

**INCIDENTAL RISK OF PRE-DIABETES AMONG INDIVIDUALS OF SAKKARDARA
REGION AT NAGPUR : AN OBSERVATIONAL STUDY**

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ABSTRACT

Introduction-Pre-diabetes is a precursor condition for type 2 Diabetes mellitus. Although in many cases it is reversible, Pre-diabetes frequently remains undiagnosed and therefore risk of developing type 2 Diabetes Mellitus is increased. The risk factors for pre-diabetes are same as those for type 2 diabetes mellitus. An individual's risk factors for pre-diabetes include obesity, high waist circumference, family history of diabetes, hypertension, cardiovascular diseases etc. Pre-diabetes itself is a risk factor for type 2 Diabetes Mellitus.⁽⁴⁾ **Material and Methods**-In this study 66 individuals were selected from our institutions on the basis of Indian diabetes risk score and blood sugar level. After diagnosed pre-diabetic individuals all were observed for demographic characteristics and the statistical analysis done. **conclusion**-In this observational study we can conclude that Age, occupation, dietary habits, frequency of micturition at night, physical Inactivity, diwaswap(day time sleep), overweight or abnormal BMI, Kapha predominant prakriti all these factors might be the risk factors for Pre-diabetes and Diabetes.

KEYWORDS: Prediabetes, Incidence, Risk Factor.

INTRODUCTION

Diabetes is an "Iceberg" disease. Based on current estimates, increase in both the prevalence and incidence of type 2 diabetes mellitus have arisen globally. During year 2014, the number of cases of diabetes worldwide was estimated to be around 422 million. Of these, more than 90% are type 2 diabetes. In 2012, an estimated 1.5 million people died from consequences of high blood sugar levels. More than 80 % succumb to the complications due to Diabetes Mellitus in developing and poor countries. The prevalence of Diabetes globally was estimated to be 8.5% in adults aged more than 18 years.^[1]

Diabetes is a non-communicable disease which is attaining increasing importance among the adult population in both developed and developing countries. The effect of chronic non-communicable diseases on the lives of people is serious when measured in terms of loss of life, disability, family poverty and economic loss to the country. In 2008, 57 million deaths occurred, out of these 36 million or 63 percent were due to non-communicable disease in which 3.5 percent deaths were due to Diabetes.^[2]

India is facing a rapid health transition with a rising burden of non-communicable diseases causing significant morbidity and mortality, both in metropolitan and rural population, with considerable loss in potentially productive years (age 35-64 years) of life. In India non-communicable diseases are assessed to account for about 53 percent of all deaths.^[2]

Unfavourable modification of lifestyle and dietary habits that are related with urbanization are believed to be the most important factors for the development of Diabetes. In urban areas the prevalence is approximately twice than that in rural areas.^[1]

Diabetic patients, if undiagnosed or inadequately treated, develop multiple chronic complications leading to irreversible disability and death. Coronary heart disease and stroke are more common in patients of diabetes than in the general population. Micro vascular complications like diabetic nephropathy and diabetic neuropathy and retinopathy are serious health problems resulting in deterioration of the quality of life and premature death. In fact, diabetes is listed among the five most important factors of the cardiovascular disease epidemic in Asia. Lower limb amputation are at least 10 times more common in diabetic than in non-diabetic subjects in

developed as well as developing countries, more than half of all non-traumatic amputations are due to diabetes. In pregnant woman diabetes diagnosed for first time during pregnancy carries a high health risk to both mother and foetus. The mortality due to diabetes among the people with diabetes is 1.5 to 2.5 times higher than in the general population.^[1]

The population in India has an increased vulnerability to Diabetes mellitus. According to WHO the target population for screening of Diabetes in high risk groups. These groups are 1) those in the age group 40 years or more. 2) Those whose parents or siblings are Diabetic. 3) Those who are obese. 4) Woman who have or had a baby weighing more than 4.5 kg. 5) Women who show excess weight gain during pregnancy.^[1]

Diabetes is a group of metabolic disorder characterized by a chronic hyperglycaemia condition resulting from insufficient action of insulin, impaired insulin secretion and increased insulin resistance.^[3]

Diabetes mellitus is one of the most common chronic disease across the world and number of diabetic patients is on rise.^[3]

Type 2 Diabetes Mellitus or non-insulin dependent diabetes mellitus account for at least 90% of all cases of diabetes. It is characterised by insulin resistance and relative insulin deficiency, either or both of which may be present at the time diabetes is diagnosed. Type 2 diabetes remain undetected for many years and the diagnosis is often made when a complication appears or a routine blood or urine glucose test is done.⁽³⁾

Pre-diabetes is a precursor condition for type 2 Diabetes mellitus. Although in many cases it is reversible, Pre-diabetes frequently remains undiagnosed and therefore risk of developing type 2 Diabetes Mellitus is increased.

The risk factors for pre-diabetes are same as those for type 2 diabetes mellitus. An individual's risk factors for pre-diabetes include obesity, high waist circumference, family history of diabetes, hypertension, cardiovascular diseases etc. Pre-diabetes itself is a risk factor for type 2 Diabetes Mellitus.^[4]

MATERIAL AND METHODS

- This paper is some part of my postgraduate dissertation work
- Individuals were selected from OPDs and IPDs of our institution.

Objective Parameters

Indian Diabetes Risk Score	
Particulars	Score
1)AGE:- a) <35 years	0
b) 35-49 years	20

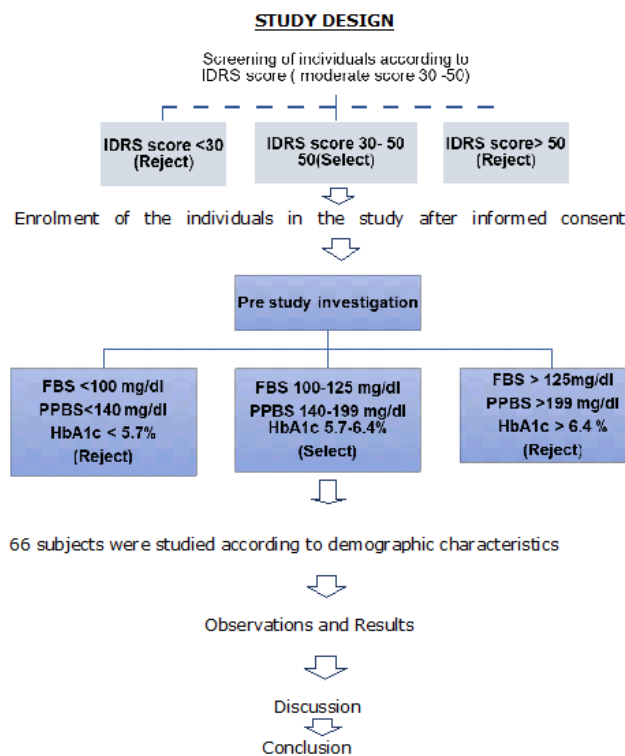
- The diagnosed individuals of pre-diabetes were taken according to IDRS (Indian Diabetes Risk Score) moderate score (30 to 50) and Blood sugar Level
- Study was carried out in *Swasthyarakshan* OPD of our institute [at Sakkardara region of Nagpur].

Type of Study

An Observational study

Sample Size

66 individuals were studied.



Inclusion criteria

- 1) Diagnosed individuals of pre-diabetes according to IDRS (moderate score 30 to 50) and BSL
- 2) Age group between 30 to 60 years.
- 3) With no any other systemic disorder.
- 4) Individuals of both sex.

Exclusion criteria

- 1) IDRS > 60 and < 30.
- 2) Individuals with age <30 yrs and >60 yrs
- 3) Pre-diabetes with any other systemic disorder and complications.
- 4) ANC and PNC
- 5) Individuals undergone any major surgery.

c) >50 years	30
2) WAIST CIRCUMFERENCE:-	
a) Waist < 80 cm(female) Waist <90 cm(male)	0
b) Waist >80-89 cm(F) Waist >90-99 cm(M)	10
c) Waist >90 cm(F) Waist >100 cm(M)	20
3) PHYSICAL ACTIVITIES	
1. Vigorous exercise (regular) or strenuous (manual) work at home/work.	0
2. Moderate exercise (regular) or moderate physical activity at home/work.	10
3. Mild exercise (regular) or mild physical activity at home/work.	20
4. No exercise and sedentary activities at home/work.	30
4) FAMILY HISTORY OF DIABETES	
1. No diabetes in parents	0
2. One parent is diabetic	10
3. Both parent are diabetic	20

Score Calculation

≥60:-Very high risk of having diabetes

30-50:- The risk of having diabetes is moderate.

<30:- Risk of having diabetes is probably low

1) Fasting blood sugar

Normal: <100 mg/dl

Pre-diabetes: 100-125 mg/dl

Diabetes: >125 mg/dl

2) Post prandial blood sugar

Normal: <140 mg/dl

Pre-diabetes: 140-199 mg/dl

Diabetes: >199 mg/dl

3) HbA1c

Normal: <5.7 %

Pre-diabetes: 5.7 to 6.4%

Diabetes: > 6.4

- Place of work**

Swasthyarakshan OPD, of our institution.

- Ethical Clearance**

Ethical clearance from Ethical committee of our institute was obtained before beginning of the research work.

- Case Report Form**

Records of all patients were documented and follow up were mentioned in case report form before and after completion of study.

- Sampling Technique**

Simple random method

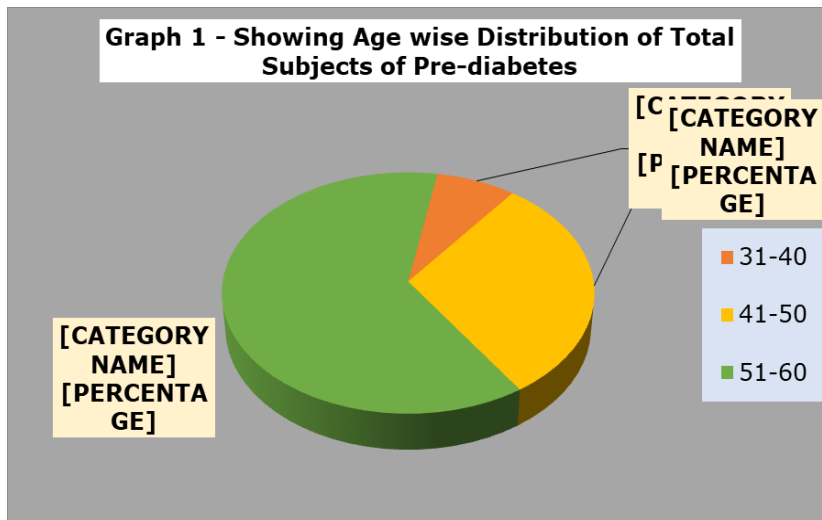
OBSERVATIONS AND RESULTS

In this study 66 subjects with a single group of Pre-diabetes after the screening according to Indian Diabetes Risk Score were selected randomly as per selection criteria irrespective of sex, religion and socio-economic status. They were enrolled according to inclusion criteria. Subjects attending Outdoor Patient unit of Swasthavritta department in hospital were examined. After complete examination, subjects were recruited by allotting numbers from 1-66. All observations were statistically analysed and results obtained are presented as below-

1) Total number of Subjects recruited in the study-66
Total 66 subjects were enrolled. So the demographic data for the same is provided.

Demographic Data**1. Age****Table 1 - Age wise Distribution of Total Subjects of Pre-Diabetes**

Age in Years	No. of Subjects	Percentage
31-40	5	8
41-50	20	30
51-60	41	62
Total	66	100



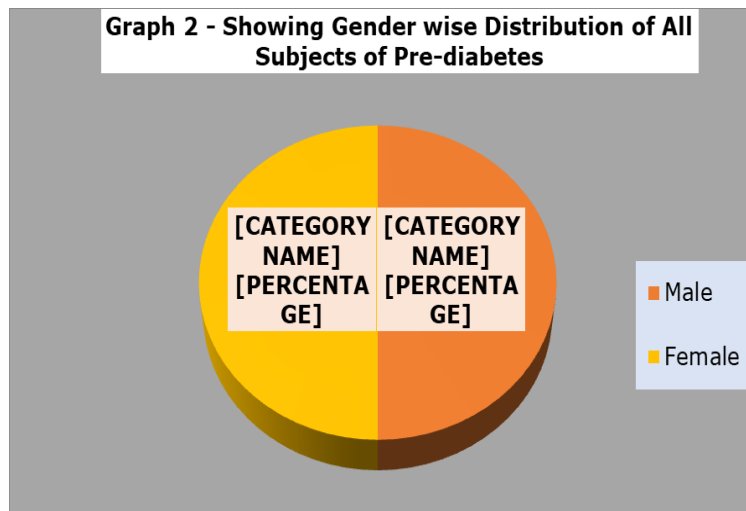
In this study it was observed that maximum number of subjects i.e. 62% were belonging to the age group of 51-60yrs and 30% subjects belonging to age group 41-50yrs, and the rest of them i.e. 8% were between the age-group of 31-40yrs.(Table-1)

Gender	No. of subjects	Percentage
Male	33	50
Female	33	50
Total	66	100

2) Gender

Table 2 -Gender wise Distribution of Total Subjects of Pre-Diabetes.

Gender- Gender wise distribution observed that 33 subjects i.e. 50 % were male and 33 subjects i.e. 50% were female. (Table-2)



3) Education

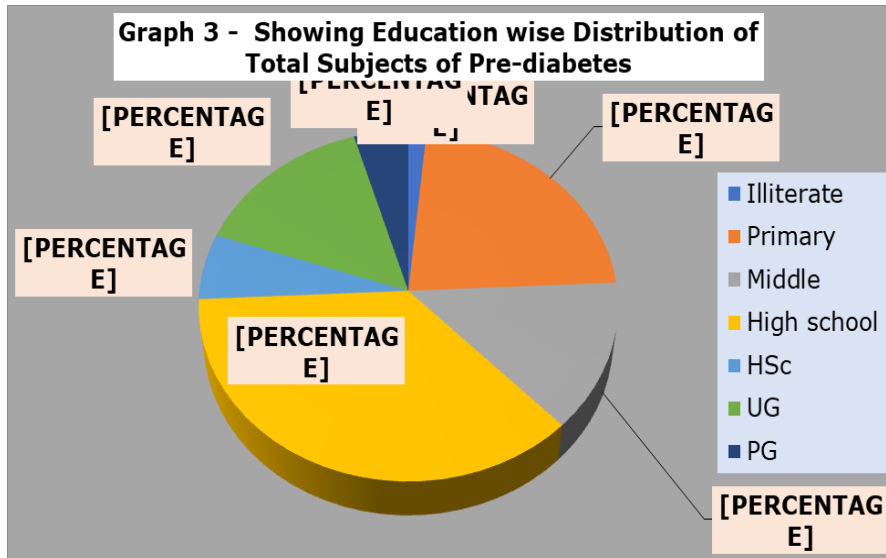
Table 3: Education wise Distribution of Total Subjects of Pre-Diabetes.

Education	No. of individuals	Percent
Illiterate	1	1
Primary	15	23
Middle	9	14
High school	24	36
HSC	4	6
UG	10	15
PG	3	5
Total	66	100

Education wise distribution of all subjects observed that 23% subjects were educated primarily, 14 % subjects

were educated upto middle school, 36% subjects were high school passed which was highest in number, 6%

subjects were HSC passed, 15% subjects were undergraduate and 5% subjects have done their Post-graduation.



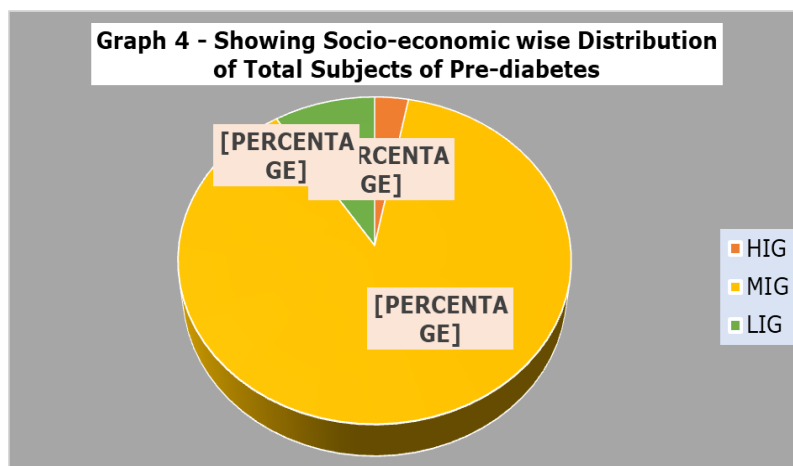
4) Socio-Economic Status

Table 4 - Socio-Economic wise Distribution of Total Subjects of Pre-Diabetes

Socio-Economic Status	No. of subjects	Percentage
HIG	2	3.03
MIG	58	87.88
LIG	6	9.10
Total	66	100

Socio-economic wise distribution of all subjects observed that only 3.03% were of High income group (HIG), maximum subjects were of Middle income

group(MIG) i.e. 87.88% and 9.10 % subjects were of Lower income group(LIG).

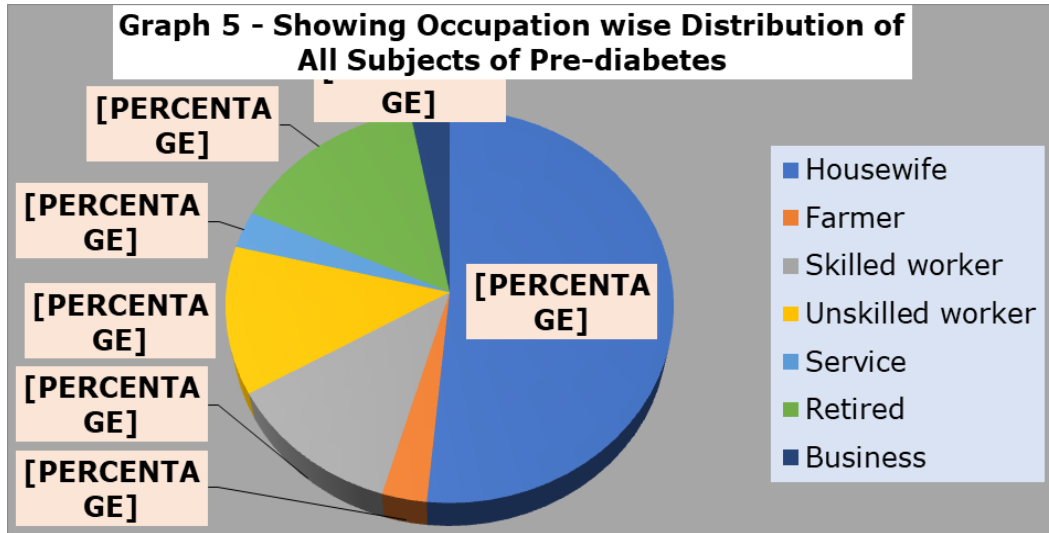


5) Occupation

Table 5 - Occupation wise Distribution of Total Subjects of Pre-Diabetes.

Occupation	No. of Subjects	Percentage
Housewife	34	51.51
Farmer	2	3.03
Skilled worker	8	12.12
Unskilled worker	8	12.12
Service	2	3.03

Retired	10	15.15
Business	2	3.03
Total	66	100



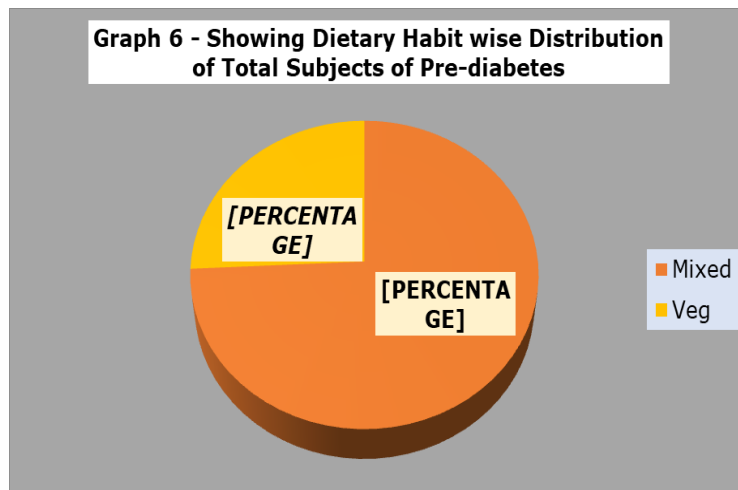
Occupation wise distribution of the study showed that maximum subjects i.e. 51.51% were housewives. Whereas 24 % subjects were labour (skilled and unskilled worker), 3% were Farmer, 3% were on Service, 3% were business man and 15% were retired.

Dietary habits of all patients showed that maximum subjects were taking mixed diet i.e. 74.24% and remaining 25.76 were taking pure vegetarian diet.

6) Dietary Habits

Table 6: Dietary Habit wise Distribution of Total Subjects of Pre-Diabetes

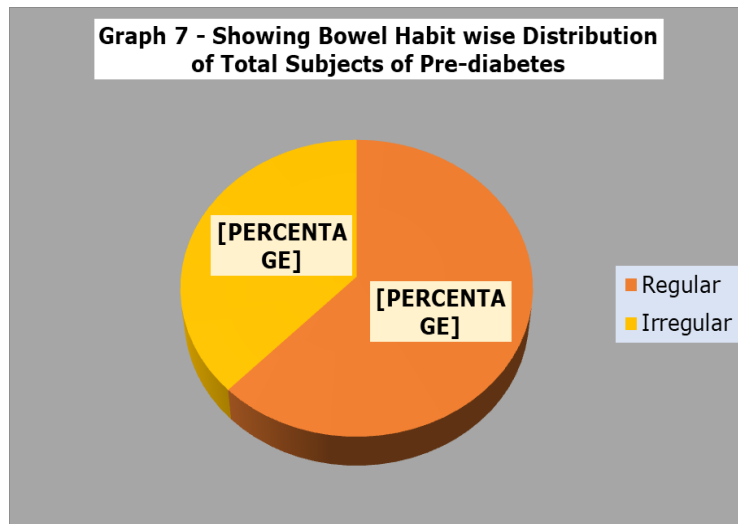
Diet	No. of subjects	Percentage
Mixed	49	74.24
Vegetarian	17	25.76
Total	66	100



7) Bowel Habits

Table 7- Bowel Habit wise Distribution of Total Subjects of Pre-Diabetes.

Bowel Habit	No. of subjects	Percentage
Regular	41	62.12
Irregular	25	37.88
Total	66	100



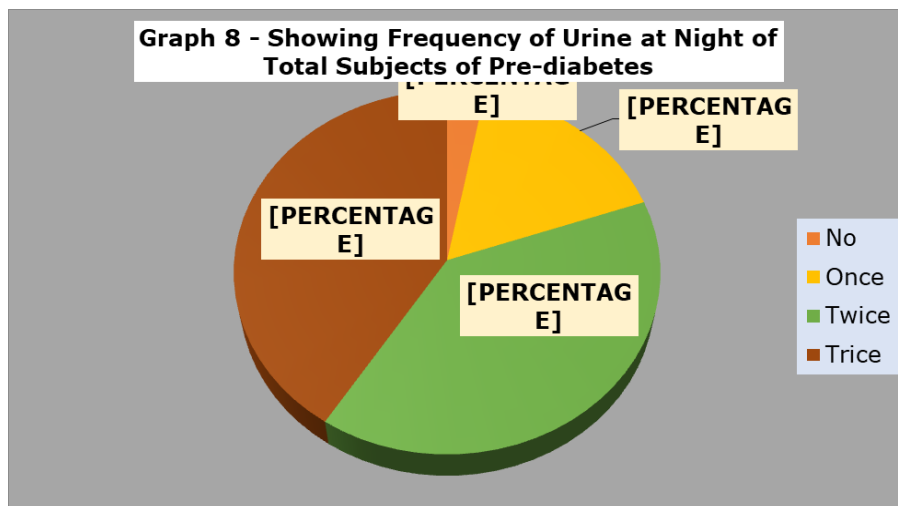
Bowel habits wise observation showed that maximum subjects were of regular bowel habit i.e. 62.12 % and remaining 37.88 % were of irregular bowel habit.

Urine frequency at night of all subjects observed that maximum i.e. 41 % subjects were micturating three times at night, 39.39 % were micturating at night, 16.67 % were micturating once and 3.03 % were of no frequency at night.

8) Urine Frequency at Night

Table 8: Showing Urine Frequency at Night of Total Subjects of Pre-Diabetes.

Frequency at night	No. of subjects	Percentage
No	2	3.03
Once	11	16.67
Twice	26	39.39
Thrice	27	41
Total	66	100

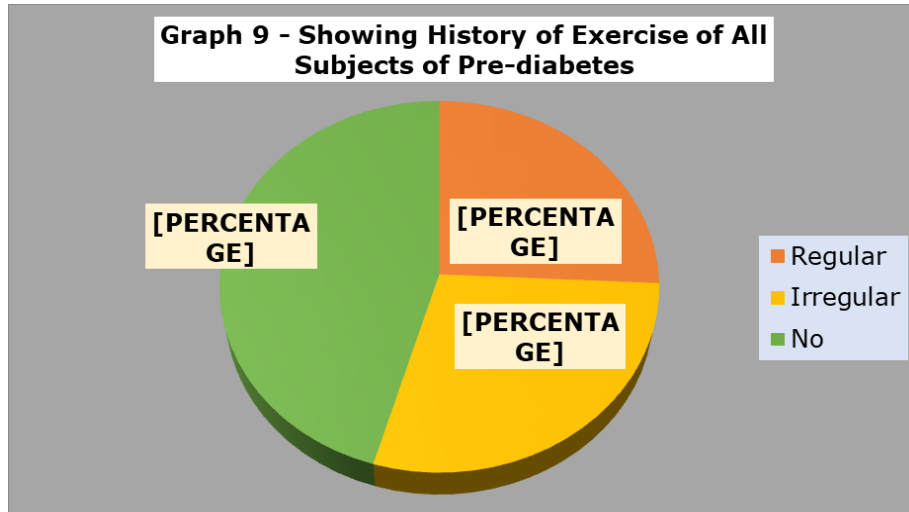


9) Exercise

Table 9 – Showing History of Exercise of Total Subjects of Pre-Diabetes.

Pattern of Exercise	No. of subjects	Percentage
Regular	17	26
Irregular	19	29
No	30	45
Total	66	100

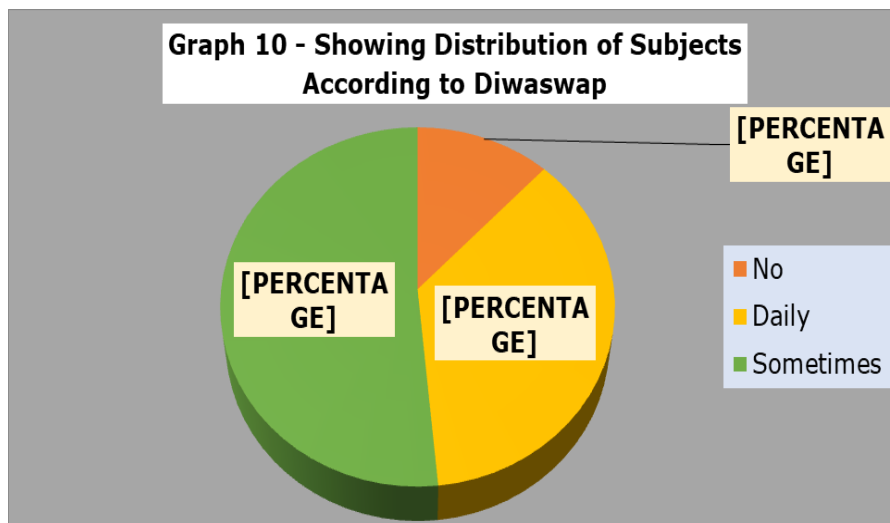
History for exercise taken of every individuals observed that maximum i.e. 45 % subjects were not doing exercise, 29 % subjects were doing exercise irregularly and 26% were doing exercise regularly.



10) *Diwaswap*

Table 10: Showing History of *Diwaswap* of Total Subjects of Pre-Diabetes.

History	No. of subjects	Percentage
No	8	12
Daily	24	36
Sometimes	34	52



History for *Diwaswap* of all pre-diabetic subjects observed that 52 % subjects were used to sleep at day time sometimes, 36 % subjects were used to sleep at day

time daily and only 8 % subjects were not used to take sleep at day time.

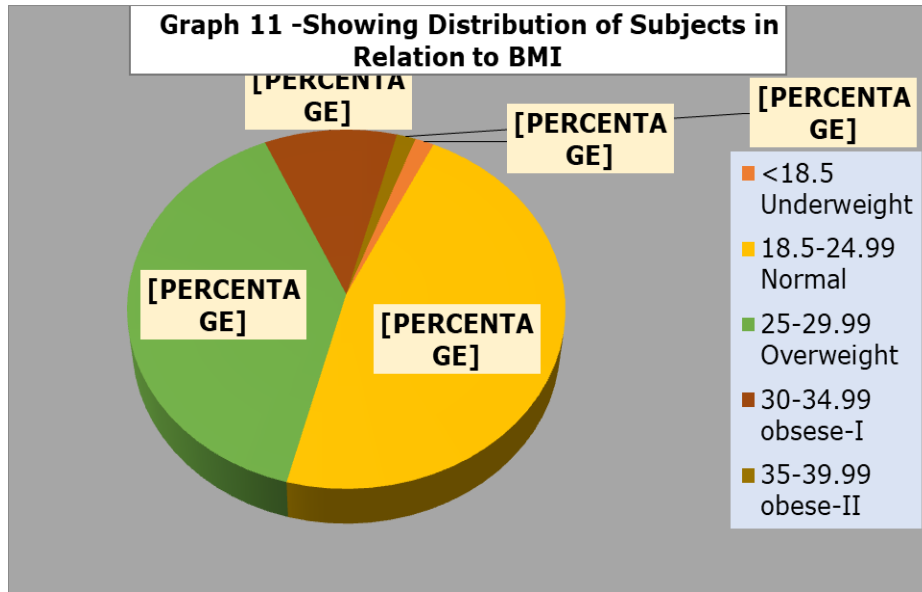
11) Body Mass Index

Table 11- BMI wise Distribution of Total Subjects of Pre-Diabetes.

BMI	No. of subjects	Percentage
<18.5 Underweight	1	1 %
18.5-24.99 Normal	31	47
25-29.99 Overweight	26	39
30-34.99 obese-I	7	11
35-39.99 obese-II	1	2
Total	66	100

Body Mass Index wise distribution observed that maximum i.e. 47 % subjects were of normal BMI, 39 % subjects were of overweight, 11 % were of obese –I

class, 2 % were of obese – II class and only 1 % were of underweight.



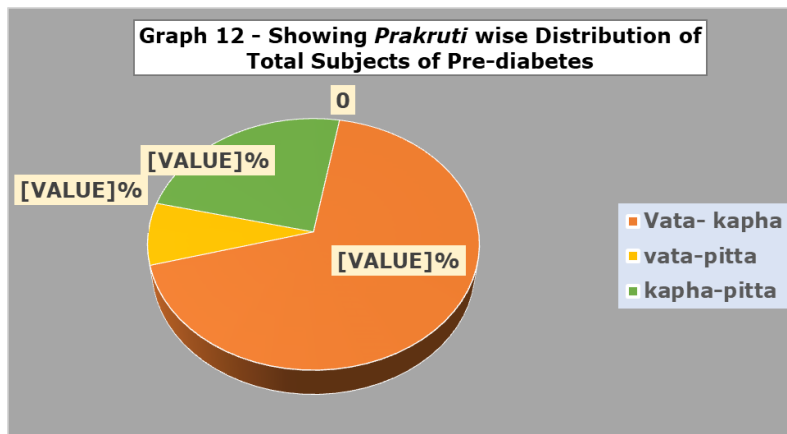
12) Prakruti

Table 12- Prakrutiwise Distribution of Total Subjects of Pre-Diabetes.

Prakruti	No. of subjects	Percentage
Kapha-Pitta	16	24.24
Vata-Kapha	45	68.18
Vata-Pitta	5	7.58
Total	66	100

Prakruti wise observation showed that maximum subjects were of Vata – Kapha Prakrutii.e. 68 %, 24 %

were of Kapha –Pitta Prakruti and 8 % were of Vata Pitta Prakruti.



Discussion on Demographic Data

Analysis according to Age (Table-1)

Out of the total 66 subjects, maximum 62% were in the age of 51 to 60 years. This shows that as age increases the risk of developing diabetes increases. Increasing age after 45 is one of the risk factor for diabetes and pre-diabetes in modern literature. In this age people adopt faulty dietary habits and faulty lifestyle modification and if this continues for many years it may disturb their normal metabolic functions. That is why we can say that risk of Diabetes increases with age and it is more in age greater than 50 years of age.

Analysis according to Gender (Table-2)

Out of all 66 subjects, 50% were male and 50% were female. This was coincidence otherwise prevalence of diabetes more in male than female.

Analysis according to Educational Status (Table-3)

Educational qualification wise distribution of all subjects observed that 23% subjects were educated primarily, 14 % subjects were educated up to middle school, 36% subjects were high school passed which was highest in number, 6% subjects were HSC passed, 15% subjects were undergraduate and 5% subjects have done their

Post-graduation. Thus, in this study most of the subjects participated were of HSC passed.

Analysis according to Socio-economic Status (Table-4)

In this study maximum number of subjects i.e. 88 % were of Middle income group.

Analysis according to Occupational Status (Table-5)

In this study maximum number of Housewives i.e. 52% were participated and after that on second number labour worker were participated. Housewives work in home only, they don't have habit of doing exercise. They take a nap in the day time which increases *Kapha Dosha* in body and they don't have a knowledge of healthy dietary habits. Labour class worker have irregular timing of eating food and are addicted to alcohol consumption. This might be the reason behind these finding.

Analysis according to Dietary Habits (Table-6)

Among all 66 subjects of Pre-diabetes 74 % subjects were taking mixed diet. Only 26% subjects were taking pure vegetarian diet. We can say that chances of getting diabetes more in non- vegetarian people because of fat rich diet, oily, spicy and more animal fat and protein, which can lead to abnormal metabolic process. Here, it indicates that person consuming mixed diet are more prone to Diabetes.

Analysis according to Bowel Habits (Table-7)

Bowel habits wise observation showed that maximum subjects were of regular bowel habit i.e. 62.12 % and remaining 37.88 % were of irregular bowel habit. This shows that there may be no role of bowel habit.

Analysis according to Urine Frequency at Night (Table-8)

Among all pre-diabetic subjects history taken for urine frequency at night found that maximum i.e. 41 % subjects used to wake up for micturition three times in a night and 39.39 % used to wake up twice at night for micturition. This indicates that polyuria is an alarming sign for detecting pre-diabetes and diabetes in subjects.

According to *Samprapti* of *Prameha* the aggravated *kapha* spreads all over the body, it first of all gets mixed with *Medas* (fat) because there is increase in quantity and decrease in viscosity of *medas kapha* itself is vitiated. Fluid (*dhatu*) of the body along with *kapha* and *meda* enter into the kidney and bladder and get transform into urine and vitiates the *Mutravaha Strotas* which increases the quantity of urine. This might be the pathophysiology of urine frequency at night according to *Ayurveda*.

Analysis according to History of Exercise (Table-9)

Among all pre-diabetic subjects history taken for exercise observed that maximum i.e. 45 % subjects were not doing exercise in any form. From these findings we can say that chances of pre-diabetes and diabetes is more

in those people who are physically inactive and it is one of the risk factor for pre-diabetes and diabetes.

According to *Ayurveda* the causes of *Prameha Aasyasukha* and *swapnasukh* which are very similar to physical inactivity, that is why we can say that being physically active is very important to breakdown the pathophysiology of *Prameha*.

Analysis according to History of Diwaswap (Table-10)

History for *Diwaswap* of all pre-diabetic subjects observed that 52 % subjects were used to sleep at day time sometimes, 36 % subjects were used to sleep at day time daily. From this observation we can say that *Diwaswap* is one of the cause for pre-diabetes and it is explained in *Ayurvedic* literature. Day time sleep conserve the energy obtained from noon meals and is easily stored in form of fat which gradually makes the person overweight and disturbs the BMI.

Diwaswap is one of the cause explained for *Prameha*. Which means that used to sleep at day time after taking food. The first *awasthapak* of *aahar* is *Madhurawastha* and predominant *dosha* is *kapha*, and in this stage who takes sleep *kapha dosha* gets aggravated more which convert into *aamsanchiti* and finally it disturb the metabolic process.

Analysis according to BMI (Table-11)

BMI wise distribution observed that maximum i.e. 47 % subjects were of normal BMI, 39 % subjects were overweight and 11 % were of obese –I class. 50% (39%+11%) of the subjects were of abnormal BMI and it can be said that abnormal BMI is a precursor for pre-diabetes and diabetes. Hence it becomes must to have a normal BMI to reduce the risk of diabetes and pre-diabetes.

Analysis according to Prakruti (Table-12)

Prakruti wise observation showed that maximum subjects were of *Vata-kapha prakruti* i.e. 68 %, 24 % were of *Kapha-Pitta prakruti* and 8 % were of *Vata Pitta Prakruti*. As per the *Ayurvedic* classics, if a person with *Kapha* predominant constitution resorts to use of *Kapha* aggravating factors, results in an aggravation of *Kapha Dosha* and *Kaphaja* disorders. Hence, in pre-diabetes the main vitiated *Dosha* is *Kapha* and same observations were found in this study.

CONCLUSION

In this observational study we can conclude that Age, occupation, dietary habits, frequency of micturition at night, physical Inactivity, diwaswap (day time sleep), overweight or abnormal BMI, *Kapha* predominant prakriti all these factors might be the risk factors for Pre-diabetes and Diabetes.

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