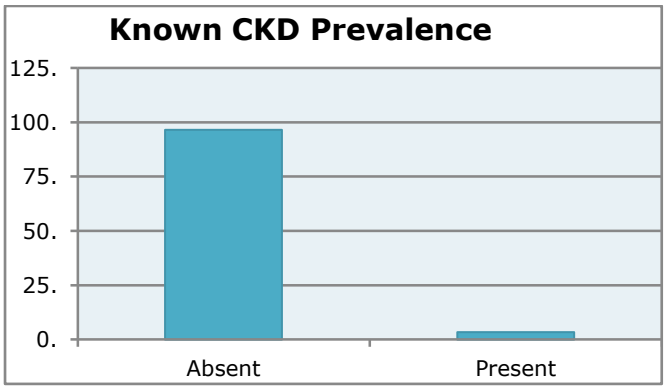


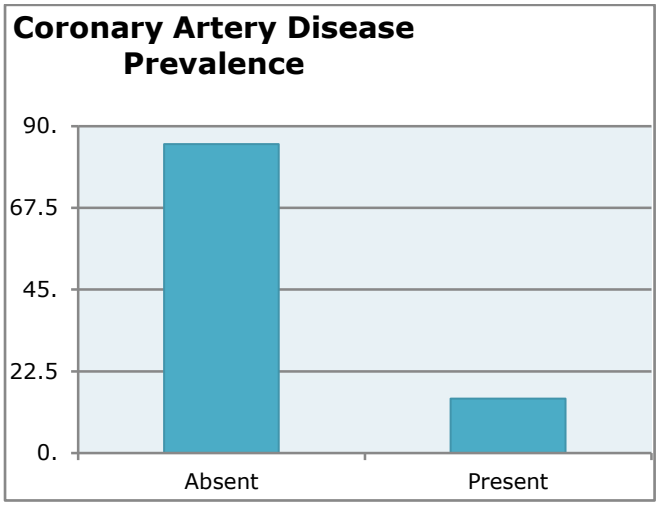
Duration of Diabetes

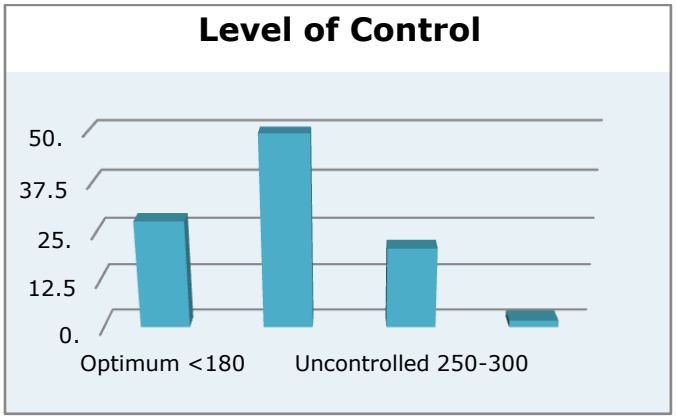
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Denovo	12	10.4	10.4	10.4
	Up to 5 Years	43	37.4	37.4	47.8
	5-10 Years	36	31.3	31.3	79.1
	10-15 Years	15	13.0	13.0	92.2
	15-20 Years	2	1.7	1.7	93.9
	20-30 years	6	5.2	5.2	99.1
	>30 years	1	.9	.9	100.0
	Total	115	100.0	100.0	

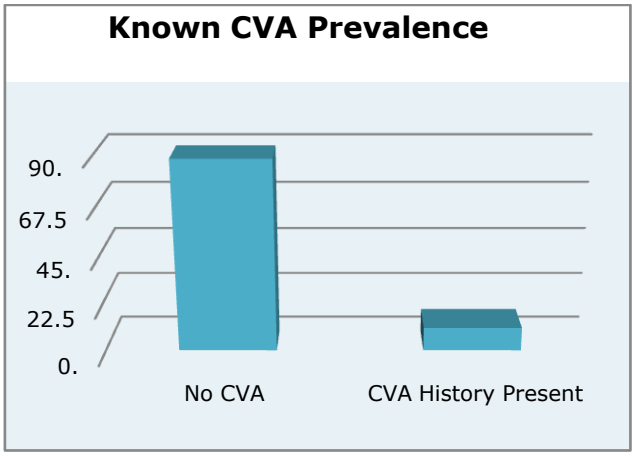


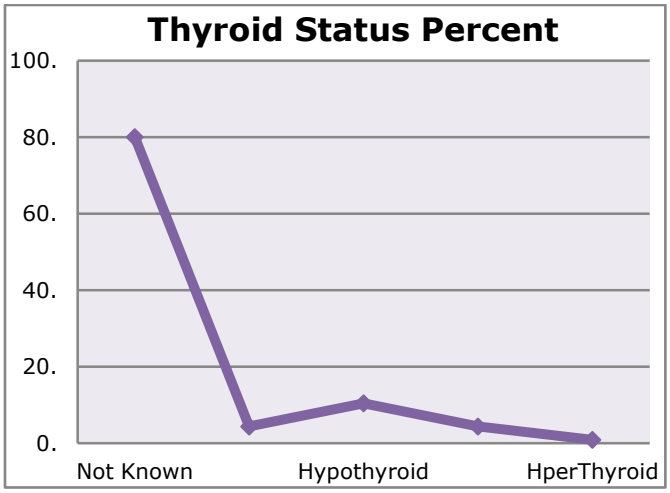


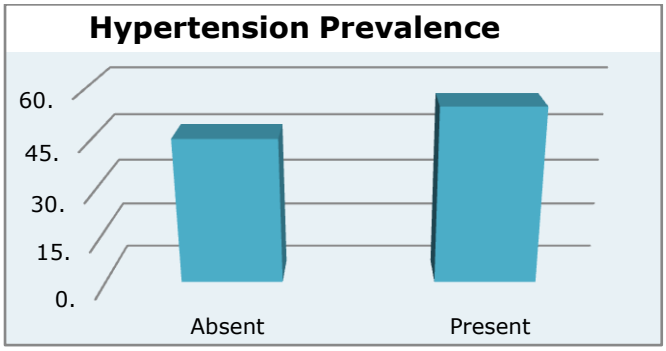


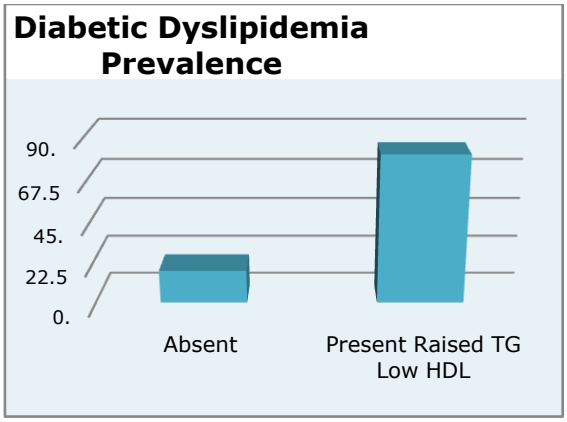








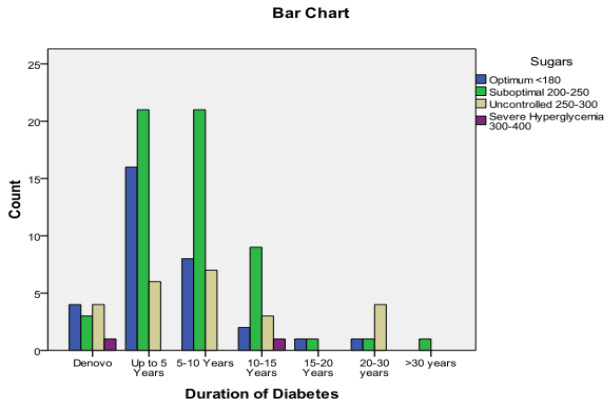




Discussion

The following observations were made in ours study, some of which were at par with other studies, but some other features in our study were less commonly observed in reported literature. Our observation of patient had a male female ratio of less than one, suggesting of a possibility of a female preponderance, although such an observation is not seen for the first time and in reported literature such a state is reported, albeit less often, [52, 53]. Other population based studies didn't find any difference in the gender ratio [55]. Variable age observation revealed mean age of the disease being 44.3 years with a standard deviation 1.14, another cause of concern is the fact that the prevalence in individuals aged 30-40 years is almost equal to that observed in the age bracket of 50-60, hence we are observing a diabetic burden in a younger and older patient alike and that is a challenge the health sector is facing now, also the fact is that most of the young individuals are

unaware regarding their diabetic status and in turn present to the health care provider when consumed by a complication usually a CAD event. Our observation for the Denovo diabetics (those diagnosed first time in a hospital setting) is quiet alarming and revealing at the same time, the denovo diabetics in our study was over 10% and to compound the woes further most of these individual had very high level of sugars usually in excess of 300 in over 70% of such individuals, this state can be attributed to the lack of awareness of the disease and unmet health needs.



Although the data pertaining to denovo diabetes and suboptimal control is not statistically significant as similar lack of control in most of the other groups, yet the significance of such an observation remains. The mean level of sugar control throughout groups was found to be around 240 mg/dl, which leaves a lot to be desired, and only around 28% individual had an optimum control of sugars, although slight better control was seen in females but it was not statistically significant. Various studies have addressed this issue of lack of optimal sugars in diabetic patients and their level of optimal sugars remained from 34 to 38 percent, few other studies have found the level of control to be around 31%. A Swedish survey found that 34 percent of Type 2 diabetics had good glycemic control [(56)]. A study by F. Al-Maskari, et al. found that 38 percent of Type 2 DM subjects had good glycemic control [(57)] and study by J. Al-Kaabi, et al., reported 31 percent of subjects had good glycemic control [(58)]. Further diabetic dyslipidemia was particularly common in our study in excess of 81 percent; other authors have found similar associations in their study Parikh et al [(59)]. Another unique aspect of our diabetic data was the fact that the number of OHAs used and its relation with the various other variables viz; duration of diabetes, age, and level of control was done using Bivariable analysis was done by Pearson correlation coefficient, duration of diabetes was found to be significant P<0.05.

Correlations

		Gender	Number of Drugs	Age	Duration of Diabetes	Sugars
Gender	Pearson Correlation	1	.029	-.022	.028	-.043
	Sig. (2-tailed)		.762	.817	.764	.647
	N	115	115	115	115	115

**. Correlation is significant at the 0.01 level (2-tailed).

Although for the ease of examination the data were gleaned by the presence or absence of diabetic dyslipidemia only, the high prevalence seen in excess of 85 percent dyslipidemia in general speaks of a very high CV risk, which is at par with other studies [(60-65)]. Hypertension was found to be associated in over half of the patients with diabetes, we also tested the hypothesis that duration of diabetes is strongly associated with the increased association with hypertension, which

was found to be statistically significant; this finding is a highlight of this study, which has not been reported in Indian literature, the biggest study the SITE study which was a multi centered study involving in excess of 20,000 individuals evaluated the twin disease had found similar association of hypertension around 46 percent [60]. Statin use in our study was found to be around 28 percent, similar use is seen in other studies in India around 26 percent [62]. Coronary artery disease (CAD), in our studies was found in around 14 percent, which is a bit lower than the reported in available literature, various Indian studies have shown that around 20 percent of CAD individuals are diabetic and similarly around 20 percent of diabetics suffer from CAD [60]. Our study had a percentage of stroke (CVA) of around 1 percent, which is at par with other population studies in India. The NPCDCS study estimated overall prevalence of diabetes, hypertension, Ischemic Heart Diseases (IHD) and Stroke is 62.47, 159.46, 37.00 and 1.54 respectively per 1000 population [62]. Weight analysis was a particularly weak point of our study as the individual were not defined as having over weight and obese based on the IDF modified ATP III criteria [66], hence no inference is made as to the high prevalence of normal weight seen in our study. However, the presence of lean type 2 diabetics described in literature were observed in our study in around 1 percent, and c-peptide was done to differentiate them from LADA, which for the purpose of our study, was defined as an entity with lack of family history, lean or normal weight, lack of sugar control with OHA within 6 months of therapy, and lack of ketosis. Most of our Diabetics were type 2 diabetics over 90 percent, few individuals were type 1, and LADA phenotype was seen in our study to be more common than lean type 2, these findings were at par with other reported studies in India [76, 77]. Although, antibodies were not used in our study due to lack of resource in rural area, yet, the differentiation via C-peptide is a practice at par with other reported literature [77]. Certain Type-1 diabetics can be very difficult to classify initially into one of the above categories and frequent Ketosis and absolutely no control with OHAs helps to put them into late onset Type-1 Diabetes subsequently, one such patient we had in the study, another interesting fact noted was a young boy who was initially diagnosed with high sugars and fever, was subsequently put on Insulins, surprisingly he took OHAs elsewhere and his sugars were found to be control, such a patient was considered as MODY and is up for follow up to classify him properly subsequently, appropriate classification of diabetes can sometimes be a challenge as has been elucidated in practice management supplement ADA [44]. Lean Diabetics were those diabetics who had other features of diabetes but were of BMI of around 18, and could maintain their sugars on OHAs as other T2DM individuals, Pancreatic Diabetes and GDM as an entity was made but the enrollment of the patient in the study was not done. Microalbuminuria prevalence in our study was found in around 9 percent of individuals which is at par with other reported studies, although the prevalence of known CKD a variable which was defined in our studies as individuals already a proven case and under nephrology treatment, and hence a lower prevalence of around 2.5 percent can be understood in our study, with eGFR studies at par prevalence would have been seen [68-71]. Microalbuminuria was found to be statistically significantly associated with hypertension, P value <0.036, duration of diabetes and level of sugar control were not found to be statistically significant in our study. Neuropathic symptoms, was observed in our study well over 65 percent of individuals, although our study relied heavily on patient reported symptoms as inclusion criteria, and not objective method to define it by VPS, still the need of the diabetic patients viz; aches & pain, numbness, tingling shows the unmet need for diabetic patients from rural pockets, such an increased association might be due to associated nutritional disorders and is also be seen in the other general population from rural places [38,39,31]. Musculoskeletal symptoms:

Periarthritis and non specific aches and pains were commonly seen in our study, available literature suggests that Adhesive Capsulitis (AC) or Frozen Shoulder (FS) is commonly seen in around 20 percent of diabetes subjects and is associated with duration of diabetes and age [71,72], bivariate analysis of our data in relation to musculoskeletal symptoms in general suggested gender and age to be statistically significant, as is found in other reported studies. .

Correlations

		Musculoskeletal Symptoms	Gender	Age	Type of Diabetes
Musculoskeletal Symptoms	Pearson Correlation	1	.201*	.227*	-.076
	Sig. (2-tailed)		.031	.015	.417
	N	115	115	115	115

*. Correlation is significant at the 0.05 level (2-tailed).

The pain symptoms in particular are a cause of concern for diabetic therapy compliance and establishing faith for the health care provider in the patients. Weakness is also a particular problem in field settings, and Bivariable analysis done by Pearson correlation coefficient found that weakness was only statistically significant in associated neuropathic symptoms along with increased age (P value <0.034 and <0.006 respectively), other variables viz duration of diabetes age, level of sugar control, gender, statin usage, number of oral hypoglycemic used were not found to be statistically significant.. Fatigue is a common and distressing complaint among people with diabetes, literature about diabetes-related fatigue is minimal, among many reasons is the potential problem of standardizing the definition of fatigue across studies, and some objective diagnostic criteria. Additionally, very rarely diabetes randomized clinical trials have included measurement of patient-reported outcomes, such as symptoms or health-related quality of life in their study designs, one study did provide some meaningful finding, that symptom-focused education improved self-management practices, Hb_{A1c} levels, quality of life, and symptom distress [74,75]. Thyroid status in diabetes was studied and was found to be statistically significant with respect to age and duration of diabetes, P value <0.036 and 0.04 respectively.

Conclusion

In conclusion, diabetes study in every area is a necessity to chart out the action plan for that territory, although this was a cross-sectional study with its associated limitations, certain generalizations hold true. Classification of diabetes can be a challenge and more so in a resource constraint environment, rural areas have a large need for musculoskeletal symptom which needs to be properly studied, fatigue (weakness) as a symptom complex during the presentation and on continuous management follow up is a challenge and more studies are needed to address this issue. The Diabetic profile in rural areas is very high CV risk, low penetration of statins, high association of hypertension, suboptimal sugar control and very high level of dyslipidemia speaks of a lack of awareness and a need for renewed strategy. We hope this study creates awareness regarding the special needs of diabetics and further reinforcement to strive hard for better management of diabetes to improve the complication burden.

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