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A Clinical Study on Standard of Diabetic Care Practiced In Rural Population of Karnataka andIts Impact on Glycemic Control and Occurrence of Microvascular Complications

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Abstract:*Stark difference in allocation of health resources between urban and rural areas result in poor diabetic screening and preventive services. Given the disease is now highly visible across all sections of society in India, there is a need more than ever for urgent research at regional and national level to assess epidemiology in Indian rural population. Our study was conducted as a hospital based cross sectional study between November 2016 and November 2018, wherein all diagnosed &confirmed diabetic patients who came to A J hospital from rural areas of Karnataka were included. In our study conducted on 200 diabetic patients in A. J. Hospital, Mangalore. In our study we concluded that diabetes knowledge unsurprisingly affected every parameter including fasting blood glucose, serum creatinine, presence of retinopathy and neuropathy showing a trend of poor diabetes knowledge associated with worsening of above mentioned parameters, but significant association between diabetes knowledge and glycated hemoglobin couldn't be established*

Diabetes knowledge in rural population is still very poor and needs a lot of proactive involvement from health care professionals, government agencies and diabetes patients as well to face this modern

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I. Introduction

Diabetes is a major health care problem in India. All involved with diabetes care agree that patients play a major role in the successful management of diabetes. To be able to provide comprehensive care including appropriate education and advice it is essential to understand perceptions, attitudes and practices amongst patients with diabetes. We carried out the study amongst persons with diabetes from rural communities with the objective of understanding their perceptions, and practices in relation to their disease and its management. Based on this pilot study, a more extensive study involving rural communities as whole could reveal more reliable trends about diabetes epidemiology in rural India.

II. Material And Methods

This hospital based cross sectional study was carried out on patients of Department of general Medicine at A J Hospital& research centre , Mangalore, , Karnataka from November 2016 to November 2018. A total 200 adult subjects (both male and females) of aged ≥ 18, years were for in this study.

Source of Data: Hospital based study.

Method of collection of data: All diagnosed &confirmed diabetic patients who come to A J hospital from rural areas of Karnataka

Study design: Cross sectional study

Study duration: 2 years **,** November 2016 – November 2018

Sample size: 200

Subjects & selection method: The study population was drawn from diabetic patients who presented to A J Hospital general medicine OPD or admitted in the ward during the period between november 2016 and November 2018.

Inclusion criteria:

1. All diagnosed & confirmed diabetic patients who come to A J hospital from rural areas of Karnataka

Exclusion criteria:

1. Patients from urban areas
2. Patients who had a significant period of stay in urban areas
3. Patients who do not consent

Procedure methodology

After obtaining informed consent , each patient was given a questionnaire to assess diabetes knowledge. With a maximum attainable score of 18, score of 9 was taken as cutoff to categorize in to satisfactory or poor diabetes knowledge . Blood investigations (FBS, PPBS , HbA1C, RENAL FUNCTION TESTS) , urine analysis , fundoscopic examination and clinical evaluation of diabetic peripheral neuropathy were done . Neuropathy was asessed using a diabetic neuropathy examination score with a maximum score of 16 and score of 3 taken as cutoff for presence of polyneuropathy.

Statistical analysis

The collected data was analyzed using mean, mode for demographic data and frequency percentage for the analysis of the clinical data.

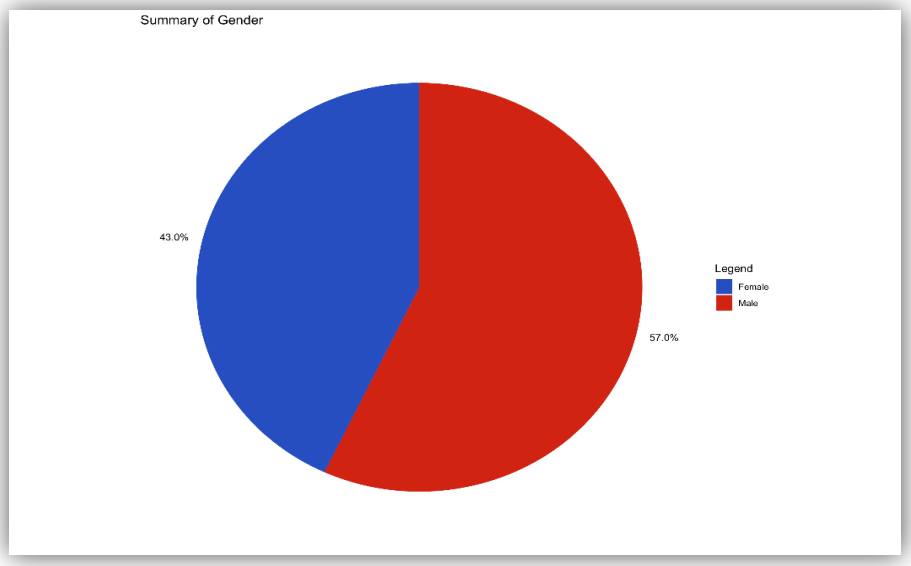
Statistical Analysis was done using SPSS software version 23.0.

A 'p' value less than 0.05 ($p<0.05$) is considered significant.

The various measures of central tendencies and graphical representations were used to analyze the data

III. Result

Participant's age range was from 38 to 80 years; mean age was 55.87 years. 86(43%) were females and 114(57%) were males.



(Piechart 1)

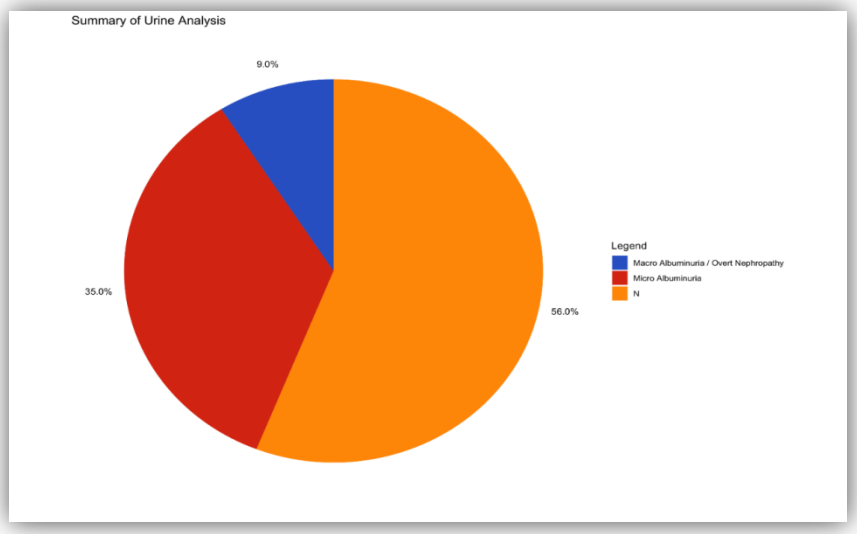
Gender distribution of diabetic patients , male : 57% , female : 43%

Fundoscopic assessment showed 28.5% to have non proliferative diabetic retinopathy and 5% had proliferative diabetic retinopathy.

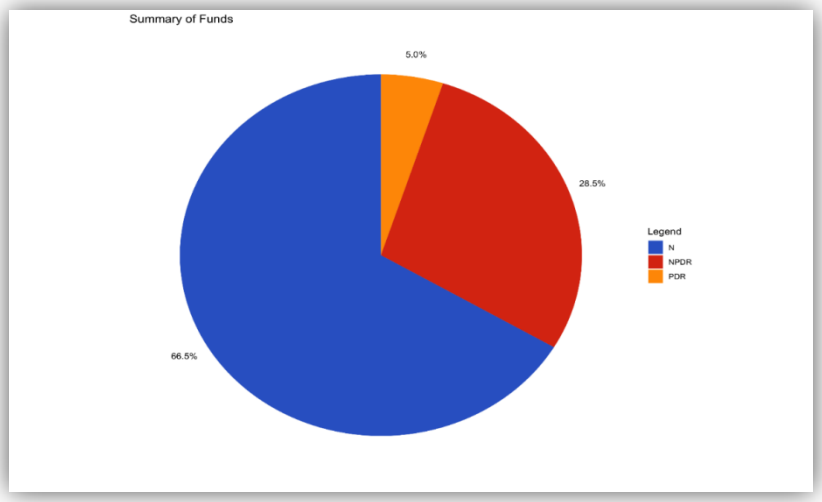
Diabetic neuropathy examination score was used to determine neuropathy and revealed 27% of the participants to have diabetic polyneuropathy.

Diabetes knowledge questionnaire was used to assess level of diabetes knowledge among participants , showing only 18.5% of participants having satisfactory diabetes knowledge.

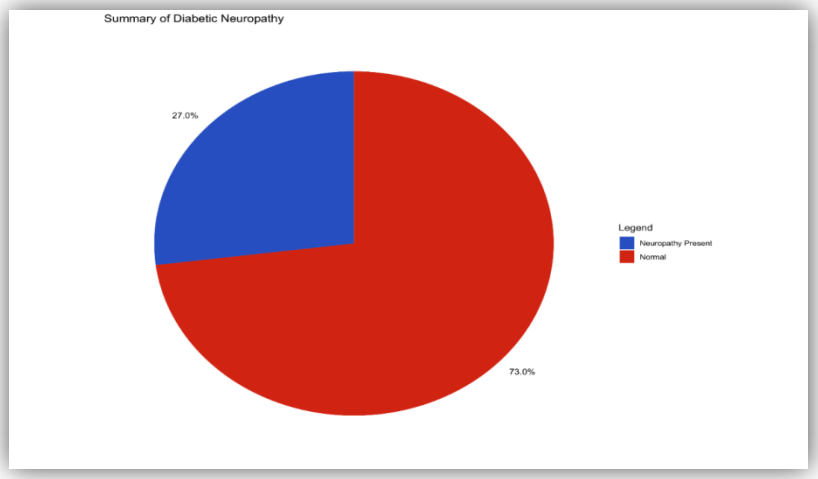
Diabetes knowledge unsurprisingly affected every parameter including fasting blood glucose , serum creatinine, presence of retinopathy and neuropathy showing a trend of poor diabetes knowledge associated with worsening of above mentioned parameters.



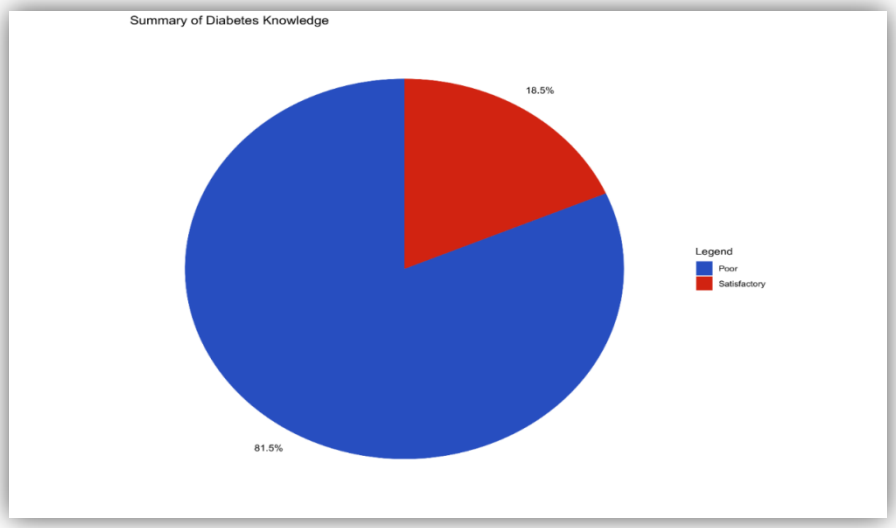
(Pie chart 2) Urine analysis studies show 18(9%) having macroalbuminuria and 70(35%) participants having microalbuminuria,Normal : 56%



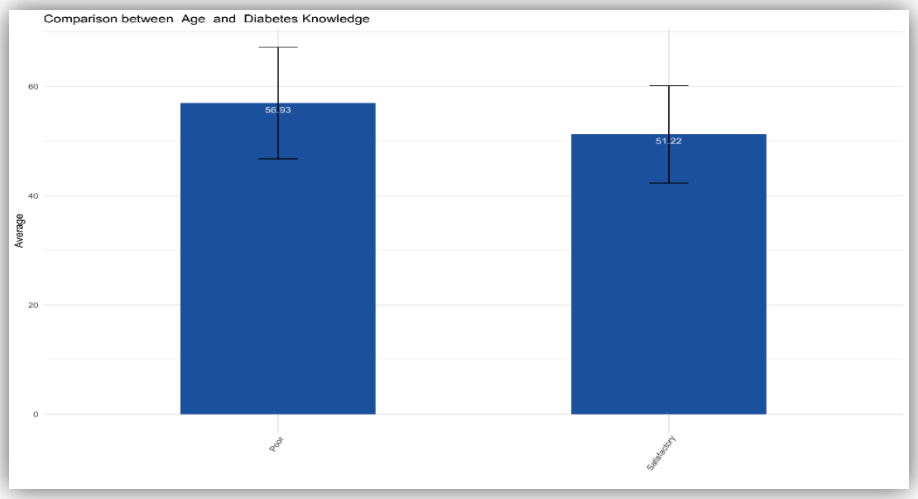
(pie chart 3) Spectrum of fundoscopic changes : Non proliferative diabetic retinopathy : 28.5% **,**Proliferative diabetic retinopathy : 5% **,** Normal : 66.5%



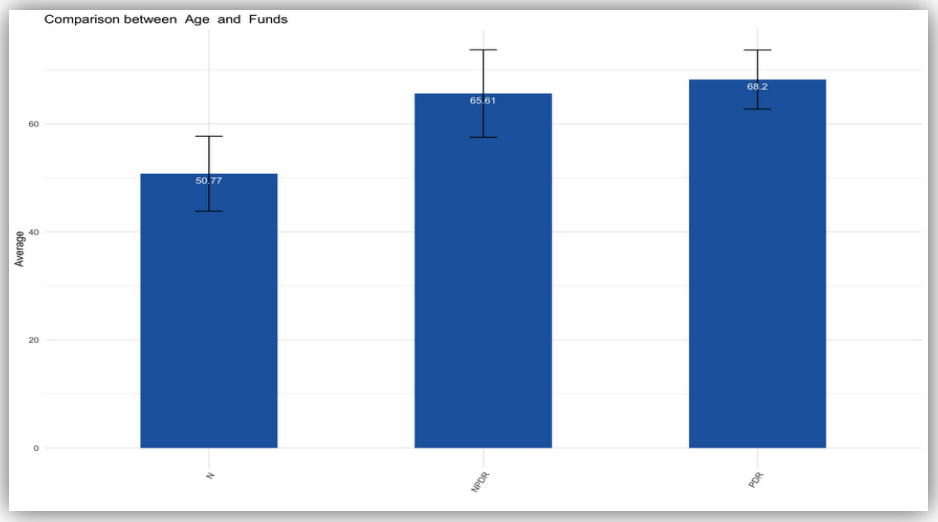
(piechart -4)diabetic neuropathy assessed using DNE score**:** Polyneuropathy present :27% (DNE SCORE >3) ,Normal : 73%



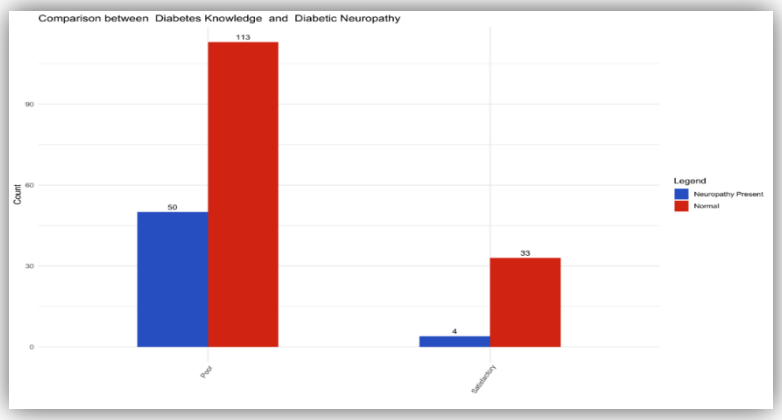
(piechart -5)diabetes knowledge assessment using modified dkqDiabetes knowledge poor : 81.5%, Diabetes knowledge satisfactory : 18.5%



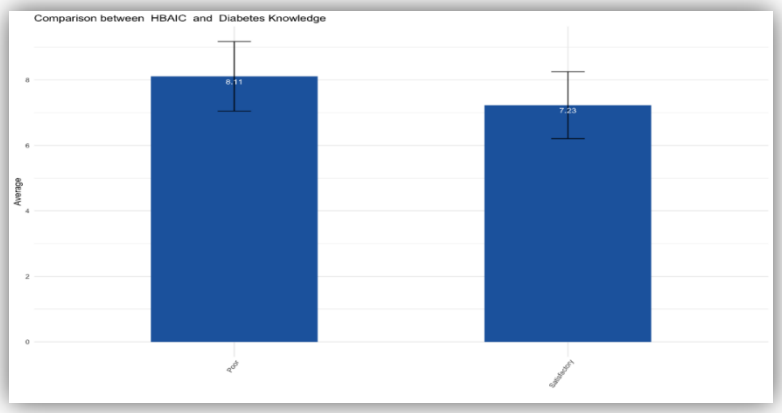
(Bar diagram -1)correalation between age and diabetes knowledge *:* Average age of participants with poor diabetes knowledge : 56.93 years , Average age of participants with satisfactory diabetes knowledge : 51.22 years



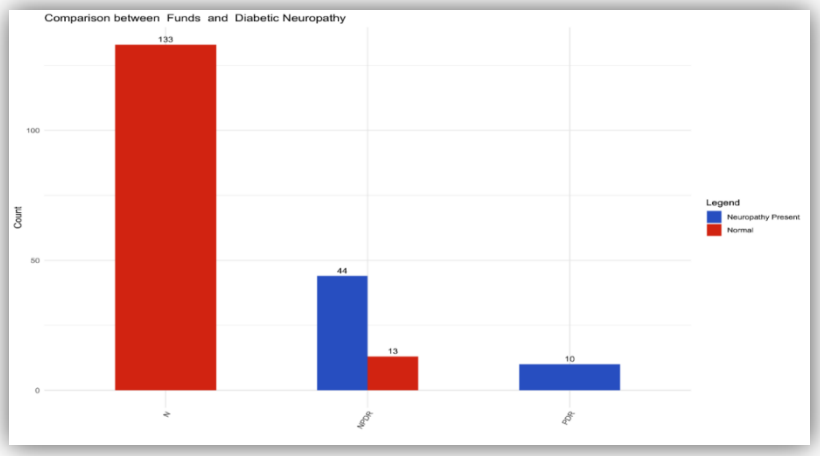
(bar diagram -2)correlation between age and fundoscopy findings - Average age of participants with normal fundus :50.77years , Average age of participants with NPDR : 65.61years , Average age of participants with PDR : 68.2years



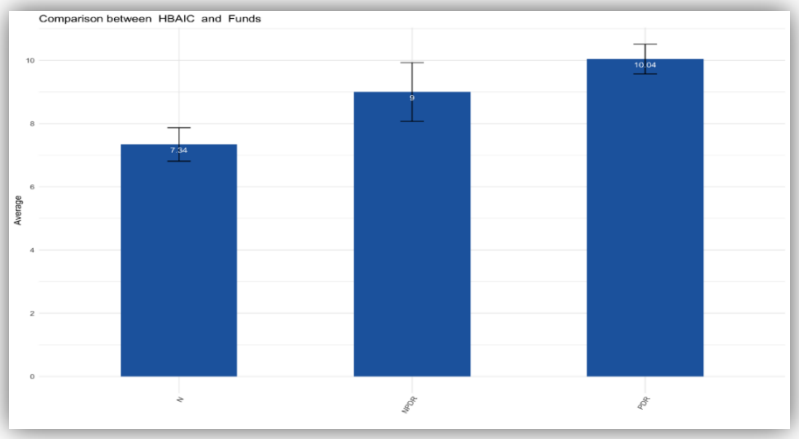
(bar diagram -3)diabetes knowledge vs diabetic neuropathy**:** Prevalence of diabetic neuropathy in participants with satisfactory diabetes knowledge : 10.8% , Prevalence of diabetic neuropathy in participants with poor diabetes knowledge : 30.6%



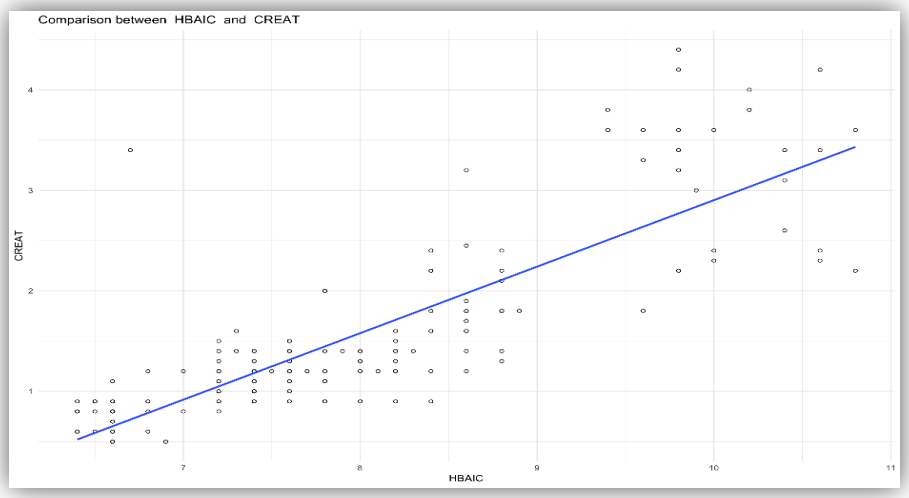
(bar diagram -4)hba1c vs diabetes knowledge- Average hbA1c in participants with poor diabetes knowledge : 8.11 , Average hbA1c in participants with satisfactory diabetes knowledge : 7.23



(Bar diagram -5)diabetic retinopathy vs diabetic neuropathy- In comparison between diabetic retinopathy and neuropathy, 77% of the participants with NPDR had peripheral neuropathy, whereas in participants with PDR, 100% of them had peripheral neuropathy



(Bar diagram -6)hba1c vs retinopathy- Hba1c showed a positive correlation with occurrence of microvascular complications , severity of complications (participants with PDR have higher hba1c values compared to participants with NPDR)



(Graph 1) correlation between Hba1c and serum creatinine - Hba1c showed positive correlation with creatinine, with Correlation Coefficient of 0.84

- Participant's age range was from 38 to 80 years; mean age was 55.87 years
- 86(43%) of the study population were females and 114(57%) were males
- In comparison between Age and Diabetes Knowledge, the average age of population with satisfactory diabetes knowledge is 51.22 years compared to 56.93years in population with poor diabetes knowledge [p value:0.000912]
- Age showed positive correlation with fasting, post prandial blood glucose , blood urea nitrogen , creatinine, and hba1c.
- In comparison between BUN and urine analysis, average BUN in participants with macro albuminuria / Overt Nephropathy is 77.83mg/dl , whereas in participants with micro albuminuria it is 87.49mg/dl, and in participants with urine analysis within normal limits average BUN is 65.61mg/dl [p value:0.0021]
- Hba1c showed positive correlation with creatinine, with Correlation Coefficient of 0.84
- In comparison between BUN and Diabetes Knowledge , average BUN in participants with poor diabetes knowledge is 80.85 and in participants with satisfactory diabetes knowledge is 45.78
- In comparison between Diabetes Knowledge and Diabetic Neuropathy ,Neuropathy is Present in 50 participants whose diabetes knowledge is poor ,whereas neuropathy is present in as low as 4 participants with satisfactory diabetes knowledge
- In comparison between FBS and diabetic retinopathy , average FBS in participants with NPDR is 194.86mg/dl, and 261.2mg/dl in participants with PDR
- In comparison between urine analysis (proteinuria) and FBS , participants with macro albuminuria has higher FBS compared to micro albuminuria , much higher levels of FBS are seen in patients with micro and macro albuminuria compared to participants with normal urine analysis.

- In comparison between renal parameters (creatinine,BUN) and urine analysis , higher levels of creatinine and BUN are seen in participants with micro and macro albuminuria compared to participants with normal urine analysis
- In comparison between urine analysis (proteinuria) and peripheral neuropathy, 50% percent of the participants with macro albuminuria has neuropathy and 34.2% of the participants with micro albuminuria has neuropathy
- In comparison between urine analysis (proteinuria) and retinopathy , 50% of the participants with macro albuminuria has diabetic retinopathy and 35.71% of participants with micro albuminuria has diabetic retinopathy

IV. Discussion

This was a cross sectional hospital based study conducted on 200 diagnosed diabetes mellitus patients, presenting to department of general medicine, A J HOSPITAL , mangalore from rural areas of Karnataka over a period of 2 years (november 2016-november 2018).

In our study participant's age range was from 38 to 80 years with a mean age of 55.87 years, which was comparable to a study by S.P. Dussa K, Sahay et al [1] in which Participant's age range was from 36 to 75 years with a mean age of 52.22 years.

In this study 43% of the study population were females and 57% were males, predominantly male population which can be compared to a study by Varghese A , deepa R et al [2]in which study population was predominantly male comprising of 61.4%, and females about 38.6%.

In our study a comparative analysis between Age and diabetes knowledge, showed that average age of population with satisfactory diabetes knowledge is 51.22 years compared to 56.93years in population with poor diabetes knowledge ,which can be compared to a study by S.P. Dussa K, Sahay et al [1] in which advanced age and middle age population showed poor diabetes knowledge scores compared to young working population. In this study a comparison between serum creatinine and urine analysis showed average creatinine in participants with macro albuminuria / Overt Nephropathy as 2.12mg/dl , whereas in participants with micro albuminuria it is 1.84mg/dl, and in participants with urine analysis within normal limits average BUN is 1.27mg/dl which can compared to a study by A Varghese, R Deepa et al [2] in which microalbuminuric patients had average creatinine of 1.35mg/dl and normoalbuminuric patients had average creatinine of 0.91mg/dl and showed similar increasing trend in creatinine values as severity of proteinuria increases.

In our study prevalence of diabetic retinopathy is showing the occurrence of Non proliferative diabetic retinopathy among 28.5% of the study population whereas Proliferative diabetic retinopathy was seen in 5% of the study population, which can be compared to a study by Rema m, M. Ponnaiya, et al [3] which showed a similar occurrence of non proliferative diabetic retinopathy in 30.8% and proliferative diabetic retinopathy in 3.4% of study population.

In our study , comparison between diabetic retinopathy and fasting blood glucose showed average fasting blood glucose level of 114mg/dl in study population with non proliferative diabetic retinopathy and 261mg/dl in study population with proliferative diabetic retinopathy which can be compared to a study by by Rema m, M. Ponnaiya, et al [3] with similar fasting blood glucose values of 126mg/dl in non proliferative diabetic retinopathy group and 248mg/dl in proliferative retinopathy group

In our study ,comparison between diabetic retinopathy and post prandial blood glucose showed average fasting blood glucose level of 266mg/dl in study population with non proliferative diabetic retinopathy and 327mg/dl in study population with proliferative diabetic retinopathy which can be compared to a study by by Rema m, M. Ponnaiya, et al [3] with similar post prandial blood glucose values of 282mg/dl in non proliferative diabetic retinopathy group and 294mg/dl in proliferative retinopathy group

In our study ,comparison between diabetic retinopathy and diabetic neuropathy showed that study population with proliferative diabetic retinopathy had diabetic peripheral polyneuropathy in all of them 100%, which can be compared to a study by Virendra K. Sharma et al [4] which showed a similar pattern of 100% of the population with proliferative diabetic retinopathy to be effected by diabetic peripheral

.In our study ,comparison between diabetic retinopathy and diabetic neuropathy showed that study population with non proliferative diabetic retinopathy had diabetic peripheral polyneuropathy in 77% of them which can be compared to a study by Virendra K. Sharma et al [4] which showed a 78.5% of the population with non proliferative diabetic retinopathy to be effected by diabetic peripheral polyneuropathy

In our study a comparison between hbA1c and retinopathy changes showed average hbA1c in study population with non proliferative diabetic retinopathy to be 9% and 10.04% in study population with proliferative diabetic retinopathy which can be compared to a study by Virendra K. Sharma et al [4]which showed average hbA1c of 10.3% in NPDR and 11% in study population with PDR.

In our study a comparison between microalbuminuria and diabetic peripheral polyneuropathy changes showed 12.4 % of study population with microalbuminuria to have peripheral polyneuropathy when compared to a study by A Varghese, R Deepa et al [2] which has 34.2% of the microalbiminuric patients to have diabetic peripheral polyneuropathy.

In our study a comparison between serum creatinine and diabetic retinopathy, average serum creatinine in study population with non proliferative diabetic retinopathy was 2.28mg/dl and in proliferative diabetic retinopathy was 3.37mg/dl when compared to a study by Rema m, M. Ponnaiya, et al [3]in which average serum creatinine in study population with non proliferative diabetic retinopathy was 0.8mg/dl and 1 mg/dl in study population with proliferative diabetic retinopathy.

In our study diabetes knowledge assessed by diabetes knowledge questionnaire was found to be satisfactory only in 18.5% of study population and diabetes knowledge was found to be poor in 78.5% study population when compared to a study by S.P. Dussa K, Sahay et al [1] in which 97.5% of the study population had poor diabetes knowledge and only 2.75% study population had satisfactory diabetes knowledge.

In our study diabetic peripheral polyneuropathy evaluated through diabetic neuropathy examination score was found to be present in 27% of the study population when compared to a study by Ashok S, Ramu M et al..[5] in which 19.1% of the study population had diabetic peripheral polyneuropathy.

In our study diabetes knowledge among diagnosed cases of diabetes was assessed using a diabetes knowledge questionnaire and was found that only 2.75% of the study population who were all known diabetics had satisfactory knowledge about management practices ,preventive aspects of diabetes when compared to a study by Deepa Mohan, Deepa Raj et al [6]which primarily studied the diabetes awareness pattern in urban areas and found that diabetes awareness in overall population was 22% and it was 41% in diagnosed diabetes population.it was also found that Only 19.0% of whole population knew that diabetes could cause complications. Even among those who knew that diabetes could cause complications 55.7% were not able to specify a single organ which could get affected. Among those who knew about diabetic complications, the most common complications reported by the non-diabetic population were foot problems (21.8%), kidney disease (15.9%) and eye disease (16.3%). Other complications like heart attacks, hypertension and stroke were occasionally mentioned. Even among the self reported diabetic subjects, only 40.6% were aware that diabetes could produce some complications. Foot problems 23.0% and kidney disease 17.4%were the most commonly reported complications.

In our study diabetic peripheral polyneuropathy was assessed using diabetic neuropathy examination score where a score of more than 3 was taken as criteria for diagnosis of polyneuropathy , and was seen in 27% of study population when compared to a study by monisha d'souza et al.[7]in which screening for DPN was conducted using the Michigan Neuropathy Screening Instrument (MNSI). The MNSI is a validated tool for the screening of DPN in both community and hospital set ups.The MNSI includes two parts, the first part is related to patient's perception of symptoms in relation to DPN and the second part consists of a set of examinations done to detect the presence of DPN among the patients. The examinations include, i) vibration sensation test using a 128 Hz tuning fork, ii) elicitation of muscle jerk reflex at the ankle joint and iii) monofilament testing.

In our present study, we found that there is no significant association between HbA1c levels and diabetes knowledge among study population which can be compared to a study S.P. Dussa K, Sahay et al [1]which showed no significant correlation between diabetes knowledge and hbA1c

V. Conclusion

- In this study we concluded that diabetes knowledge in rural population is still very poor and needs a lot of proactive involvement from health care professionals, government agencies and diabetes patients as well to face this modern epidemic
- We concluded that Diabetes knowledge unsurprisingly affected every parameter including fasting blood glucose , serum creatinine, presence of retinopathy and neuropathy showing a trend of poor diabetes knowledge associated with worsening of above mentioned parameters, but significant association between diabetes knowledge and glycated hemoglobin couldn't be established
- Results-oriented organized programs involving patient education, updating medical fraternity on various developments in the management of diabetes, and providing them the opportunity to use and analyze these newer treatment options in the form of observational studies are required to combat the diabetes epidemic currently threatening to affect the lives of millions of people in rural India

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