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Cross Sectional Study on Prevalence of Diabetes Mellitus and Associated High Risk Factors among the Age Group of Over 18 Years in Rural Community of Puducherry

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ABSTRACT

Background: Diabetes mellitus is also known as a "Silent disease," still now no symptoms were identified and progresses to severe target organ damage. The high risk factors are communicable diseases to non-communicable diseases indicate the rural populations in Diabetes mellitus. To assess the various environmental factors contributing the occurrence of the diseases.
Objective: This study was evaluated to determine the prevalence of the type 2 diabetes mellitus.
Methods: The present study was conducted in the high risk factors among the age group in rural community.
Results: Based on the above results indicated that prevalence rate was high.
Conclusion: Multidisciplinary approach targeting

Keywords:
Type 2 diabetes mellitus, age group, sex

1. Introduction

Diabetes mellitus is a major lifestyle disorder and chronic metabolic disorder is a fast-growing global problem with huge social, health, and economic consequences and their major impact on the lives and well-being of individuals, families, and societies in Worldwide. The prevalence of Diabetes mellitus, chiefly by Type 2 Diabetes mellitus, is a global public health threat. The prevalence among adults aged 20-79 years is expected to rise from 382 million in 2013 to 592 million by the year 2035. While Type 2 Diabetes mellitus poses a huge economic burden to all nations, developing countries bear the highest burden since more than 80% of cases occur in these countries (1,2,3). The socio-economic growth and industrialization is rapidly occurring in many of Asian countries, which is adversely affecting the lifestyle of populations. Asians have a strong ethnic and genetic predisposition for Diabetes and have lower thresholds for the environmental risk factors (4). As a result, they develop Diabetes at a younger age and at a lower body mass index and waist circumference when compared with the Western population. Asian countries contribute to more than 60% of the world's diabetic population (1,2).

The socio-economic growth and industrialization is rapidly occurring in many of Asian countries, which is adversely affecting the lifestyle of populations and environment. Asians have a strong ethnic and genetic predisposition for Diabetes and have lower thresholds for the environmental risk factors (4). As a result, they develop Diabetes at a younger age and at a lower body mass index and waist circumference when compared with the Western population. Asian countries contribute to more than 60% of the world's diabetic population (1,2). South East Asian countries have the highest burden of Diabetes mellitus (5,6). International Diabetes Federation on the estimated projections regarding Diabetes mellitus and Impaired Glucose Tolerance (IGT) in South East Asians.

Prevalence estimates of Diabetes mellitus and Impaired glucose tolerance (IGT) are high for all Asian countries and are expected to increase further in the next two decades. The present trend

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indicates that more than 60% of the world's diabetic population will be in Asia (5). The adverse effect of physical inactivity and fatty food are manifested as the increasing rate of over weight and obesity. The so called "Asian Indian Phenotype" refers to certain unique clinical and biochemical abnormalities in Indians which include increased insulin resistance, greater abdominal adiposity i.e. higher waist circumference despite lower body mass index. This phenotype makes Asian Indians more prone to Diabetes mellitus (7). However, the primary driver of the epidemic of Diabetes mellitus is the rapid epidemiological transition associated with changes in dietary patterns and decreased physical activity as evident from the higher prevalence of Diabetes mellitus in the urban population (6). India comprises 85% of the adult population of South East Asia and therefore the major contribution to diabetic population in South East Asia is from India. India leads the world with largest number of diabetic subjects earning the dubious distinction of being termed the "Diabetes Capital of the World". According to the Diabetes Atlas 2006 published by the International Diabetes Federation, the number of people with Diabetes mellitus in India currently around 40.9 million is expected to rise to 69.9 million by 2025 unless urgent preventive steps are taken (2,6,8).

Many studies have illustrated the impact of socioeconomic transition occurring in rural India and environment. There are three fold rises in the prevalence of Diabetes in rural southern India (9). The transition had occurred during the last 14 years and the prevalence had risen from 2.4% to 6.4%. Some of the recent prevalence studies done in rural south India shown, prevalence was 5.8% (10), 8.32% (11) and 13.2% (12) and shows prevalence has increased in rural community of India also equal to urban. The contributing factors related were improved socioeconomic status which encompassed an increase in family income and educational status, motorized transport and a shift in occupational structure. Similar situation has been described from the neighboring countries such as Thailand, Malaysia, Bangladesh and Pakistan. This revelation of increasing prevalence of Diabetes mellitus is important as majority of population in developing countries live in rural area and therefore it would be a major contributor to the emerging epidemic of Diabetes mellitus in this part of the world (13).

Diabetes mellitus is one of the major causes of morbidity and mortality affecting youth and middle aged people. Diabetes mellitus also considered as a "silent disease," exhibiting no symptoms until it progresses to severe target organs damaged. Because of increasing burden of the disease, its iceberg nature, its complications and potential to prevent these complications with earlier diagnosis and treatment; active and opportunistic efforts are required for early diagnosis of Diabetes mellitus by means of screening. Early identification of at-risk individuals and appropriate lifestyle intervention would help in preventing or postponing the onset of Diabetes mellitus (14).

A significant proportion of people with type 2 Diabetes mellitus presents with complications (both macro vascular and micro vascular), usually subclinical and asymptomatic at the time of diagnosis. Early diagnosis of Diabetes offers the chance of intervention and curbs the onward progression of complications. Hence it is imperative that to curtail the menace of complications, an early diagnosis of Diabetes mellitus and Pre-Diabetes is important. This also presents an opportunity to gauge the prevalence of risk factors for development of Diabetes mellitus in the said population and the opportunity to intervene in the high risk cases to prevent the development of Diabetes mellitus in an individual level (15). With this background, this study was undertaken to know the prevalence of Type 2 Diabetes mellitus and associated high risk factors among adults in rural community of Pondicherry.

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2. Material and Methods

Description of study area

These are the common communicable (Acute respiratory infections, Acute diarrheal diseases, Tuberculosis, Malaria, Filaria, Enteric fever, Dengue,) and non-communicable (Hypertension, Diabetes Mellitus, IHD, Stroke, Cancer) diseases present in Pondicherry (100). There are 2 Government Hospitals, 3 Community Health Centers, 27 Primary Health Centers, 2 Government Medical Colleges and 7 Private Medical Colleges and 12 Private Nursing Homes present in Pondicherry District to provide and maintain good health. In recent times Type 2 Diabetes mellitus is a leading cause of morbidity in Pondicherry District. I have conducted my studies in the rural areas of Pondicherry as the prevalence studies are rare among the rural population compare to urban region. I have selected Pondicherry as my study area as my institution is situated here.

Study design and period

A cross sectional, descriptive, community based survey was undertaken in Pondicherry with the above mentioned objectives among rural community. The study was approved by the Institutional Ethical committee (Human studies) of the institute as shown in **Annexure** 2. The study period was between April 2014 to September 2014.

Survey settings

The data for this cross sectional survey was collected from rural community of Pondicherry. There were 30 Primary Health Centers in Pondicherry, among the above Primary Health Centers 5 rural PHC were selected to represent each community so that the results may be provide generalized details. The consent from the respective participants was taken before starting the survey.

Selection of age groups

Inclusion criteria:

- All people aged above 18 years in study population.
- All the Pre-Diabetes Subjects included based on available reports.

Exclusion Criteria

- All people aged below 18 years.
- Women with Gestational Diabetes Mellitus
- Individuals who declined for informed consent, and Not available at home even after repeat third visit.

Sample size and sampling techniques

The sample size was calculated using available recent prevalence studies (Samanth et al study shows 5.8% in Pondicherry-2012) in rural area of Pondicherry (10). The required sample size was 1624, we have taken it as 1821 with 20% non-response rate in this study. When prevalence/ proportion rate known, sample Size is calculated by following method (101).

When prevalence rate is known or proportion of occurrence is known,

$$n = \frac{4pq}{L^2}$$

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Where p = prevalence/proportion of an event, q = 1-p
L2 = Permissible error in the estimate of p
Where p = 5.8, q = 100 – 5.8 = 94.2, L^2 = 20% (permissible error) = 1.3456
n = (4 × 5.8 × 94.2) ÷ 1.345 = 1624 (Sample size)

Sampling techniques

A multi-stage random sampling technique was applied in selection of 1624 sample subjects in the survey. In the first stage, all the 27 Primary Health Centers in the Pondicherry have been listed. 5 Primary Health Centers were selected using lot method in the Second stage. The names of the following Primary Health Centers are being selected by using lot method for data collection.

- Thirubuvanai (32,787 Population)
- Katterikuppam (12,443 Population)
- Nettapakkam (14,100 Population)
- Bahour (26,996 Population)
- Abishegapakkam (6,836 Population)

In the third stage, one village from each Primary Health Centers was selected as per the second stage by random. The following villages and samples aged above 18 years was surveyed by direct interview method by using pretested questionnaire were selected by lot methods.

List of PHC's	**List of Villages**	**No. of houses to be surveyed**	**No. of individuals surveyed**
Thirubuvanai	Madagadipet (4,750)	120	416
Katterikuppam	Mutrampet (2,102)	161	421
Nettapakkam	Pandasozanallur (5,544)	103	352
Bahour	Bahour (3,978)	79	241
Abishegapakkam	Thimmanayakanpalayam (2,833)	107	391

3. Data collection procedure

First house was selected randomly selected village moved towards the right side of the first house till adequate sample sizes were obtained in particular villages. Procedure for the survey was explained to the participants in the local (Tamil) and English languages, assessing the potential respondents that the participation is voluntary and anonymous, assured them that their responses would be kept confidential. They were request to share the information by recollecting method on the variables mentioned in the questionnaire. The data have collected from participants along with consent forms and request to sign. No incentives of any kind were offered to the participants. The data was obtained from those who were present in the house at the time of survey and the data from those who were not present was collected later after giving prior information. All efforts were made to collect the data of the patient's by visiting their houses on three occasions. Mostly data was collected early in the morning 6 to 8 AM and evening 18 to 21 PM which is convenient of the participants.

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Variables

The survey instruments were anonymous in nature which was pre-tested, open ended questions consisted of variables in six sections is attached as **Annexure 3.**

1) Socio demographic factors

- Age
- Sex
- Religion
- Education status
- Occupation
- Family income
- Marital status
- H/o Diabetes
- Sibling Diabetes History

2) Risk factors of type 2 Diabetes Mellitus

- Tobacco usage (Smoking Tobacco, Chewing Tobacco and Both forms)
- Alcohol consumption (Daily-at least 80 ml, Regular-once in a week andOccasionally-once in a month)
- Physical activity / Exercise
- Diet habit
- Type of diet (Vegetarian / Mixed Vegetarian)
- Oil rich food habit
- Known Hypertension
- Known Dyslipedemia

3) Seeking of medical care among Diabetes Subjects

- Taking medical care or not
- Place of treatment
- Type of treatment
- Regularity of treatment

4) Co-Morbid Conditions among Diabetes

- Respiratory Infections
- Ischemic Heart Disease
- Gastro intestinal problem
- Hemipharesis
- Eye defects (Refractory errors / surgeries)
- Skin infections
- Any other complications like joint pain, Giddiness etc,

5) General and Clinical Examination

6) Anthropometric Examination done as per **Annexure 4.**

- Height
- Weight
- Body Mass Index calculation

Each questionnaire would take 15 minutes to complete by the investigator.

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4. Data analysis and statistical tests

The data were analyzed using SPSS version 20 for Percentage, Proportion, Chi-square test, ANOVA, Student "t" test, Odds Ratio and significance of association at the level of $p<0.05$. We analyzed the waited prevalence, percentage and mean for this study.

Table 1: Distribution of total population according to family size, number of families and aged above 18 years of subjects

Family size	Number of families (%)	Total number of family members (%) a	Aged 18 years and above Numbers (%) b
≤2	153 (26.8)	284 (13.1)	281 (98.9)
3	131 (23)	345 (15.9)	316 (91.6)
4	115 (20.2)	512 (23.6)	435 (85)
5	88 (15.4)	440 (20.1)	344 (78.2)
>5	86 (15.1)	588 (27.1)	445 (75.7)
Total	570 (100)	2169 (100)	1821 (84)

(Percentage in bracket shows aged 18 years and above %=b/a)

Table 1 shows total numbers of houses surveyed in this study were 570. Total members were 2169, in that 1821 participants were equal and above the age group of 18 years. 588 (27.1%) members belongs to the family size 5 and above, 512 (23.6%) belongs to family size 4, 440 (20.3%) belongs to family size 5 and 629 (29%) belongs to family size 3 and below.

Table 2: Distribution of subjects according to Religion

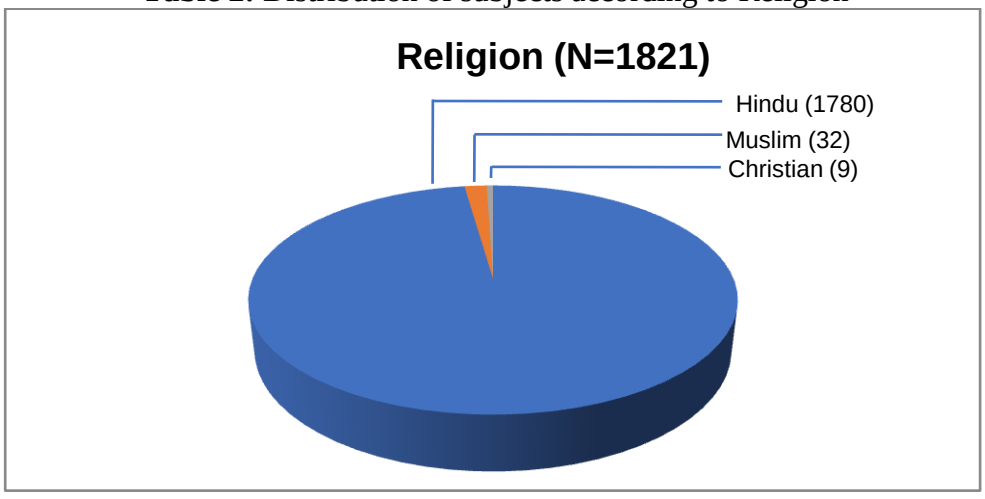

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Table 2 shows 1780 (97%) participants were Hindu, 32 (1.8%) were Muslims and 9 (0.5%) were Christians.

Table 3: Distribution of study population according to Age group in years and Gender

Age group in years	Male Numbers (%)	Female Numbers (%)	Total Numbers (%)
≤20	71 (8.1)	69 (7.2)	140 (7.7)
21 – 30	188 (21.8)	278 (28.9)	466 (25.6)
31 – 40	206 (24)	216 (22.5)	422 (23.2)
41 – 50	181 (21.1)	173 (18)	354 (19.4)
51 – 60	138 (16.1)	140 (14.6)	278 (15.3)
> 60	75 (8.7)	86 (8.9)	161 (8.8)
Total	859 (100)	962 (100)	1821 (100)

Table 3 shows total eligible study population was 1821 of which males 859 (47.1%) and females 962 (52.8%) respectively. Age group between 21-30 years accounted 466 (25.6%), 31-40 years accounted 422 (23.2%), 41-50 years accounted 354 (19.4%), and age above 60 years 161 (8.8%). Age group between 21-30 years' females 278 (28.9%) were more than males 188 (21.8%) and age group between 41-50 years' males 181 (21.1%) were more than females 173 (18%).

Table 4: Distribution of subjects according to and Marital Status and Sex wise

Marital Status	Male Numbers (%)	Female Numbers (%)	Total Numbers (%)
Married	627 (73.0)	688 (71.5)	1315 (72.2)
Unmarried	222 (25.8)	149 (15.5)	371 (20.4)
Divorced	3 (0.3)	5 (0.5)	8 (0.4)
Widow/widower	7 (0.8)	120 (12.5)	127 (7)
Total	859 (100)	962 (100)	1821 (100)

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Table 4 shows 1315 (72.2%) were married, unmarried were 371 (20.4%), widow & widower were 127 (7%). Students group were come under the category of unmarried participants. Males (25.8%) were more than the females (15.5%) in unmarried group and no gender difference in other categories.

Table 5: Distribution of subjects according to Educational Status and Sex wise

Educational Status	Male Numbers (%)	Female Numbers (%)	Total Numbers (%)
Illiterate	129 (15.0)	287 (29.8)	416 (22.8)
Primary	63 (7.3)	99 (10.3)	162 (8.9)
Middle	106 (12.3)	129 (13.4)	235 (12.9)
High school	220 (12.1)	165 (17.2)	385 (21.1)
Higher secondary	140 (16.3)	129 (13.4)	269 (14.8)
Diploma	62 (7.2)	23 (24.0)	85 (4.7)
Graduate	107 (12.5)	106 (11.0)	213 (11.7)
Post graduate	32 (3.7)	24 (2.5)	56 (3.1)
Total	859 (100)	962 (100)	1821 (100)

Table 5 shows 416 (22.8%) participants were illiterate, 385 (21.1%) were studied till high school, 269 (14.8%) were finished higher secondary, 354 (19.4%) were graduates. Female (29.8%) illiterates are more than the males (15.0%) and female (37.5%) graduates were more than males (23.4%).

Table 6: Distribution of subjects according to Occupation and Sex wise

Occupation	Male Numbers (%)	Female Numbers (%)	Total Numbers (%)
Unemployed *	110 (12.8)	583 (60.6)	693 (38.1)
Daily wagers	193 (22.5)	181 (18.8)	374 (20.5)
Private	226 (26.3)	96 (10)	322 (17.7)
self-employment	127 (14.8)	11 (1.1)	138 (7.6)
Student	62 (7.2)	59 (6.1)	121 (6.6)
Business	69 (8.0)	3 (0.3)	72 (4)
Government	57 (6.6)	12 (1.3)	69 (3.8)
Retired	14 (1.6)	15 (1.6)	29 (1.6)
Total	859 (100)	962 (100)	1821 (100)

(* includes house wife)

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Table 6 shows 374 (20.5%) were daily wagers, 322 (17.7%) were working in private and unemployed were 693 (38.1%) and house wives were included in the category of unemployed, so that 583 (32.0%) females were accounted and contributed more in unemployed group. Males were more than females as daily wagers (22.5% Vs 18.8%), government (6.6% Vs 1.3%), private (26.3% Vs 9.98%), and self-employment (14.9% Vs 1.4%). Students and retired population were almost same in both males and females.

Table 7: Distribution of Number of Families according to Family Income per month

Family Income in rupees (₹)	Number of Families	(%)
≤ 10000	263	46.1
10001 – 20000	82	14.4
20001 – 30000	92	16.1
30001 – 40000	40	7.0
40001 – 50000	56	9.8
> 50000	37	6.5
Total	570	100

Table 7 shows 263 (46.1%) families monthly income were ₹ 10,000 and below and they accounted nearly half of the population. 174 (30.5%) were earning between ₹ 10001-30000, 96 (16.8%) were earning ₹ 30001-50000 and 37 (6.5%) were earning more than ₹ 50000. The above table indicates nearly 50% of the families come under the category of low and middle economic status of the family.

Table 8: Distribution of subjects according to Body Mass Index (BMI) and sex wise

Age Group in Years	Male (BMI Kg/m²)* (<=18.5)	(18.51 -24.99)	(25 – 29.99)	(> 30.00)	Total	Female (BMI Kg/m²)# (< =18.5)	(18.51 - 24.99)	(25 - 29.99)	(> 30.00)	Total	Total (BMI Kg/m²)@ (< =18.5)	(18.51 - 24.99)	(25 - 29.99)	(> 30.00)	Total
	13	53	4	1	**71**	15	47	7		**69**	28	100	11	1	**140**
≤ 20	(18.3)	(74.6)	(5.6)	(1.4)	**(100)**	(21.7)	(68.1)	(10.1)	-	**(100)**	(20.0)	(71.4)	(7.9)	(0.7)	**(100)**
	19	117	37	15	**188**	33	173	56	16	**278**	52	290	93	31	**466**
21-30	(10.1)	(62.2)	(19.7)	(7.9)	**(100)**	(11.9)	(62.2)	(20.1)	(5.8)	**(100)**	(11.2)	(62.2)	(19.9)	(6.7)	**(100)**
	8	116	63	19	**206**	16	112	65	23	**216**	24	228	128	42	**422**
31-40	(3.9)	(56.3)	(30.6)	(9.2)	**(100)**	(7.4)	(51.9)	(30.1)	(10.6)	**(100)**	(5.7)	(54.0)	(30.3)	(10.1)	**(100)**
	16	93	56	16	**181**	10	92	50	21	**173**	26	185	106	37	**354**
41-50	(8.8)	(51.4)	(30.9)	(8.8)	**(100)**	(5.8)	(53.2)	(28.9)	(12.1)	**(100)**	(7.3)	(52.3)	(29.9)	(10.5)	**(100)**
	12	86	34	6	**138**	7	66	47	20	**140**	19	152	81	26	**278**
51-60	(8.6)	(62.3)	(24.6)	(4.3)	**(100)**	(5.0)	(47.1)	(33.6)	(14.3)	**(100)**	(6.8)	(54.7)	(29.1)	(9.4)	**(100)**
	9	35	23	8	**75**	8	44	24	10	**86**	17	79	47	18	**161**
> 60	(12.0)	(46.6)	(30.7)	(10.7)	**(100)**	(9.3)	(51.2)	(27.9)	(11.6)	**(100)**	(10.6)	(49.1)	(29.2)	(11.2)	**(100)**

$$* \textbf{Males } \chi 2 = 47.949, df = 15, P\ value = 0.000 \#\textbf{Females } \chi 2 = 59.009, df = 15, P\ value = 0.000 @\textbf{Total } \chi 2 = 88.386, df = 15, P\ value = 0.000$$

This table shows age group less than or equal to 20 years, females (10.1%) were overweight than males (5.6%), males (7.9%) were overweight than females (5.8%) in the age group of 21 to 30 years. Age group between 41 to 50 years and 51 to 60 years' females (12.1% & 33.6%) obese than males (8.8% & 29.2%). 19.9%, 30.3%, 29.9% and 29.2% total subjects were overweight in the age group between 21 to 30, 31 to 40, 41 to 50 and above the age group of 60 years. 6.7% of

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total subjects obese in the age group of 21 to 30 years. The difference between numbers of males, females and total subjects and BMI were found to be statistically significant (P<0.05).

Table 9: Distribution of subjects according to Tobacco usage and Sex wise

Tobacco Usage	Male Numbers (%)	Female Numbers (%)	Total Numbers (%)
No	731 (85.1)	924 (96.1)	1655 (90.9)
Chewing Tobacco (CT)	5 (0.6)	38 (4)	43 (2.4)
Smoking Tobacco (ST)	114 (13.3)	-	114 (6.3)
Smoking &Chewing Tobacco (ST&CT)	9 (1.1)	-	9(0.5)
Total	859 (100)	962 (100)	1821 (100)

Table 9 shows 1655 (90.9%) participants were not using any forms of tobacco, 166 (9.1%) were using different tobacco products. 114 (13.3%) were smokers, 43 (2.4%) were chewing tobacco and 9 (0.5%) were using both form of tobacco. Female 38 (4%) were using chewable form of tobacco more than the males.

Table 10: Distribution of subjects according to consumption of alcohol

Alcohol Consumption	Male Numbers (%)	Total Numbers (%)
No	675 (78.6)	1637 (89.9)
Daily (DA)	31 (3.6)	31 (1.7)
Occasionally (OC)	90 (10.5)	90 (5)
Regularly (RE)	63 (7.3)	63 (3.5)
Total	859 (100)	1821 (100)

Table 10 shows, 1637 (89.9%) were non-alcoholic and 184 (10.1%) were consuming alcohol. In that, 90 (10.5%) males were drinking alcohol occasionally (once in a month), 63 (3.5%) males were drinking regularly (once in a week) and 31 (1.7%) were drinking daily (at least 80 ml). Females (962) were included in the total (1637) of not consuming alcohol.

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Table 11: Prevalence of Diabetes mellitus in different age group among men and women

Age Group in years	Male Numbers (%)	Female Numbers (%)	Total Numbers (%)
≤20	-	-	
21-30	1(0.4)	6(1.7)	7(1.2)
31-40	18(8.7)	22(10.2)	40(9.5)
41-50	33(18.2)	41(24.0)	74(21.0)
51-60	33(23.9)	47(34.0)	80(29.0)
> 60	26(34.7)	29(34.0)	55(34.2)
Total	111(12.9)	145(15.1)	256(14.0)

$$\chi^2 value = 2.987, df = 4, P\ value = 0.56$$

Table 11 shows the total prevalence was 14.0%, among males and females the prevalence of Diabetes mellitus was 12.9% (111) and 15.1% (145) respectively. Age 60 years and above the prevalence was 34.2% (55), age group between 51- 60 was 28.8% (80) and 41-50 was 20.9% (74). Age group between 31-50 years accounted for 114 (30.4%) and it indicates most of Diabetics were in economically productive age group. Overall prevalence of females was affected by Diabetes mellitus than the males.

Table 12: Prevalence of Diabetes mellitus among men and women according to Body Mass Index (BMI)

Body Mass Index BMI (Kg/m²)	Male Numbers (%)	Female Numbers (%)	Total Numbers (%)
≤18.5	5(6.5)	4(4.5)	9(5.4)
18.5-24.99	63 (12.6)	60(11.2)	123(11.9)
25-29.99	30(13.8)	57(22.9)	87(18.7)
≥30	13(20)	24(26.7)	37(23.9)
Total	111(12.9)	145(15.1)	256(14.0)

$$\chi^2 value = 7.44, df = 3, P\ value = 0.05$$

Table 12 shows the prevalence was high among overweight 18.7% (87) and obese 23.9% (37) than normal and malnourished. Even malnourished have prevalence of Diabetes 5.4% (9). The difference between BMI and Prevalence of Type 2 Diabetes mellitus were found to be statistically significant (P<0.05).

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Table 13: Distribution of number of families according to siblings with Diabetes among Diabetic families

Family size	Number of families N (%) (a)	Number of families with Diabetes (%) (b) #	Number of families among sibling with Diabetes (%) (c) *
≤2	153(26.8)	22(14.4)	7(31.8)
3	115(20.2)	23(20.0)	13(56.5)
4	128(22.5)	25(19.5)	13(52.0)
5	88(15.4)	35(6.1)	18(51.4)
>5	86(15.1)	23(4.0)	10(43.5)
Total	570(100)	128(22.5)	61(47.7)

(Percentage in () shows # No. of families with Diabetes = b/a, * Number of families among sibling with Diabetes = c/b)

Table 13 shows total number of families was 570 and 128 (22.5%) families having Diabetes subjects in their house. 61 (47.7%) families having sibling with Diabetes out of 128 Diabetes families. 86 (33.6%) Diabetes subjects were having more than one sibling with Type 2 Diabetes mellitus.

Table 14: Distribution of Diabetes persons according to number of siblings with Diabetes

Number of Sibling with Diabetes	Male Numbers (%)	Female Numbers (%)	Total Numbers (%)
0	53(47.8)	77(53.1)	130(50.8)
1	14(12.6)	26(17.9)	40(15.7)
> 1	44(39.6)	42(29)	86(33.6)
Total	111 (100)	145(100)	256(100)

$$\chi^2 value = 3.626, df = 2, P\ value = 0.163$$

Table 14 shows 40 (15.7%) Diabetes subjects were having one sibling with diabetes and 86 (33.6%) Diabetes was having more than one sibling with diabetes.

Table 15: Distribution of Diabetes persons according to duration of Diabetes among men and women

Duration in Months	Male Numbers (%)	Female Numbers (%)	Total Numbers (%)
< 6	11(9.9)	25(17.2)	36(14.1)
7 to 24	33(29.7)	34(23.5)	67(26.2)

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25 to 48	29(26.1)	23(15.9)	52(20.3)
49 to 72	13(11.7)	18(12.4)	31(12.1)
> 72	25(22.5)	45(31.0)	70(27.3)
Total	111 (100)	145 (100)	256 (100)

$$\chi^2 value = 8.303, df = 4, P\ value = 0.081$$

Table 15 shows 67 (26.2%) subjects were having Diabetes between 7-24 months, 52 (20.3%) subjects were having between 25-48 months and 70 (27.3%) were having more than 72 months. Nearly 60% of Diabetic patients suffering from Diabetes less than 48 months. 30% were diagnosed as diabetes less than 24 months, among them more males 33 (29.7) were diagnoses than females 34 (23.5%) last two years.

Table 16: Prevalence of Diabetes mellitus according to Occupation and Sex wise

Occupation	**Male**	**Female**	**Total**
	Numbers (%)	**Numbers (%)**	**Numbers (%)**
Unemployed	13(21)	89(15.3)	102(14.7)
Daily Wages	36(18.7)	45(24.9)	81(21.7)
Self-Employment	23(18.1)	2(18.2)	25(18.1)
Private	18(8.0)	2(2.1)	20(6.2)
Retired	6(42.9)	5(33.3)	11(37.9)
Government	7(12.3)	2(16.7)	9(13.0)
Business	8(11.6)	-	8(11.1)
Total	111(12.9)	145(15.1)	256(14.0)

$* \chi^2 value = 96.115, df = 6, P\ value = 0.000$

Table 16 shows prevalence of type 2 Diabetes mellitus was 37.9% (11) in retired, 21.7% (81) in daily wagers, 14.7% (102) in unemployed and 13.0% (9) in government servants. Prevalence of Diabetes were more in females (24.9%) 45 than males (18.7%) 36 in the category of daily wagers.

Table 17: Prevalence of Diabetes mellitus and association of various risk factors among subjects

	Male		**Female**		**Total**	
Risk Factors	**Numbers**	**(%)**	**Numbers**	**(%)**	**Numbers**	**(%)**
Total	**111**	**(12.9)**	**145**	**(15.1)**	**256**	**(14.0)**
Tobacco usage*						

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No	88	(11.2)	141	(16.3)	229	(13.8)
Chewing Tobacco (CT)	1	(5.9)	4	(16)	5	(11.9)
Smoking Tobacco (ST)	21	(42)	-	-	21	(18.3)
ST & CT (Smoking & Chewing Tobacco)	1	(25)	-	-	1	(11.1)
Alcohol Consumption ≠						
No	80	(11.9)	145	(15.1)	225	(13.7)
Daily (DA)	5	(16.1)	-	-	5	(16.1)
Occasionally (OC)	15	(16.7)	-	-	15	(16.7)
Regularly (RE)	11	(17.5)	-	-	11	(17.5)
Physical Activity/ Exercise Ω						
No	82	(10.4)	118	(12.8)	200	(11.7)
Yes	29	(39.1)	27	(64.3)	56	(48.3)

$* \boldsymbol{\chi^2 value = 32.11, df = 3, P\ value = 0.000}$
$\neq \boldsymbol{\chi^2 value = 46.03, df = 3, P\ value = 0.000}$
$\Omega\ \boldsymbol{\chi^2 value = 2.072, df = 1, P\ value = 0.170}$

Table 17 shows 27 Diabetes subjects were using different forms of tobacco and prevalence was 16.3%. Prevalence of Diabetes were increased among smokers than the usage of chewable tobacco.

Table 18: Prevalence of Diabetes mellitus and association between each risk factor among subjects

Risk Factors	**Male**		**Female**		**Total**	
	(N)	**(%)**	**(N)**	**(%)**	**(N)**	**(%)**
Total	111	12.9	145	15.1	256	14.0
Diet Habit *						
Vegetarian	13	(27.1)	15	(22.7)	28	(25)
Non vegetarian	98	(12.1)	130	(14.5)	228	(13.4)
Type of Diet ≠						
Mixed	57	(12)	66	(13)	123	(13)
Carbohydrate	42	(12.1)	57	(14.3)	99	(13.3)
Protein	12	(33.3)	22	(40)	34	(37.4)
Fat rich foodΩ						
No	40	(12.7)	49	(13.2)	89	(13)

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Yes	71	(13.1)	96	(16.7)	167	(15)

$* \boldsymbol{value = 0.120, df = 1, P\ value = 0.037, \neq \chi^2 value = 1.381, df = 2, P\ value = 0.50,}$

$\Omega\ \boldsymbol{\chi^2 value = 0.139, df = 1, P\ value = 0.791}$

Table 18 shows Prevalence of Diabetes mellitus among vegetarians 24.6% (28) and non-vegetarians were 13.4% (228).

Prevalence of Diabetes mellitus was 13.3% (99) those eating carbohydrate diet, 12.5% (123) those food habit mixed diet and 37.4% (34) in those eating protein diet.

Table 19: Prevalence of Known Hypertension among Diabetes mellitus according to Sex wise

	Male		**Female**		**Total**	
Risk Factors	**(N)**	**(%)**	**(N)**	**(%)**	**(N)**	**(%)**
Total	111	(12.9)	145	(15.1)	256	(14.0)
Known Hypertension*						
No	80	(9.9)	93	(10.5)	173	(10.2)
Yes	31	(59.6)	52	(67.5)	83	(64.3)
Known Dyslipedemia#						
No	101	(12.1)	133	(14.1)	234	(13.2)
Yes	10	(41.7)	12	(63.2)	22	(51.2)

$* \boldsymbol{\chi^2 value = 1.806, df = 1, P\ value = 0.225}$

$\#\boldsymbol{\chi^2 value = 0.043, df = 1, P\ value = 0.826}$

Table 19 shows prevalence of Known Hypertension among Diabetes was 64.34 (83).

Table 20: Mean duration of Diabetes in months and association of various risk factors according to sex wise

Risk Factors	**Male Numbers (Mean ± SD)**	**Female Numbers (Mean ±SD)**	**Total Numbers (Mean ±SD)**
Total	**111(52.8±15.1)**	**145(52.6±13.1)**	**256 (52.7±15.1)**
Tobacco Usage*			
No	88(48.3±26.6)	141(56.7±26.7)	229(53.4±26.6)
Yes	23(67.1±28.1)	4(57±35.4)	27(65.6±28.1)
Alcohol Consumption#			
No	80(56.0±26.7)	145(56.6±26.7)	225(56.4±26.7)
Yes	31(42.3±26.9)	-	31(42.3±26.9)
Physical Activity/Exercise@			

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No	82(49.5±26.8)	118(51.1±26.7)	200(50.5±26.7)
Yes	29(59.76±26.7)	27(80.7±28.5)	56(69.9±26.7)

$*$ **Males** $t = 1.67, df = 109, P\ value = 0.098$ $*$ **Females** $t = 0.013, df = 143, P\ value = 0.990$

$*$ **Total** $t = 1.204, df = 254, P\ value = 0.230$

#**Males** $t = 1.37, df = 109, P\ value = 0.185$ #**Total** $t = 1.477, df = 254, P\ value = 0.141$

@**Males** $t = 0.976, df = 109, P\ value = 0.331$ @**Females** $t = 2.792, df = 143, P\ value = 0.006$

@**Total** $t = 2.604, df = 254, P\ value = 0.010$

Table 20 shows mean duration of Diabetic subject according to sex wise in moths. Mean duration of 256 Diabetic subjects were (52.7±15.1) of which males 111 (52.8±15.1) and females were (52.6±13.1) respectively. Mean duration of 229 non-tobacco users were (53.4±26.7) and 27 tobacco users were (65.6±28.1). Mean duration of 23 male tobacco users were (67.1±28.1) and 4 female tobacco users were (57±35.4). Mean duration of Diabetes in months of males, females and total among tobacco users and non-tobacco users were not found statistically significant (P>0.05).

Mean duration of 31 alcohol users were (42.4±26.9). Mean duration of 200 subjects those who were not done any kind of physical activity (50.5±26.7) and 56 subjects those who were doing physical activity (69.9±26.7).

Mean duration of 29 male subjects those who were doing physical activity (59.8±26.7) and 27 females those who were doing physical activity were (80.7±28.5).

Table 21: Distribution of Medical Care according to Place, Type and Regularity of Treatment

Medical Care	**Male Numbers (%)**	**Female Numbers (%)**	**Total Numbers (%)**
Total*	111 (100)	145 (100)	256 (100)
Yes	95(85.6)	121(83.5)	216(84.4)
No	16(14.4)	24(16.6)	40(15.6)
Place of Treatment			
Government	61(55)	87(60.0)	148(57.8)
Private	34(30.6)	31(21.4)	65(25.4)
Both	-	3(2.07)	3(1.2)
No	16(14.4)	24(16.6)	40(15.6)
Treatment Type			
Allopathic	94(84.7)	120(82.8)	214(83.6)
Ayurvedhic	-	1(0.7)	1(0.4)
Siddha	1(0.9)	-	1(0.4)
No	16(14.4)	24(21.4)	40(15.6)

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Regularity of Treatment#			
Regular	84(75.7)	111(76.6)	195(76.2)
Irregular	11(9.9)	20(13.8)	21(8.2)
No	16(14.4)	24(16.6)	40(15.6)
Duration of Blood Investigation			
0	89(80.2)	112(77.2)	201(78.5)
< 6	21(18.9)	31(21.4)	52(20.3)
> 6	1(0.9)	2(0.8)	3(1.8)

$(*)\boldsymbol{\chi^2 value = 0.280, df = 1, P\ value = 0.729}$
$(\#)\boldsymbol{\chi^2 value = 0.886, df = 2, P\ value = 0.642}$

Table 21 shows Percentage of seeking medical care among Diabetes subjects. 216 (84.4%) subjects were taking medical care and 40 (15.6%) subjects were not taking treatment. 148 (57.8%) were taking treatment in government and 65 (25.4%) were taking treatment in private. 214 (83.6%) of subjects taking allopathic treatment. 195 (76.2%) subjects were taking treatment regularly and 8.2% were irregular on treatment. Nearly 55 (21.5%) subjects were undergoing blood investigation regularly in every 6-12 months' period.

Table 22: Distribution of present Co-Morbid Condition among Diabetes Subjects

Co-Morbid Condition	**Number of persons**	**%**
No	216	84.4
Giddiness	17	6.6%
Joint Pain	10	3.9%
Eye Defect	9	3.5%
Diabetic Foot	2	0.8
Skin Infection	1	0.4
Hemipharesis	1	0.4

Table 22 shows 216 (84.4%) Diabetes subjects not having any complication and 40 (15.6%) subjects having Co-Morbid Condition like giddiness, joint pain, eye defect, diabetic foot, skin infection, Hemipharesis. 10 (3.9%) were having joint pain, 9 (3.5%) were having eye defect and 17 (6.6%) having giddiness.

Table 23: Numbers of males and females in different age group among Diabetes and Non-Diabetes subjects

Age group in years	**Diabetics Number**	**Non Diabetics Number**	**Total Number**
≤20	-	140(9)	140(7.7)
21 – 30	7(2.7)	459(29.3)	459(25.2)
31 – 40	40(15.6)	382(24.4)	422(23.2)

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41 – 50	74(28.9)	280(17.9)	354(19.4)
51 – 60	80(31.3)	198(12.7)	278(15.3)
> 60	55(21.5)	106(6.8)	161(8.8)
Total	256 (100)	1565 (100)	1821(100)

Age Vs Diabetics and Non Diabetics excludes $\leq$ 20years $\chi 2 = 208.46, df = 5, P\ value = 0.000$

Table 23 shows 7 diabetics (2.7%) in the age group of 21-30 years, 40 diabetics (15.6%) in the age group of 31-40 years, 74 diabetics (28.9%) were in the age group of 41-50 years, 80 diabetics (31.3%) were in the age group of 51-60 years and 55 diabetics (21.5%) were above 60 years.

Table 24: Mean age of male and female and its association among Diabetes and Non-Diabetes subjects

$* t = 15.287, P\ value = 0.000 \#\ t = 9.902, P\ value = 0.000 \sigma\ t = 11.697, P\ value = 0.000$

Table 24 shows that the mean age of total 1821 was (40.1±26.6) of which 256 Diabetic subjects were (52.67±15.1) and 1565 Non-Diabetic subjects were (38.0±15.1). The difference between mean age of Diabetics and Non-Diabetics and Prevalence of Type 2 Diabetes mellitus were found to be statistically significant (P<0.05).

Risk Factors	**Diabetics Number (Mean Age±SD)**	**Non-Diabetics Number (Mean Age±SD)**	**Total Number (Mean Age±SD)**
Total*	256 (52.7±15.1)	1565 (38.0±15.1)	1821 (40.1±26.6)
Male#	111 (52.8±1.2)	748 (38.5±0.5)	859 (40.4±15.1)
Female σ	145 (52.6±13.1)	817 (37.5±14.5)	962 (39.8±15.1)

The mean age of a total of 859 males were (40.4±15.1), of this 111 were diabetics (52.8±1.2) and Non –Diabetics (38.5±0.5). The difference between mean age of Diabetics and Non-Diabetics and Prevalence of Type 2 Diabetes mellitus were found to be statistically significant (P<0.05). The mean age of a total of 962 females were (39.8±15.1), of which 145 were Diabetics (52.6±13.1) and 817 were Non-Diabetics (37.5±14.5). The difference between mean age of Diabetics and Non-Diabetics and Prevalence of Type 2 Diabetes mellitus were found to be statistically significant (P<0.05).

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Table 25: Gender wise comparison of Diabetes and Non-Diabetes subjects according to BMI

Body Mass Index BMI (Kg/m²)	*Male Number (%)		**Female Number (%)		***Total Number (%)	
	Diabetic	Non Diabetic	Diabetic	Non Diabetic	Diabetic	Non Diabetic
≤ 18.5	5 (4.5)	72 (9.6)	4 (2.8)	85 (10.4)	9 (3.5)	157 (10.0)
18.5-24.99	63 (56.8)	437 (5.8)	60 (41.4)	474 (51.0)	123 (48.1)	911 (58.2)
25-29.99	30 (27.0)	187 (25.0)	57 (39.3)	192 (23.5)	87 (34)	379 (24.2)
≥ 30	13 (11.7)	52 (7)	24 (16.6)	66 (8.1)	37 (14.5)	118 (7.5)
Total	111 (100)	748 (100)	145 (100)	817 (100)	256 (100)	1565 (100)

χ^2 = 5.925, df = 3, P value = 0.115 **χ^2 = 35.26, df = 3, P value = 0.000 *χ^2 = 34.806, df = 3, P value = 0.000**

Table 25 shows 9 Diabetics (3.5%) and 157 Non Diabetics (10.0%) were less than or equal to the BMI of 18.50, 123 Diabetics (48.1%) and 911 Non Diabetics (58.2%) were between 18.51 to 24.99, 87 Diabetics (34%) and 379 Non Diabetics (24.2%) were between the BMI of 25 to 29.99, 37 Diabetics (14.5%) and 118 Non Diabetics (7.5%) were more than the BMI of 30. An overall evaluation revealed in the overweight category numbers of females (57) were more than males (30) and similarly in the obese category numbers of females (24) were more than males (13).
The difference between BMI of Diabetics and Non-Diabetics and Prevalence of Type 2 Diabetes mellitus were not found to be statistically significant in males (P>0.05).

Table 26: Comparison of risk factor of dietary pattern among Diabetes and Non-Diabetes according to sex wise

Risk Factors	Diabetic	Non Diabetic	Odds ratio (OR)	P Value
Total	**256(100)**	**1565(100)**		
Food Habit				
Vegetarian	28 (10.9)	86 (5.5)	1.839	P=0.002
Non vegetarian	228 (89.1)	1479 (94.5)		
Type of Diet				
Mixed	123 (48.1)	860 (55)	-	P=0.000
Carbohydrate	99 (38.7)	648 (41.4)		
Protein	34 (13.3)	57 (3.6)		
Fat rich food				
No	89 (34.8)	614 (39.2)	0.848	P=0.188
Yes	167 (65.2)	951 (60.8)		

Table 26 shows 28 Diabetics (10.9%) and 86 Non Diabetics (5.5%) were vegetarians, 228 Diabetics (89.1%) and 1479 Non Diabetics (94.5) were non-vegetarians and also both are

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statistically significant (P<0.05). Those who are eating non-vegetarian 1.84 times having higher risk of getting Diabetes compare to vegetarians.
123 Diabetics (48.1%) and 860 Non Diabetics (55%) were mixed diet, 99 Diabetics (38.7%) and 648 Non Diabetics (41.4%) were carbohydrate rich diet, 34 Diabetics (13.3%) and 57 Non Diabetics (3.6%) were eating protein rich diet, the difference between type of food of Diabetics and Non-Diabetics and Prevalence of Type 2 Diabetes mellitus were found to be statistically significant (P<0.05). 89 Diabetics (34.8%) and 614 Non Diabetics (39.2%) were not eating any type of oil rich foods, 167 Diabetics (65.2%) and 951 Non Diabetics (60.8%) were eating oil rich foods regularly.

Table 27: Comparison of known Hypertension and Known Dyslipedemia among Diabetes and Non-Diabetes according to sex wise

Risk Factors	Male Number (%)		Female Number (%)		Total Number (%)	
	Diabetic	Non Diabetic	Diabetic	Non Diabetic	Diabetic	Non Diabetic
Total	111(100)	748(100)	145(100)	817(100)	256(100)	1565(100)
Known Hypertension*						
No	80 (72.1)	727 (97.2)	93 (64.1)	792 (96.9)	173 (67.6)	1519 (97.1)
Yes	31 (27.9)	21 (2.8)	52 (35.9)	25 (3.1)	83 (32.4)	46 (2.9)
Known Cholesterol#						
No	101 (9.1)	734 (98.1)	133 (91.7)	810 (99.1)	234 (91.41)	1544 (98.7)
Yes	10 (9.0)	14 (1.9)	12 (8.3)	7 (0.9)	22 (8.6)	22 (1.4)

$*\ \textbf{Males}\ \chi 2 = 107.25, df = 1, P\ value = 0.000, OR = 0.166, *\ \textbf{Females}\ \chi 2 = 179.94, df = 1, P\ value = 0.000, OR = 0.156$
$*\textbf{Total}\ \chi 2 = 290.53, df = 1, P\ value = 0.000, OR = 0.159$
$\#\textbf{Males}\ \chi 2 = 18.130, df = 1, P\ value = 0.000, OR = O.290, \quad \#\textbf{Females}\chi 2 = 35.01, df = 1, P\ value = 0.000, OR = 0.220$
$\#\textbf{Total}\ \chi 2 = 50.184, df = 1, P\ value = 0.000, OR = 0.257$

Table 27 shows 83 Diabetics (32.4%) having known hypertension in that females 52 (35.9%) more than males 31 (27.9%). 22 Diabetics (8.6%) having known Dyslipedemia and the difference between known Dyslipedemia of Diabetics and Non-Diabetics and Prevalence of Type 2 Diabetes mellitus were found to be statistically significant (P<0.05). Total numbers of houses in five number of villages, under five number of PHC surveyed in this study were 570. Total members were 2169 and 1821 participants were equal and above the age group of 18 years.
The total eligible study population was 1821 of which males 859 (47.1%) and females 962 (52.8%) respectively as shown Table 3. In other studies, the population selected in rural areas were 1403 and 616 respectively (10,43). Age group between 21-30 years accounted 466 (25.6%), 31-40 years accounted 422 (23.2%), 41-50 years accounted 354 (19.4%), and age above 60 years 161 (8.8%). The cumulative age of 1821 participants was 72,941 years (males 72851 years & females 72893) years accounting as mean age of the participants was 40.1±26.6 years and males & females were 40.4±15.1 (859) & 39.8± 15.1(962) years respectively.
The prevalence of Diabetes mellitus among 1821 was 14.0% which is high among females 15.1% (962) than males 12.9% (859). Prevalence of Diabetes was more among females than the males. Total prevalence of similar studies conducted elsewhere as shown with the similar range of

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prevalence in rural area are 18.17% and 9.2% (9,51) compare to urban areas elsewhere conducted showing higher prevalence of Diabetes mellitus 4.6% and 9% (4,7). Table 24 shows, the mean age of Diabetics of 256 was (52.7±15.1) years, males (111) and females (145) were (52.8±15.1) and (52.6±13.1) years respectively. Shabana et al study was found to be mean age of Diabetes with similar (102). The mean age of Non-Diabetics of 1565 was found to be (38.0±15.1) years, males (748) and females (817) were (38.5±0.5) and (37.5±14.5) years.

Age group between 41-50 & 51-60 the prevalence of Type 2 Diabetes mellitus was more in Females (23.7%) & (33.6%) than males (18.2%) & (23.9%). Prevalence of Type 2 Diabetes mellitus was more in 60 (34.2%) years and above, age group between 51-60 (28.8%) and 41-50 (20.9%) shows in Table 11. The prevalence of Type 2 Diabetes mellitus was increasing as their age increases was not found to be statistically significant (P>0.05). Similarly, previous studies shown increase in prevalence of Diabetes as age increases (3,7,14,55). Previously reported higher prevalence in females compare to males (3,56,103,104).

The subjects in this study based on their education status as illiterates accounted 416 (22.8%) which is higher. Female illiterates (29.8%) were more than males (15.0%). Degree holders accounted 19.4% and 57.7% subjects accounted together under the category of primary, middle, high and higher secondary school. Diploma graduate women (24.0%) were more than male graduates (7.2%) shows in Table 6 (3,7,14,55).

Table 16 shows nearly 39% accounted under the unemployed category which included house wives. Daily wagers were 20.5% and this shows that in the rural areas most of them were illiterates and persons who had reached or completed schooling. Arora v et al, Reshma S Patil et al, Shiju TM et al, Rao C R et al studies were categorized similarly (3,7,14,55).

Table 8 shows 19.9%, 30.3%, 29.9% and 29.2% total subjects were overweight in the age group between 21 to 30, 31 to 40, 41 to 50 and above the age group of 60 years. 6.7% of total subjects obese in the age group of 21 to 30 years. There is a statistically significant difference among BMI of males and females in different age group in this study (P<0.05) and which interestingly BMI were also found to be difference among age group of males and females respectively. Similarly, BMI was categorized in previous studies (11,14,46,51,55).

The prevalence of Diabetes mellitus among lean Diabetics was 5.4% in 18.5 Kg/m², 11.8% and 48.4% among normal BMI and overweight or obese subjects. Prevalence of overweight & obese females (22.8% & 26.6%) was more than males (13.82% & 20.0%). Table 25 shows differences were found to be statistically significant among female subjects and total participants in this study (P<0.05). More number of diabetic men and women was 11.7% and 16.6% over the BMI of 30 Kg/m² in this study.

Central obesity is one of the important risk factor for prevalence of Diabetes mellitus. Rao and co-workers and Bener co-workers were found association between Diabetes and abdominal obesity like current study (55,104). Ramchandran et al, also reported significant association of central obesity with Diabetes (13,44). Table 9 and 10 shows 166 (9.1%) were using tobacco products and none of the females were smokers in this study, 184 (10.1%) were consuming alcohol and none of the females were consuming alcohol, and 1705 (93.6%) were not doing physical activity or exercise in this study.

The prevalence of type 2 Diabetes mellitus among tobacco users, alcoholics and lack of physical activity or exercise was found to be 18.3%, 16.3% and 11% respectively as shown in the Table 17. Previous studies also reported the association between prevalence of Diabetes and tobacco, alcohol and physical inactivity were found to be statistically significant (P<0.05) (11,14,46,49,51,55,59,66,67,72,73).

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Table 20 shows mean duration of Diabetes among smokers was 65.6±28.1months (27) which is greater than the non-tobacco user 53.4±26.7 months (229). Mean duration of 23 male tobacco users were (67.1±28.1 months) and 4 female tobacco users were (57±35.4 months). Mean duration of Diabetes in months of males, females and total subjects among tobacco users and non-tobacco users were not found statistically significant (P>0.05). Mean duration of Diabetes among non-alcoholic was 56.4±26.7 months (225) which is greater than alcoholic's 41.3±27.0 months (31) therefore male also alcoholics and non-alcoholics were not found statistically significant (P>0.05). Mean duration of Diabetes among those who were not done any kind of physical activity 50.5±26.7 months (200) lower than those who were doing physical activity 69.9±26.6 months (56). Mean duration of Diabetes in months of males and physical activity were not found statistically significant (P>0.05).

The sibling having Diabetes with the study subjects were found to be nearly 50% in this study. 86 Diabetes subjects were having more than one sibling with Diabetes and 40 Diabetes subjects were having one sibling with Diabetes shows in Table 14. The availability of references is very hard to Indian situations.

Table 24 shows nearly 60% of Diabetic patients suffering from Diabetes less than 48 months. 30% were diagnosed as Diabetes less than 24 months, among them more males 33 (29.7) were diagnoses than females 34 (23.4%) last two years.

Table 21 shows 216 (84.4%) subjects were taking medical care and 40 (15.6%) subjects were not taking treatment. 148 (57.8%) were taking treatment in government and 65 (25.4%) were taking treatment in private 214 (83.6%) of subjects taking allopathic treatment.

This study shows Prevalence of Diabetes mellitus among vegetarians 24.6% (28) and non-vegetarians were 13.4% (228). Prevalence of Diabetes mellitus was 13.3% (99) those eating carbohydrate diet, 12.5% (123) those food habit mixed diet and 37.4% (34) in those eating protein diet. Prevalence of Diabetes mellitus was 14.9% (167) those eating oil rich foods and more than the prevalence of 12.7% (89) not eating oil rich foods shows in Table 26. OR= 2.2 among males, OR=1.5 among females and OR=1.8 among total subjects in Vegetarian and Non-Vegetarian were found to be statistically significant in this study (96,11).

Table 19 shows Prevalence of Type 2 Diabetes mellitus among known hypertension, females 67.5% was more than males 59.6% in this study. Similarly, some studies showed strong correlation between hypertension and Diabetes (7,11). Prevalence of Type 2 Diabetes mellitus among known Dyslipedemia was 51.2%. Comparison of known hypertension and known Dyslipedemia among Diabetes and Non-Diabetes according to sex wise is associated statistically significant (P<0.05). Similarly, some study shown strong correlation between Dyslipedemia and Diabetes (7,11,102).

Table 22 shows 216 (84.4%) Diabetes subjects not having any complication and 40 (15.6%) subjects having Co-Morbid Condition like giddiness, joint pain, eye defect, diabetic foot, skin infection, Hemipharesis. 10 (3.9%) were having joint pain, 9 (3.5%) were having eye defect and 17 (6.6%) having giddiness. Arora V et al study showed long term effect of type 2 Diabetes mellitus leading to serious conditions like Coronary heart disease, Retinopathy, Cerebro vascular accident, Neuropathy and Nephropathy (3).

The study gave in depth analysis of prevalence of Diabetes, co-morbid conditions and various risk factors associated with Diabetes among rural population of Pondicherry.

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5. Conclusion

The study would have the limitations such as recall bias by old age subjects about their duration of Diabetes and previous co-morbid conditions. It was not possible to classify definition of Diabetes mellitus and Pre-Diabetes (Impaired Glucose Tolerance) in this study for analysis purpose. The study did not take consideration of Gestational Diabetes mellitus among pregnant women in the analysis. Diabetes mellitus it seems to be increasing the populations of rural area. This study mainly focusing on lifestyle and healthy lifestyle among the risk factors may be effective.

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Ethical approval: The study was approved by the Institutional Ethics Committee

6. Conflict Of Interest

The authors declare no conflict of interest.

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