Prevalence of Diabetes Risk in Anantapur Population

A Dissertation Submitted by

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Under the Guidance of

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CERTIFICATE

This is to certify that Boya Anilkumar is submitting Experimental Study & Survey on **"Prevalence of Diabetes Risk in Anantapur Population"** in partial fulfillment of the requirement for the Master of Science (Yoga) registered in **Swami Vivekananda Yoga Anusandhana Samsthana (S-Vyasa University), Bengaluru** and this is a record of the work carried out by him in this institution.

Guide

Date:

Place: Bengaluru

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Assistant professor, S-VYASA University

D E C L A R A T I O N

I, hereby declare that this study was conducted by me at Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA), Bengaluru, under the guidance of **Dr.Kashinath Metri** Assistant professor, S-VYASA University Bengaluru.

I also declare that the subject matter of my dissertation entitled **"Prevalence of Diabetes Risk In Anantapur Population",** has not previously formed the basis of the award of any degree, diploma, associate-ship, fellowship or similar title.

Date: **Boya Anilkumar**

Place: Bengaluru   (Candidate)

A C K N O W L E D G E M E N T

I would like to express the deepest gratitude to my guides**, Dr.Kashinath Metri and co-guide Rashmi Atul Babat** for their guidance and encouragement. I attribute the success of this study, inferences and insights to him.

I thank all the members of the faculty and my friends for their help at different stages of this work. And I also would like to thank all the survey participants involved in my study as subjects. My special thanks and gratitude to our coordinator **Dr. Promila Choudhary** who encouraged and motivated at every stage of my work.

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I will be always grateful to my university Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA) for its support in promoting my career.

Finally, I thank that unseen Divine without whose wish, this work wouldn't have been possible.

Date**:**   **Boya Anilkumar**

Place: Bengaluru   (Candidate)

STANDARD INTERNATIONAL TRANSLITERATION CODE USED TO TRANSLITERATE SANSKRIT WORDS

a	=	अ	ṅa	=	ङ	pa	=	प
ā	=	आ	ca	=	च	pha	=	फ
i	=	इ	cha	=	छ	ba	=	ब
ī	=	ई	ja	=	ज	bha	=	भ
u	=	उ	jha	=	झ	ma	=	म
ū	=	ऊ	ñ	=	ञ	ya	=	य
ṛ	=	ऋ	ṭa	=	ट	ra	=	र
ṝ	=	ॠ	ṭha	=	ठ	la	=	ल
e	=	ए	ḍa	=	ड	va	=	व
ai	=	ऐ	ḍha	=	ढ	śa	=	श
o	=	ओ	ṇa	=	ण	ṣa	=	ष
au	=	औ	ta	=	त	sa	=	स
ṁ	=	अ	tha	=	थ	ha	=	ह
ḥ	=	अः	da	=	द	kṣa	=	क्ष
ka	=	क	dha	=	घ	tr	=	त्र
kha	=	ख	na	=	न	jña	=	ज्ञ
ga	=	ग	gha	=	घ			

TITLE: "PREVALENCE OF DIABETES RISK IN ANANTAPUR POPULATION"

➢ **ABSTRACT**
- **Background**

There is evidence for high prevalence of Type 2 diabetes mellitus and pre-DM in both rural and urban areas of India. Apart from pre-diabetes and diabetes there is large population which are at risk of T2DM.we carried out survey study in the Anantapur population as a part of thE Niyantritha Madhumeha Bharata Abhiyan(NMB) sponsered by AYUSH ministry and locally controlled by the associates or the extened arms of leading yoga institutes like SVYASA.

➢ **Aim:** Present study intended to determine prevalence of Diabetic Risk among population in Anantapur, Andhra Pradesh.

➢ **Methodology**: We Surveyed 311 participants residing in Anantapur of Andhra pradesh India in the age range of 21years to 75 years. Door to door survey method was used. Subjects were assessed for diabetes risk using Indian Diabetic Risk Score scale (IDRS). Total 311 persons were covered. Data was analyzed suing Microsoft excel and present in the mean, SD and percentage. Subjects with known history of diabetes, physical handicapped, suffering from major chronic health problems were excluded from the study.

➢ **Results:** The prevalence of diabetic risk in Anantapur population is observed as below.
- As per the IRDS survey the sample in the high risk category is in the order of 52.73%.
- In the higher age group of 51years and above it is 23.47%, where as in
- 35 years to 50 years it is 26.37%, and in
- 34 years and below it is 2.89%.

➢ **Conclusion:**

Among 311 people surveyed in Anantpur district we found 52.73% people at the risk of T2DM.

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1.INTRODUCTION

INTRODUCTION

Today's medical science through various research papers published, trying to control Diabetes through pharmaceutical (chemical) drugs and lifestyle, but yet to get breakthrough for complete cure.

The ancient science of India is successful in proving that Madhumeha (Diabetes) can be prevented by practicing yoga at the early stage.

WHAT IS HEALTH AND DIABETES

The word 'Health' comes from the Greek word 'Healing' which means wholesomeness. Health is wholesomeness and it is natural state of the body. Various systems which Promotes the health are called health care systems. Any health care system is the product of its history, and exists in the environmental and cultural context. Since the context is changing, there is no ideal health care system. Various systems always fluctuate from holism to Reductionism approach. Two ancient systems which have holistic approach are Yoga and Ayurveda and both have basis in Sankhya philosophy[1].

According to WHO, the world health organization health means the physical,mental,social emotional, spiritual well-being of a person. It is not just the absence of disease.

- **Physical well-being:** This means the absence of diseases at the physical level and also the ability to adjust and tolerate various changes in the environment like cold, heat, pollution, germs etc.
- **Mental well-being:** When a person is free from any mental tension and illness, it can be termed as.
- **Social well-being:** When we are able to adapt, cope ourselves to the people and surrounding, then it leads to social well-being. We should have acceptance and respect towards each other.
- **Spiritual well-being:** When a person is able to manifest divinity in his all aspects of life, it leads to spiritual well-being[2].

The term Yoga derives its verbal root from "*yuj*" in Samskåta. "*Yuj*" means joining. Yoga literally means communion of the soul (*the jévätma*) with the absolute (*paramātmā*), is the ancient Indian science and technology of attaining health, purity, peace and bliss. The word denotes the spiritual link of man not only with God but also with nature and its hundreds of thousands of creatures, plants and animals[3] .

Diabetes is the cause of Metabolic disorder and to prevent and have good health as per the definition of WHO, let us now understand what is a Metabolic Disorder.

Metabolic diseases result from disturbances in the metabolism, the complex system of chemical processes by which the body nourishes, maintains, and regulates itself. These processes control how the body stores and releases the energy needed to grow, to maintain tissues, or to repair them. Metabolic diseases may arise chiefly as a result of poor nutrition or endocrine disorders. Endocrine diseases are caused by malfunctions in the body's system for regulating metabolism. Much of this regulation is accomplished by hormones, chemicals that are produced in one part of the body but affect one or more other parts[4].

One of the most common endocrine diseases is diabetes mellitus, which is a serious disorder involving the hormone insulin. Insulin is produced by the pancreas, which acts as both a gland and a digestive organ. Insulin enables cells to use and store sugar as a source of energy. In some cases of diabetes, the pancreas does not produce enough insulin. In other cases, insulin is produced, but the body's cells resist its effects. Being overweight increases the risk of diabetes because excess weight is one cause of insulin resistance. Diabetes severely affects cells throughout the body. Cells that cannot use sugar may starve and die. Other cells are damaged by high levels of sugar that build up in the blood. As cellular damage accumulates, diabetes can cause disability and death[5].

Diabetes is a long-term disease that disrupts the body's ability to use a sugar called glucose. It also hampers use of other nutrients, such as protein and fat. Glucose is a common product of digestion. It circulates in the blood to the body's cells, where it serves as one of the chief sources of energy. Diabetes disrupts the body's mechanisms for moving glucose out of the bloodstream and using it in cells. As a result, levels of blood glucose-also called blood sugar-stay excessively high, leading to serious complications over time. High blood glucose levels directly affect the eyes, kidneys, and nervous system. In addition, diabetes increases risk of atherosclerosis. This condition narrows arteries, especially those that carry blood to the heart, brain, and legs. Diabetes affects more than 100 million people worldwide.

DIABETES MELLITUS

DEFINITION

The term diabetes mellitus describes a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both[6].

CLASSIFICATION

Diabetes Mellitus is broadly classified into three categories[7]

- **Insulin Dependent Diabetes Mellitus (IDDM)**

It develops before the age of 40. This is often seen in children too. It is the most certain that the disease is autoimmune in nature and there is a genetic predisposition. The body's defense mechanism attacks the pancreas and destroys the Islets, and the level of endogenous insulin is very low. An environmental factor of viral etiology is also thought to play an important role in the genesis of the disease. This situation can be summarized as: genetic predisposition → environmental insularities → activation of autoimmunity → destruction of the cells of the pancreas → diabetes

- **Non-Insulin Dependent Diabetes Mellitus (NIDDM)**

It is the most common form of the disease and accounts for 90% of all diabetics. This usually begins after middle age. The defect here can be either one of the Beta cells failing to produce enough insulin or and impaired tissue sensitivity to insulin.

- **Gestational Diabetes**

It occurs in women who have high blood sugar during pregnancy but have not been diagnosed with diabetes previously. After delivery of the baby, many women see their blood sugar return to normal. Some women will go on to develop type 2 diabetes.

The values for blood Glucose levels are as Follows[8]: (8).

S.No	Classification	Fasting Blood Glucose (mg/dl)	Post Prandial Blood Glucose (mg/dl)
1	Normal	80-100 mg/dl	140 mg/dl
2	Pre-Diabetes	100-124 mg/dl	140-199 mg/dl
3	Diabetes	125 mg/dl	200 mg/dl

COMPLICATIONS OF DIABETES

- Vision loss or blindness
- Kidney damage or failure
- Nerve pain and damage
- Heart and blood vessel disease
- High blood pressure
- Dental problems
- Hand problems
- Foot problems

The pictorial view of the major complications of Diabetes is as follows[9]
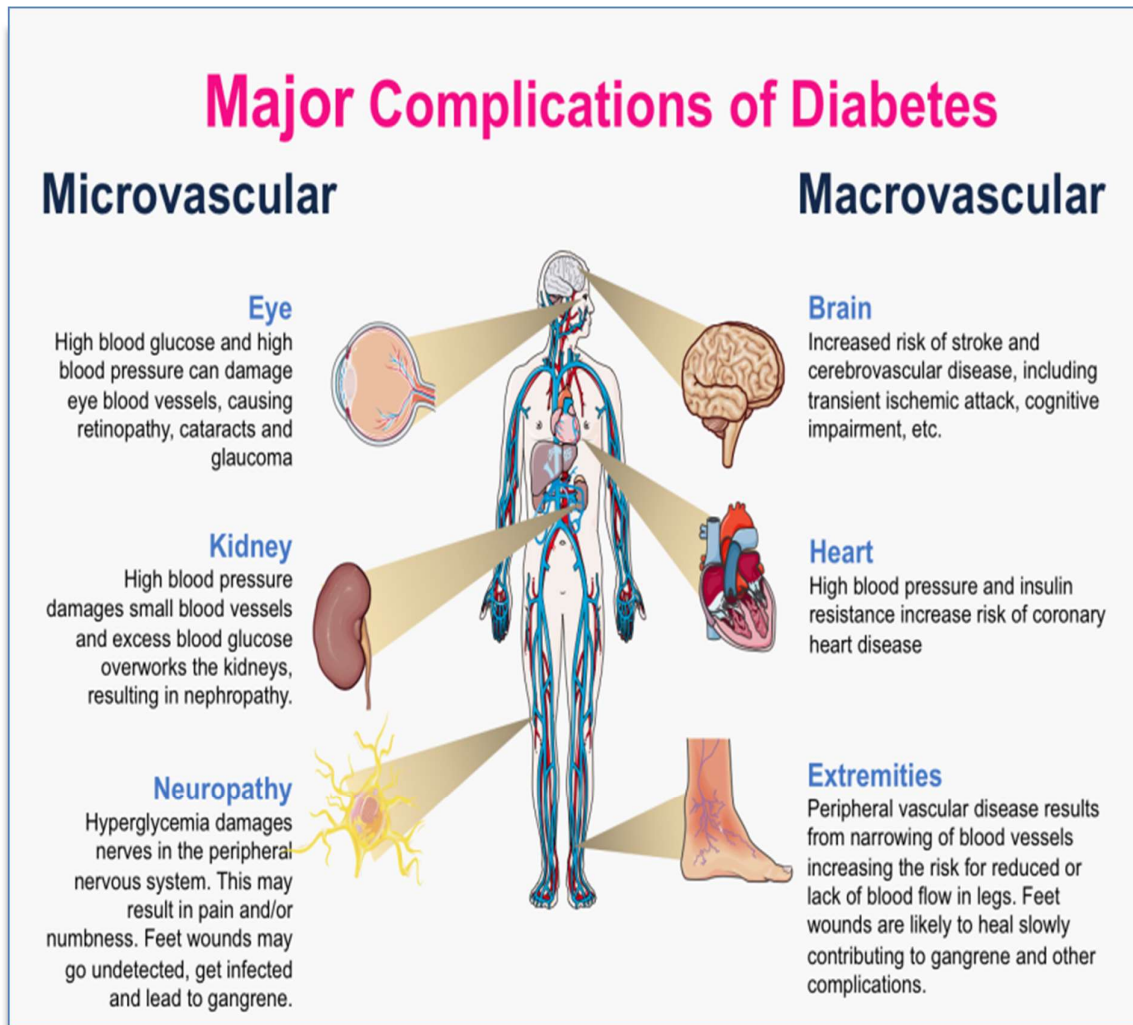
PREVALENCE OF DIABETES

- According to International Diabetes Federation estimates, around 415 million people had DM in 2015 and this number is expected to rise to 642 million by 2040. Around 75% of subjects with DM live in low- and middle-income countries (LMICs). In financial terms, the global burden of DM is enormous, with an estimated annual expenditure of 673 billion US dollars in 2015, which constituted 12% of global health spending for that year. While in urban areas of LMICs, diabetes is well recognized as a public health priority; recent prevalence data suggest that diabetes is an increasing problem among rural populations as well[10].

- India is home to 69.1 million people with diabetes estimated to have the second highest number of cases of diabetes after china in 2015. The prevalence of DM in India ranges from 5–17%, with higher levels found in the southern part of the country and in urban areas. DM continues to increase as a result of rapid cultural and social changes, which include: ageing populations, increasing urbanization, dietary changes, reduced physical activity and unhealthy behaviour. Historically a disease of the affluent, recent epidemiological evidence indicates a rising DM incidence and prevalence in urban India's middle class and working poor. Indians are also believed to have a greater degree of insulin resistance and a stronger genetic predisposition to diabetes[11].

- Against this background, an understanding of the changing epidemiology of diabetes in India is required. Estimation of the prevalence of diabetes and identification of high risk groups is essential for planning of community based risk factor reduction interventions.

2. LITERARY RESEARCH FROM CLASSICAL TEXTS

INTRODUCTION ANCIENT CONCEPTS OF DIABETES

A study of ancient literature indicates that diabetes was fairly well known and well conceived as an entity in ancient India. The knowledge of the system of diabetes mellitus, as the history reveals, existed with the Indians since prehistoric age. Its earliest reference (1000 BC in the Ayurvedic literature) is found in mythological form where it is said to have originated by eating Havisha,[12].A special food which used to be offered at the times of yagna organized by Dakshaprajapati. The disease was known as 'Asrava' during vedic era (6000 BC). The Adhya Devata Lord Gajanana (Ganesha) suffered from this disease. He had suffered from the disease because of his dietary and working habits. He used to consume the excess of sweets (Modaka) and work continuously in sitting position and his body was also obese. After the attack of this disease, he started to take Kapittha, Jambuphala and Shiva Gutika on the advice by his father Lord Shiva. (As described in Chakradutta Rasayana).Detailed description of madhumeha is available in Brahattrai viz. Charak Samhita, Sushruta Samhita and Vagbhatta. Asthanga Haridaya (600 AD) is the first medical treatise in which one gets clear definition of madhumeha/diabetes mellitus by mentioning glycosuria (madhviv mehati-honey like urine). The word Prameha (diabetes) is derived from the root 'miha sechane' meaning watering. In reference to disease of human beings, it may have a meaning of passing urine, qualified by prefix 'pra' meaning excess in both frequency and quantity. (Prameha = Pra (excessive + Meha (Urination)[13]. This derivation of word is again substantiated when the clinical features of 'Prameha' are described as 'prabhuta-mutrata and Avil mutrata'[14] [15] i.e. excessive urination with increased turbidity of urine. Also discussed by ancient Hindu physicians like Charaka, Shushruta, Vagbhata etc. as 'Madhumeha' (Honey urine), diabetes mellitus is

<div align="center">

मधुरं यच्च मेहेषु प्रायो मध्विव मेहति ।

सर्वेऽपि मधुमेहाख्या माधुर्यांच्च यनोरतः ॥ वा । नि ।१०

</div>

"Mudhura Yachch Mehesu Proyo Madhvint Maihati"
"Sarve Api Madhumehachya Madhuyachchi Manorath"[16]

It means, 'Madhumeha' is a disease in which a patient passes sweet urine and exhibits sweetness all over the body i.e. in sweat, mucus, breath, blood etc. The ancient Hindu physicians knew of the fact that the urine of a Madhumeha Patient tastes sweet. They have recorded in their observations that, - 'if too many ants swarm around a spot of urine, one can state that Prameha (diabetes) of any variety, if neglected will finally lead to 'Madhumeha'and in due course become incurable.

Following shlokas details are part of the 6th Chapter of Charak Samhita Chikitsastana which deals with treatment of Prameha – causes, symptoms, types, treatment and diet for urinary disorders and diabetes.

- **NIDANA (CAUSES) OF MADHUMEHA**

The only Charaka explains specific Nidanas for Madhumeha. The samanya Nidanas of pramehas and Vataja prameha may attribute to Madhumeha, as it is one of the types of Vataja prameha.

आस्यासुखं स्वप्रसुखं दधीनि ग्राम्यौदकानूपरसाः पयांसि|
नवान्नपानं गुडवैकृतं च प्रमेहहेतुः कफकृच्च सर्वम्||४||

āsyāsukhaṃ svapnasukhaṃ dadhīni grāmyaudakānūparasāḥ payāṃsi|
navānnapānaṃ guḍavaikṛtaṃ ca pramehahetuḥ kaphakṛcca sarvam||4||

Asyashuka – eating as per one's will,
SwapnaSukha- Addiction to the pleasure of sedentary habits and sleep
Dadhi- excess intake of curds
Gramya udaka aanupa rasa – soup of meat of domesticated and aquatic animals and animals from marshy land,
Payas- excess intake of milk and its products preparations,
Navanna – freshly harvested grains
Nava pana- freshly prepared alcoholic drinks,
Guda vaikrtam- preparations of jaggery and
All Kapha- aggravating factors [4]

- **PRAMEHA SAMPRAPTI – PATHOGENESIS:**

मेदश्च मांसं च शरीरजं च क्लेदं कफो बस्तिगतं प्रदूष्य|
करोति मेहान् समुदीर्णमुष्णैस्तानेव पित्तं परिदूष्य चापि||५||
क्षीणेषु दोषेष्ववकृष्य बस्तौ धातून् प्रमेहाननिलः करोति|
दोषो हि बस्तिं समुपेत्य मूत्रं सन्दूष्य मेहाञ्जनयेद्यथास्वम्||६||

medaśca māṃsaṃ ca śarīrajaṃ ca kledaṃ kapho bastigataṃ pradūṣya|
karoti mehān samudīrṇamuṣṇaistāneva pittaṃ paridūṣya cāpi||5||
kṣīṇeṣu doṣeṣvavakṛṣya bastau dhātūn pramehānanilaḥ karoti|
doṣo hi bastiṃ samupetya mūtraṃ sandūṣya mehāñja

Kapha vitiates Medas (fat tissue), Mamsa (muscle tissue) and Kleda (liquid elements) of the body located in Basti (urinary tract) and causes different types of meha.
Similarly, Pitta aggravated by hot things, vitiates those elements and causes different types of Pittaja Prameha.

When other 2 Doshas are in a relatively diminished state, the aggravated Vata draws tissue elements, viz, Ojas, Majja and Lasika into the urinary tract and vitiates them to cause the 3rd category of Prameha (Vataja Meha). Different doshas having entered the urinary tract in vitiated conditions give rise to the respective categories of Meha [5-6]

- **PRAMEHA POORVAROOPA (SIGNS AND SYMPTOMS):**

स्वेदोऽङ्गगन्धः शिथिलाङ्गता च शय्यासन स्वप्नसुखे रतिश्च।
हृन्नेत्रजिह्वाश्रवणोपदेहो घनाङ्गता केशनखातिवृद्धिः॥१३॥
शीतप्रियत्वं गलतालुशोषो माधुर्यमास्ये करपाददाहः।
भविष्यतो मेहगदस्य रूपं मूत्रेऽभिधावन्ति पिपीलिकाश्च॥१४॥

svedo'ṅgagandhaḥ śithilāṅgatā ca śayyāsana svapnasukhe ratiśca|
hṛnnetrajihvāśravaṇopadeho ghanāṅgatā keśanakhātivṛddhiḥ||13||
śītapriyatvaṃ galatāluśoṣo mādhuryamāsye karapādadāhaḥ|
bhaviṣyato mehagadasya rūpaṃ mūtre'bhidhāvanti pipīlikāśca||14||

Sweda – Sweating
Anga gandha – bad body odor
Shithilangata – flabbiness of body
Shayyasana – liking for constantly lying on the bed, feeling sedentary
Rati – sleeping and leading an easy life
Hrut Upadeha – a feeling as if the heart region is covered with some paste / coating
Netra, Jihva, Shravana Srava – exudation of excreta from eyes, tongue and ears
Ghana angata – bulkiness of the body
Kesha, kha, nakha ati vriddhi- excessive growth of hair and nails
Sheeta priyata – liking for cold things
Gala, talu shosha – dryness of the throat and palate
Madhura aasya – sweet taste in the mouth
Kara pada daha – burning sensation in hands and legs and
Mutre pipilika – swarming of ants on the urine [13-14]

- **UPAGRAVA – COMPLICATIONS :**

Complications of Prameha (diabetes) cover all the conditions, which can develop with diabetes patients. The complications related to diabetes mellitus, as described in allopathic medicine, are mentioned in Ayurveda either directly or indirectly in relation to Prameha. These include dyspepsia, diarrhea, fever, burning sensation, weakness, anorexia, indigestion, and diabetic carbuncles and abscesses (referred to in Ayurveda as Pidaka, Alji, and Vidradhi). In Charak Samhita many features of complications are described that the diseases and disorders caused by over intake of Santarpana (a highly nutritious, high-calorie diet intended to increase weight).

These disorders and diseases include:

- Prameha Pidaka (carbuncles)
- Kustha (skin diseases)
- Mutrakrichhra (urinary disorders or Nephropathy)
- Klaibya (erectile dysfunction)
- Sthaulya (obesity)
- Indriya Srotasam Lepa (structural and functional impairment of the sensory organs)
- Siopha (generalized edema)

▪ **PRAMEHA CHIKITSA SUTRA – LINE OF TREATMENT:**

स्थूलः प्रमेही बलवानिहैकः कृशस्तथैकः परिदुर्बलश्च|
सम्बृंहणं तत्र कृशस्य कार्यं संशोधनं दोषबलाधिकस्य||१५||
स्निग्धस्य योगा विविधाः प्रयोज्याः कल्पोपदिष्टा मलशोधनाय |
ऊर्ध्वं तथाऽधश्च मलेऽपनीते मेहेषु सन्तर्पणमेव कार्यम्||१६||
गुल्मः क्षयो मेहनबस्तिशूलं मूत्रग्रहश्चाप्यपतर्पणेन|
प्रमेहिणः स्युः, परितर्पणानि कार्याणि तस्य प्रसमीक्ष्य वह्निम्||१७||

sthūlaḥ pramehī balavānihaikaḥ kṛśastathaikaḥ paridurbalaśca|
sambṛṃhaṇaṃ tatra kṛśasya kāryaṃ saṃśodhanaṃ doṣabalādhikasya||15||
snigdhasya yogā vividhāḥ prayojyāḥ kalpopadiṣṭā malaśodhanāya |
ūrdhvaṃ tathā'dhaśca male'panīte meheṣu santarpaṇameva kāryam||16||
gulmaḥ kṣayo mehanabastiśūlaṃ mūtragrahaścāpyapatarpaṇena|
pramehiṇaḥ syuḥ, paritarpaṇāni kāryāṇi tasya prasamīkṣya vahnim||17||

Patients suffering from Prameha can be classified into 2 categories viz,

1) Sthula Pramehi – Those who are obese and strong. They are given Shodhana (cleansing, purification treatment).

2) Krusha Pramehi – Those that is emaciated and weak. They are given nourishing treatment – Brumhana therapy

In both the above cases, patient is administered Snehana – oleation treatment. Then, Vamana, Virechana recipes, described in KalpaSthana are administered. After Dosha is eliminated, the patient is given Santharpana or nourishing therapy because Apatharpana (fasting) therapy in this condition may produce Gulma (cystic tumor), Kshaya (chronic respiratory disorder),

Meha – chroni urinary tract disorder

Bastishoola – bladder pain

Mutragraha – urinary retention

Hence, based on the state of Agni (digestion strength), Prameha patient should be given Santarpana (nourishing therapy), after Shodhana. [15-17]

Shamana – alleviation Therapy
If the patient of Prameha who needs Shodhana or elimination therapy is not eligible for it, he is given Shamana treatment (with oral medicines) [18 1/2]

- **PATHYA FOR PRAMEHA**

संशोधनं नाईति यः प्रमेही तस्य क्रिया संशमनी प्रयोज्या|
मन्थाः कषाया यवचूर्णलेहाः प्रमेहशान्त्यै लघवश्च भक्ष्याः||१८||
ये विष्किरा ये प्रतुदा विहङ्गास्तेषां रसैर्जाङ्गलजैर्मनोज्ञैः|
यवौदनं रूक्षमथापि वाट्यमद्यात् ससक्तूनपि चाप्यपूपान्||१९||
मुद्गादियूषैरथ तिक्तशाकैः पुराणशाल्योदनमाददीत|
दन्तीङ्गुदीतैलयुतं प्रमेही तथाऽतसीसर्षपतैलयुक्तम्||२०||
सषष्टिकं स्यात्तृणधान्यमन्नं यवप्रधानस्तु भवेत् प्रमेही|

saṃśodhanaṃ nārhati yaḥ pramehī tasya kriyā saṃśamanī prayojyā|
manthāḥ kaṣāyā yavcūrṇalehāḥ pramehaśāntyai laghavaśca bhakṣyāḥ||18||
ye viṣkirā ye pratudā vihaṅgāsteṣāṃ rasairjāṅgalajairmanojñaiḥ|
yavaudanaṃ rūkṣamathāpi vātyamadyāt sasaktūnapi cāpyapūpān||19||
mudgādiyūṣairatha tiktaśākaiḥ purāṇaśālyodanamādadīta|
dantīṅgudītailayutaṃ pramehī tathā'tasīsarṣapatailayuktam||20||
saṣaṣṭikaṃ syāttṛṇadhānyamannaṃ yavapradhānastu bhavet pramehī|

The patient suffering from Prameha is given the following food:

Mantha (flour of different types of corn mixed with water), Kashaya (herbal decoctions), barley powder, Avaleha prepared of barely and such other light-to-digest eatables.

In Ayurveda, 'Yoga' is explained as an outstanding tradition of health care. As it is called as 'sarvanga sadhana'(exercising whole body and mind, it is an essential aspect in the treatment of Madhumeha. At metabolic, level, physical exercise and relaxation exercise are used to stimulate the inner organs, to improve flexibility, stamina and power of forbearance. Jain et al [17], Sahay [18], and Sahaya et al[19] have reported that yoga therapy is of special use in reverting the typical hyperglycaemic conditions, while some 'Asanas' have proved to be helpful to revitalize the pancreas by localized stretch and relaxation inherent in these postures effectively. Asanas like 'Bhujangasan', 'Shalabhasan', 'Ardhamatsyandriyasan'are believed to be effective.

• PREVENTION METHODS

Principles in the Prevention of Diabetes

Preventive measures are always better to handle like Diabetes. This disease can be controlled by giving comprehensive attention to 3 aspects:

They are

1) *ĀHĀRA* (Diet)

2) *VIHĀRA* (Exercise)

3) *AUSHADHA* (medicine).

Daily Regimen (Dinācarya):

आहारशयनब्रह्मचर्यौर्युत्तया प्रयोजितैः ।

शरीरं धार्यते नित्यमागरमिव धारणैः ॥ अ । हृ । ७ । ४२

ähäraçayanabrahmacaryauryuttayä prayojitaiù |
çaréraà dhäryate nityamägaramiva dhäraëaiù || a | hå | 7 | 42

Traya upastambha: Āyurveda considers *āhāra, Śayana* and *abrahmācarya* as the pillars which support the body constantly just like house is (supported by the pillars).

In this study, the role of *āhār*a & *vihāra* has great importance to control and prevention of diabetes. The *saṁhitā* give us the information about *āhāra* and *vihāra t*hat an individual has to adopt under the headings of *dinācarya*(daily regimen which gives the description of food, sleep, etc.) and *åtuchary*a (seasonal regimen). Although *dinācarya* and *ritucharya* is explained in general, all the activities which decrease Kapha may be adopted as it is the main *dośa* involved in the causation of Diabetes.

DIET (ĀHĀRA):

Most health problems develop due to the wrong eating habits and cooking methods. The diet planning mentioned in our classical literature is very rational and based on certain principles. Lot of importance is given to the diet with regard to its processing, quality, quantity and so on. Due consideration is given to the atmosphere, psychological condition, status of health, digestion etc. of the person while dealing with this issue. The proper incorporation of diet not only can prevent many preventable disorders but plays major role in the management of the Diseases. *Āyurveda* has very holistic and scientific approach in planning the diet. The fundamental principles like *tridoṣa, prakrti*, the tastes, processing of food, the quality, quantity, and the rules regarding eating food if considered while incorporating the diet one can keep away from many diseases of body and mind

REGIMEN OF DIET (ĀHĀRA VIDHI): (A.H 8/46)

Two parts of the stomach (half of its capacity) should be filled with solid foods, one part by liquids and the remaining one part should be kept vacant for accommodating air.

EFFECT OF EXCESS/INSUFFICIENT QUANTITY OF FOOD (A.H 8/3)

Consuming of insufficient quantity of food does not help improvement of strength, growth and vigor; it becomes a cause for all diseases vāta in origin. Excess quantity on the other hand produces quick increase of all the dośa.

QUANTITY OF THE FOOD TO BE CONSUMED (ĀHĀRA MĀTRA APEKÑA):

मात्रशी सर्वकालान् स्यान्मात्रा ह्यग्रेः प्रवर्तिका ।

मात्रां द्रव्याण्यपेक्ष्यन्ते गुरुण्यपि लघुन्यपि ॥

गुरूणामर्धसौहित्यं लघुनां नातित्रुप्तता ॥

मात्राप्रमाणम् निर्दिष्टं सुखं यावद्विजीर्यति । अ ।हृ । ७ । ७-२

mätraçé sarvakälän syänmäträ hyagreù pravartikä |
mäträà dravyäëyapekñyante guruëyapi laghunyapi ||
gurüëämardhasauhityaà laghunäà nätitruptatä ||
mäträpramäëam nirdiñöaà suûaà yävadvijéryati | a å | 7 | 7-2

A gentleman should always consume proper quantity of food, as proper quantity is the activator of agni (digestive function), foods whether it is laghu (easily digestible) or guru (non-easily digestible) both require a specified quantity for digestion.

BAD KINDS OF DIET

मिश्रं पथ्यमपथ्यं च समशनं मतम् ।

विद्यादध्यशनम् भूयो भुक्तस्योपरि भोजनम् ।

अकाले बहु चाल्पं वा भुक्तं तु विषमाशनम् ॥ अ । हृ । ८ । ३३-३४

miçraà pathyamapathyaà ca samaçanaà matam | vidyädadhyaçanam bhüyo bhuktasyopari bhojanam | akäle bahu cälpaà vä bhuktaà tu viñamäçanam || a | hå | 8 | 33-34

Consuming suitable and unsuitable foods mixed together is known as samasana, consuming large quantity of food even before the previous meal is digested constitutes sadhyasana, consuming less or more quantity at improper time is viñamäsana. All these three either cause death or give rise to dreaded diseases.

SLEEP (NIDRA):

अकाले अतिप्रसङ्गाच्च न च निद्रा निषेविता ।

सुखायुषी परकुर्यात् कालरात्रि वापरा ॥ अ ॥ हृ । ७ । ५४

akäle atiprasaìgäcca na ca nidrä niñevitä |
sukhäyuñé parakuryät kälarätri väparä || a || hå | 7 | 54

Sleep indulged at improper time, in excess or not at all, destroys happiness (health) and life like any other *kälarätri* (goddess of death). Sleep during daytime is beneficial during summer, as *väta* under goes mild increase, dryness is more because the season is adana and the nights are short. The same during other seasons aggravates kapha and *pitta*. (A.H. 7/53)

Persons who are having more of *medas* (fat) and *kapha*, who take fatty materials (food) daily should not sleep during daytime. (A.H. 7/60)

EXERCISE (VYĀYĀMA /VIHĀRA):

व्यायामयोगैः विविधैः स्नानजलावसेककैः ।

सेव्यत्वगरुचन्दनाध्यैर्विलेपनैश्चाशु न सन्ति मेहाः । च । चि । ६ । ५०

vyäyämayogaiù vividhaiù snänajalävasekakaiù |
sevyatvagarucandanädhyairvilepanaiscäçu na santi mehäù | ca | ci | 6 | 50

A/c *Carak*a, doing strenuous exercises every day, massage (with soft powder), application of *candana* etc., are useful in the treatment of *Prameh*a. If practiced daily, *Prameha* can be prevented. Lightness (of the body), ability to do hard work, keen digestion, reduction of (excess fat), stable and distinct physique accrue from *vyäyäm*a (physical exercise). (A.H. 2/10)

According to *Suśruta*, (su. Chi 24/37-45) there is nothing equivalent to exercise for reducing excess fat. Those who practice exercise will never be prone to diseases.

RASĀYANA THERAPY:

प्रभावर्णस्वरौदार्यं देहेन्द्रियबलं परम्। च चि १। १। ७

prabhävarëasvaraudäryaà dehendriyabalaà param | ca ci 1 | 1 | 7
Rasāyana cikitsāa helps to improve *prabhā.*

सत्यवादिनमक्रोधं निवृत्तं मद्यमैथुनात्। अहिंसकमनायासं प्रशान्तं प्रियवादिनम्॥

जपशौचपरं धीरं दाननित्यम् तपस्विनम्॥ देवगोब्राह्मणाचार्यगुरुवृद्धाच्चने रतम्॥

आनृशंस्यपरं नित्यं नित्यं क्षीरघृताशिनम्। देशकाल प्रमाणज्ज्ञं युक्तिज्ज्ञमनहंकृतम्।

ङ्स्ताचारमसंकीर्णमध्यात्मप्रवणेन्द्रियम्। उपासितारं वृद्धानामास्तिकानां जितात्मनाम्॥

धर्मशास्त्रपरं विद्यन्नरं नित्यरसायनम्॥ च। चि। १ ।४ ।३०-३४

satyavädinamakrodhaà nivättaà madyamaithunät | ahiàsakamanäyäsaà praçäntaà priyavädinam ||
japaçaucaparaà dhéraà dänanityam tapasvinam || devagobrähmaëäcäryaguruväddhärcane ratam ||
änåçaàsyaparaà nityaà nityaà kñéraghåtäçinam | deçakäla pramäëajjïaà yuktijjïamanahaìkåtam |
çstäcäramasaìkéréëamadhyätmapravaëendriyam | upäsitäraà väddhänämästikänäà jitätmanäam ||
dharmaçästraparaà vidyannaraà nityarasäyanam || ca | ci | 1|4|30-34
A/C *Bhagavadgītā,*

युक्ताहार विहारस्य युक्तचेष्ट्स्य कर्मसु।

युक्त स्वप्नावबोधस्य योग भवति दुःखह। भ। गी। ६-१७

yuktähära vihärasya yuktaceñöasya karmasu |
yukta svapnävabodhasya yoga bhavati duùûaha | bha | gé | 6-17

For one who is temperate in food and recreation, who is detached and self-restrained in work, who is regulated in sleep and in vigil-yoga brings about the cessation of the travail of *Samsāra.*

3.SCIENTIFIC LITERATURE REVIEW

- Diabetes is a condition in which either the body produces insufficient insulin or it produces sufficient insulin but body cells are not able to use it properly. There are 2 types of diabetes: type 1, which is called insulin-dependent diabetes mellitus, and type 2, which is called non-insulin-dependent diabetes mellitus.3 Type 2 is more prevalent and is rapidly increasing in number across the globe. Undiagnosed and untreated, this disease leads to a host of serious conditions in which multiple organs are affected. Worldwide, diabetes has raised concern and is receiving increased attention. With the limitations of modern medical system in containing diabetes, there is great momentum in the direction of holistic approach of treatment[20].

- Prevalence of diabetes in adults worldwide was estimated to be 4.0% in 1995 and to rise to 5.4% by the year 2025. It is higher in developed than in developing countries. The number of adults with diabetes in the world will rise from 135 million in 1995 to 300 million in the year 2025. The major part of this numerical increase will occur in developing countries. There will be a 42% increase, from 51 to 72 million, in the developed countries and a 170% increase, from 84 to 228 million, in the developing countries. Thus, by the year 2025, >75% of people with diabetes will reside in developing countries, as compared with 62% in 1995. The countries with the largest number of people with diabetes are, and will be in the year 2025, India, China, and the U.S. In developing countries, the majority of people with diabetes are in the age range of 45–64 years. In the developed countries, the majority of people with diabetes are aged ≥65 years. This pattern will be accentuated by the year 2025. There are more women than men with diabetes, especially in developed countries. In the future, diabetes will be increasingly concentrated in urban areas[21].

- The overall prevalence of diabetes in all 15 states of India was 7·3% (95% CI 7·0–7·5). The prevalence of diabetes varied from 4·3% in Bihar (95% CI 3·7–5·0) to 10·0% (8·7–11·2) in Punjab and was higher in urban areas (11·2%, 10·6–11·8) than in rural areas (5·2%, 4·9–5·4; p<0·0001) and higher in mainland states (8·3%, 7·9–8·7) than in the northeast (5·9%, 5·5–6·2; p<0·0001). Overall, 1862 (47·3%) of 3938 individuals identified as having diabetes had not been diagnosed previously. States with higher per-capita GDP seemed to have a higher prevalence of diabetes (eg, Chandigarh, which had the highest GDP of US$ 3433, had the highest prevalence of 13·6%, 12.8–15·2). In rural areas of all states, diabetes was more prevalent in individuals of higher SES. However, in urban areas of some of the more affluent states (Chandigarh, Maharashtra, and Tamil Nadu), diabetes prevalence was higher in people with lower SES. The overall prevalence of prediabetes in all 15 states was 10·3% (10·0–10·6). The prevalence of prediabetes varied from

6·0% (5·1–6·8) in Mizoram to 14·7% (13·6–15·9) in Tripura, and the prevalence of impaired fasting glucose was generally higher than the prevalence of impaired glucose tolerance. Age, male sex, obesity, hypertension, and family history of diabetes were independent risk factors for diabetes in both urban and rural areas[22].

- Prediabetes (intermediate hyperglycaemia) is a high-risk state for diabetes that is defined by glycaemic variables that are higher than normal, but lower than diabetes thresholds. 5–10% of people per year with prediabetes will progress to diabetes, with the same proportion converting back to normoglycaemia. Prevalence of prediabetes is increasing worldwide and experts have projected that more than 470 million people will have prediabetes by 2030. Prediabetes is associated with the simultaneous presence of insulin resistance and β-cell dysfunction—abnormalities that start before glucose changes are detectable. Observational evidence shows associations between prediabetes and early forms of nephropathy, chronic kidney disease, small fibre neuropathy, diabetic retinopathy, and increased risk of macrovascular disease. Multifactorial risk scores using non-invasive measures and blood-based metabolic traits, in addition to glycaemic values, could optimise estimation of diabetes risk. For prediabetic individuals, lifestyle modification is the cornerstone of diabetes prevention, with evidence of a 40–70% relative-risk reduction[23].

Sr	Author, Journal, year, Volume,Title	Sample size and Research design and method	Results	Conclusion
1	Authors -A Gupta,R Gupta,M Sarnaa,S Rastogi,V.P.Gupta, K Kotharit, Journal -Diabetes Research and Clinical Practice Volume 61, Issue 1, July 2003, Pages 69-76, Title of the Study - Prevalence of diabetes, impaired fasting glucose and insulin resistance syndrome in an urban Indian population[24].	Randomly selected adults ≥20 years were studied using stratified sampling. Target sample was 1800 (men 960, women 840). RESERCH DESIGN AND METHOD- Studies were identified year range1123 subjects (response 62.4%) were evaluated and blood samples were available in 532 men and 559 women (n=1091, 60.6%). Measurement of anthropometric variables, blood pressure, fasting blood glucose and lipids was performed. Atherosclerosis risk factors were determined using current guidelines.	Diabetes was present in 70 men (13.2%) and 64 women (11.5%). IRS was present in 52 men (9.8%) and 114 women (20.4%) with age-adjusted prevalence of 7.9% in men (CI 6.7–9.1) and 17.5% in women (CI 14.4–20.6) with an overall prevalence of 12.8% (CI 10.8–14.8). Other metabolic abnormalities of IRS in men and women were high triglycerides in 32.1 and 28.6%, low HDL cholesterol in 54.9 and 90.2%; central obesity in 21.8 and 44.0%, and high normal blood pressure or hypertension in 35.5 and 32.4%. IFG subjects had similar atherosclerosis risk factor profile as normal subjects while those with IRS and diabetes had significantly greater prevalence of obesity, central obesity, hypertension, high triglycerides and low HDL ($P<0.01$).	There is significant prevalence of diabetes and IRS in this urban Indian population. Subjects with diabetes as well as IRS have greater prevalence of obesity, central obesity, hypertension, hypertriglyceridemia and low HDL as compared with normal subjects.

Sr	Author, Journal, year, Volume,Title	Sample size and Research design and method	Results	Conclusion
2	Authors - J.E.ShawR.A.SicreeP.Z.Zimmet, Journal -Diabetes Research and Clinical PracticeVolume 87, Issue 1, January 2010, Pages 4-14 , Title of the Study -Global estimates of the prevalence of diabetes for 2010 and 2030[25].	Studies from 91 countries were used to calculate age- and sex-specific diabetes prevalence, which were applied to national population estimates, to determine national diabetes prevalence for all 216 countries for 2010 and 2030.

RESERCH DESIGN AND METHOD - Studies were identified using Medline, and contact with all national and regional International Diabetes Federation offices. Studies were included if diabetes prevalence was assessed using a population-based methodology, and was based on World Health Organization or American Diabetes Association diagnostic criteria for at least three separate age-groups within the 20–79 year range | The world prevalence of diabetes among adults (aged 20–79 years) will be 6.4%, affecting 285 million adults, in 2010, and will increase to 7.7%, and 439 million adults by 2030. Between 2010 and 2030, there will be a 69% increase in numbers of adults with diabetes in developing countries and a 20% increase in developed countries. | These predictions, based on a larger number of studies than previous estimates, indicate a growing burden of diabetes, particularly in developing countries. |

Sr	Author, Journal, year, Volume,Title	Sample size and Research design and method	Results	Conclusion
4	Authors - R. M. Anjana,R. Pradeepa,M. Deepa,M. Datta,V. Sudha, Journal - Diabetologia, December 2011, Volume 54, Issue 12 , Title of the Study -Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India[26].	This study reports the results of the first phase of a national study to determine the prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in India. RESERCH DESIGN AND METHOD - A total of 363 primary sampling units (188 urban, 175 rural), in three states (Tamilnadu, Maharashtra and Jharkhand) and one union territory (Chandigarh) of India were sampled using a stratified multistage sampling design to survey individuals aged ≥20 years. The prevalence rates of diabetes and prediabetes were assessed by measurement of fasting and 2 h post glucose load capillary blood glucose.	Of the 16,607 individuals selected for the study, 14,277 (86%) participated, of whom 13,055 gave blood samples. The weighted prevalence of diabetes (both known and newly diagnosed) was 10.4% in Tamilnadu, 8.4% in Maharashtra, 5.3% in Jharkhand, and 13.6% in Chandigarh. The prevalences of prediabetes (impaired fasting glucose and/or impaired glucose tolerance) were 8.3%, 12.8%, 8.1% and 14.6% respectively. Multiple logistic regression analysis showed that age, male sex, family history of diabetes, urban residence, abdominal obesity, generalised obesity, hypertension and income status were significantly associated with diabetes. Significant risk factors for prediabetes were age, family history of diabetes, abdominal obesity, hypertension and income status.	We estimate that, in 2011, Maharashtra will have 6 million individuals with diabetes and 9.2 million with prediabetes, Tamilnadu will have 4.8 million with diabetes and 3.9 million with prediabetes, Jharkhand will have 0.96 million with diabetes and 1.5 million with prediabetes, and Chandigarh will have 0.12 million with diabetes and 0.13 million with prediabetes. Projections for the whole of India would be 62.4 million people with diabetes and 77.2 million people with prediabetes.

Sr	Author, Journal, year, Volume,Title	Sample size and Research design and method	Results	Conclusion
5	Authors - Anna J. Lee, Richard J. Hiscock, , Peter Wein, , Susan P. Walker,Michael Permezel, Journal -Diabetes Care 2007 Apr; 30(4): 878-883, Title of the Study - Gestational Diabetes Mellitus: Clinical Predictors and Long-Term Risk of Developing Type 2 Diabetes[27].	The study sought to determine the long-term risk of type 2 diabetes following a pregnancy complicated by gestational diabetes mellitus (GDM) and assess what maternal antepartum, postpartum, and neonatal factors are predictive of later development of type 2 diabetes. RESERCH DESIGN AND METHOD -This was a retrospective cohort study using survival analysis on 5,470 GDM patients and 783 control subjects who presented for postnatal follow-up at the Mercy Hospital for Women between 1971 and 2003.	Risk of developing diabetes increased with time of follow-up for both groups and was 9.6 times greater for patients with GDM. The cumulative risk of developing type 2 diabetes for the GDM patients was 25.8% at 15 years postdiagnosis. Predictive factors for the development of type 2 diabetes were use of insulin (hazard ratio 3.5), Asian origin compared with Caucasian (2.1), and 1-h blood glucose (1.3 for every 1 mmol increase above 10.1 mmol). BMI was associated with an increased risk of developing type 2 diabetes but did not meet the assumption of proportional hazards required for valid inference when using Cox proportional hazards.	While specific predictive factors for the later development of type 2 diabetes can be identified in the index pregnancy, women with a history of GDM, as a group, are worthy of long-term follow-up to ameliorate their excess cardiovascular risk.

Sr	Author, Journal, year, Volume,Title	Sample size and Research design and method	Results	Conclusion
6	**AUTHORS** – R C Turner,H Millns, H A W Neil, I M Stratton,S E Manley, D R Matthews,R R Holman, **JOURNAL** - BMJ 1998;316:823, Title of the study -risk factors for coronary artery disease in non-insulin dependent diabetes mellitus: United Kingdom[28].	To evaluate baseline risk factors for coronary artery disease in patients with type 2 diabetes mellitus. **RESERCH DESIGN AND METHOD** -A stepwise selection procedure, adjusting for age and sex, was used in 2693 subjects with complete data to determine which risk factors for coronary artery disease should be included in a Cox proportional hazards model.3055 white patients (mean age 52) with recently diagnosed type 2 diabetes mellitus and without evidence of disease related to atheroma. Median duration of follow up was 7.9 years. 335 patients developed coronary artery disease within 10 years.	Coronary artery disease was significantly associated with increased concentrations of low density lipoprotein cholesterol, decreased concentrations of high density lipoprotein cholesterol, and increased triglyceride concentration, haemoglobin A1c, systolic blood pressure, fasting plasma glucose concentration, and a history of smoking. The estimated hazard ratios for the upper third relative to the lower third were 2.26 (95% confidence interval 1.70 to 3.00) for low density lipoprotein cholesterol, 0.55 (0.41 to 0.73) for high density lipoprotein cholesterol, 1.52 (1.15 to 2.01) for haemoglobin A1c, and 1.82 (1.34 to 2.47) for systolic blood pressure. The estimated hazard ratio for smokers was 1.41(1.06 to 1.88).	A quintet of potentially modifiable risk factors for coronary artery disease exists in patients with type 2 diabetes mellitus. These risk factors are increased concentrations of low density lipoprotein cholesterol, decreased concentrations of high density lipoprotein cholesterol, raised blood pressure, hyperglycaemia, and smoking.

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4. AIM AND OBJECTIVES

AIM

- ❖ Determine prevalence of Diabetic Risk population in Anantapur Andhra pradesh

OBJECTIVES

- To find the number of people at risk of diabetes in anantapur area, measured using IDRS scale.

- Applicability of the IDRS scale Anantapur population

- Assessing of individual risk factors mentioned in IDRS scale on Anantapur population like age, waist, physical activity, familial history.

HYPOTHESIS

- Diabetes   more prevalence in Anantapur population.

NULL HYPOTHESIS

- The prevalence of diabetes not much in Anantapur population.

5.METHODOLOGY

METHODOLOGY

SUBJECT

- Surveyed 311 participants residing in Anantapur of Andhra pradesh India, in the age range of 21years to 75 years.

SOURCE OF SUBJECT

- The survey was done in Anantapur population, Andhra pradesh.

SAMPLE SIZE

- 311 people were surveyed as per the IRDS format shown above.

INCLUSION CRITERIA

- ☐ Age between 21 years to 75 years.
- ☐ Language: Telugu, Kannada, Urdu, Hindi, English.

ASSESSMENTS

Indian Diabetes Risk Score (IDRS) is a validated questionnaire to assess the risk of *diabetes* in an individual. It consists of *4 questions* which take into consideration of the *age, waist circumference, physical activity and family history*. Individuals with high or medium or low risk according to IDRS would be screened for *diabetes*. This simplified Indian diabetes score is useful for identifying people with undiagnosed diabetes, pre diabetes and high risk of diabetes and would make the screening programs more cost effective.

➢ Indian Diabetes Risk Score (IDRS) scoring

Scoring:

- ➢ ≥60 High risk,
- ➢ 30 – 40 Medium risk,
- ➢ <30 Low risk.

INDIAN DIABETES RISK SCORE (IDRS)

INTRODUCTION

Indian Diabetes Risk Score (IDRS) is a validated questionnaire to assess the risk of *diabetes* in an individual. We have 32 million Indians with diabetes and have the largest Diabetic pool in the world. The problem is further compounded by the fact that 66% of Indian Diabetics are not diagnosed as compared to 50% in Europe and 33% in USA. Therefore a diabetes risk score will help us to device effective screening strategies to unmask hidden burden of the disease. Personally, I am a strong proponent of universal screening and advocate that in high risk urban cities in India like Mumbai, Delhi, Chennai, etc. everyone should be screened. However universal screening is neither cost effective nor feasible. There is an urgent need for mass screening program. However, it is difficult and expensive to screen everyone [universa screening]; hence selective screening is necessary to make screening cost-effective. Therefore there is a need for having an Indian Diabetes Risk Score. This can come only from a geographical cohort with urban and rural component. The CURES is a classic cohort which has generated a risk score called IDRS with two modifiable risk factors (waist circumference and physical inactivity) and two non-modifiable risk factors (age and family history of diabetes), which may be amenable to intervention[29].

Table 2 Indian Diabetes Risk Score (IDRS)

CATEGORIZED RISK FACTORS	SCORE
AGE	
< 35 YEARS	0
35 – 49 YEARS	20
≥ 50 YEARS	30
ABDOMINAL OBESITY	
WAIST CIRCUMFERENCE	
FEMALE < 80 CM, MALE < 90 CM	0
FEMALE 80 – 90 CM, MALE 90 – 99 CM	10
FEMALE ≥ 90 CM, MALE ≥ 100	20
PHYSICAL ACTIVITY	
VIGOROUS EXERCISE OR STRENUOUS AT WORK	0
MODERATE EXERCISE AT WORK/HOME	10
MILD EXERCISE AT WORK/HOME	20
NO EXERCISE AND SENDENTARY AT WORK/HOME	30
FAMILY HISTORY	
TWO NON-DIABETIC PARENTS	0
EITHER PARENT DIABETIC	10
BOTH PARENTS DIABETIC	20
MAXIMUM SCORE	**100**

SCORE	≥60: HIGH RISK	30-50 : MEDIUM RISK	<30 : LOW RISK

The IDRS has a sensitivity of 72.5% and specificity of 60.1% and is derived based on the largest population based study on diabetes in India CURES. The advantage of IDRS is its simplicity, low cost and is easily applicable for mass screening program. IDRS should be tested in other population based studies in India both rural and urban. Prospective follow up studies on non-diabetic subjects with high-risk score are needed to assess the predictive nature of IDRS. IDRS may be predictive of metabolic syndrome and cardiovascular disease as three of the factors [age, physical activity and waist circumference] are risk factors for both metabolic syndrome and cardiovascular disease. IDRS uses two modifiable risk factors (waist circumference and physical inactivity) and two non-modifiable risk factors (age and family history of diabetes), providing a clear message that if modifiable risk factors are altered, the risk score can be considerably reduced. Subjects with high IDRS regardless of their blood sugar status, are ideal candidates for life style modification as these are risk factors for not only diabetes but also for cardiovascular disease. The new IDRS score is simple user friendly and is currently tested in the CURES cohort. It will need

validation in other population based studies from within different Indian states. It will also get modified in the process. The physical activity and family history may get modified. Also several other institutions possibly will come with their own scores or modifications (The IDRS). This score may be incorporated into the proposed Indian National Diabetes Programme and surveillance studies on NCD by WHO and ICMR. The score will no doubt need further validation in future studies.

6.DATA EXTRACTION AND DATA ANALYSIS

DATA COLLECTION

The data has been collected in the format approved and utilization for the survey of *Indian Diabetes Risk Score (RDRS) Chart.*

The information collected has been tabulated as below for compilation,

The risk factors included in this score and their scoring pattern were as follows:

1. Age: This was categorized into three groups: age <35 years was coded as 0, 35–49 years as 1, and ≥50 years as 2.
2. Abdominal obesity: Males—individuals with waist circumference ≥90–99 cm were coded as 1, those with ≥100 cm as 2, and the rest as 0. Females—individuals with waist circumference ≥80–89 cm as were coded as 1, those with ≥90 cm as 2, and the rest as 0.11.
3. Family history of diabetes: Individuals with no family history of diabetes were coded as 0, those having one parent with diabetes as 1, and those having both parents with diabetes as 2.
4. Physical activity: Individuals were coded as 0 if they did leisure time exercise and, in addition, had physically demanding work in their occupation, individuals who either did exercise or performed physically demanding work were graded as 1, and the rest as 2.

The information for these risk factors was obtained based on four simple questions and one anthropometric measurement, namely, waist circumference. The four questions are as follows:

1. What is your age?
2. Do you have a family history of diabetes? If yes, does your father or mother or both have diabetes?
3. Do you exercise regularly?
4. How physically demanding is your work (occupation)?

311 people were surveyed in Anantapur area and the risk factors recorded are as below

DATA ANALYSIS

Table 1 RDRS Sample Information

Age (Years)	51 & Above		35 to 50		34 & below		Total	Percentage
Gender	M	F	M	F	M	F		
Population	47	39	55	78	47	45	311	
Low Risk	0	0	0	0	10	9	19	6.11%
Moderate Risk	7	6	19	32	34	30	128	41.16%
High Risk	40	33	36	46	3	6	164	52.73%

STATISTICAL ANALYSIS

A total of 311 participant's records were categorized using the aforementioned criteria as given in RDRS format having no diabetes records in order to access the possibilities of risk factors. Table 2 shows 1)164 people had high risk factor with average IRDS score of 71.52 2)128 people had medium risk factor with average IRDS score of 43.2, whereas 3) 19 people are with less risk factor with average IRDS score of 11.58. From data it is concluded people with high risk factor with average score of 71.52 in the average age group of 45 to48 have not been detected with diabetes.

Table 2 Statistical Analysis of the Survey Sample

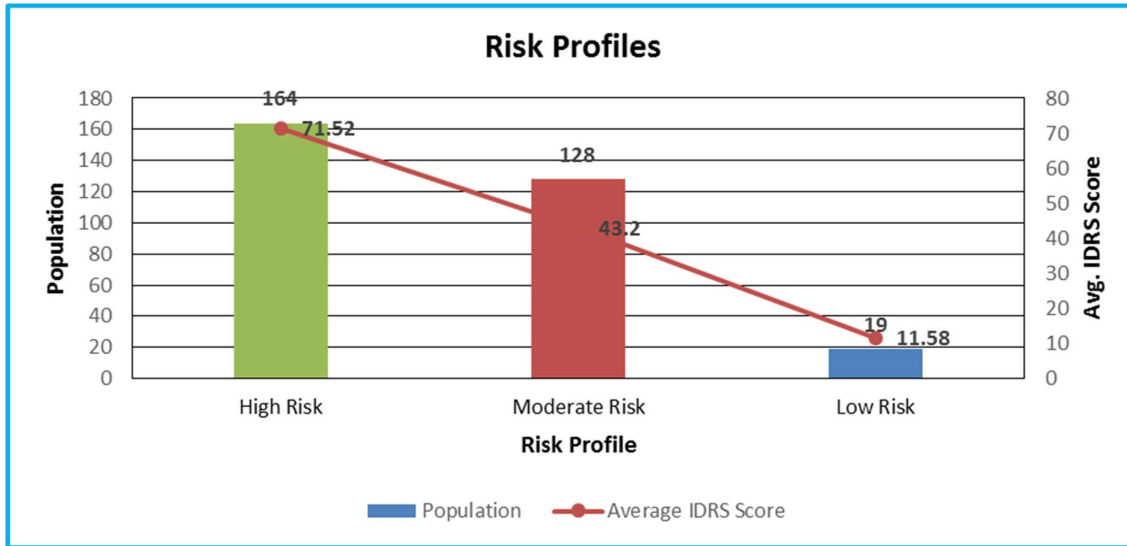| Sr.No	Diabetic Risk	Population	Gender	Age (Mean+SD)	Average IDRS Score
1	High Risk	164	Male - 79	51.81+11.13	71.52
			Female - 85	48.25+9.96	
2	Moderate Risk	128	Male - 60	36.08+12.42	43.2
			Female - 68	36.57+11.02	
3	Low Risk	19	Male - 10	25.9+4.74	11.58
			Female -9	27+3.56	

A Visual depiction of the above data is as below:

Figure 1 Visual Depiction of the Sample Risk Analysis

Table 3 Percentage Breakup of Interviewed Sample

Population %				
Age Category	**Gender**	**Count**	**Total**	**%**
51 years and above	M	47	86	27.65%
	F	39		
35 years to 50 years	M	55	133	42.77%
	F	78		
34 years and below	M	47	92	29.58%
	F	45		
		311	311	

This sample above is a part of the Anantapur population the details of which are as below

Based on data available with government statistical department.
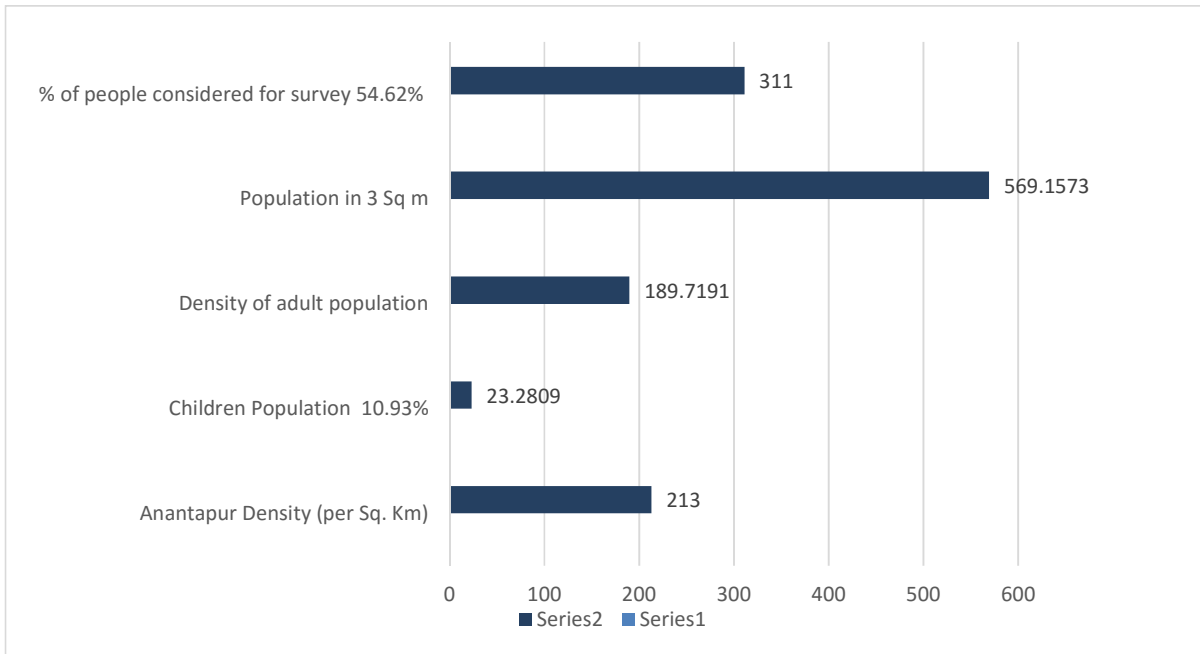
Table 5 Anantapur population

Area	Population in 2011			Growth Rate 2001-2011	Density (per Sq. Km)	Sex Ratio (females per 1000 males)
	Persons	Males	Females	2001-2011	2011	2011
Andhra Pradesh	8,45,80,777	4,24,42,146	4,21,38,631	10.98%	308	993
Anantapur	40,81,148	20,64,495	20,16,653	12.10%	213	977

1. Total children (0-6) in Anantapur city are 4,45956as per figure from Census India report on 2011. There were 2,14549 boys while 2,31369are girls. The child forms 10.59 % of total population of Anantapur City.

2. Percentage of population surveyed is depicted as below so that a representative sample is reflected in the study :

Table 6 density of population

Anantapur Density (per Sq. Km)	Children Population 10.93%	Density of adult population	Population in 3 Sq m	% of people considered for survey 311
213	23.2809	189.7191	569.1573	54.64219

Figure 3 Population Density and Survey Scope

Bar Graph 6. Depicting population density and survey scope

7.RESULTS

RESULTS

The prevalence of diabetic risk in Anantapur population is observed as below.

- As per the IRDS survey the sample in the high risk category is in the order of 52.73%.

- In the higher age group of 51years and above it is 23.47%, where as in

- 35years to50 years it is 26.37%, and in

- 34 years and below it is 2.89%.

  Further specifics are mentioned in the below table:

Diabetic Risk analyses results observed in 311 people surveyed in Anantapur population

Table 6 Diabetic Risk Analysis Results

Age (Years)	51 & Above	35 to 50	34 & below	Total	Percentage
Population	86	133	92	311	
Average Age	59.78	43.25	26.67		
Low Risk	0	0	19	20	6.11%
Moderate Risk	13	51	64	132	41.16%
High Risk	73	82	9	159	52.73%
% High Risk of Total	23.47%	26.37%	2.89%	52.73%	

Figure 2   Risk Spread of Interviewed Sample
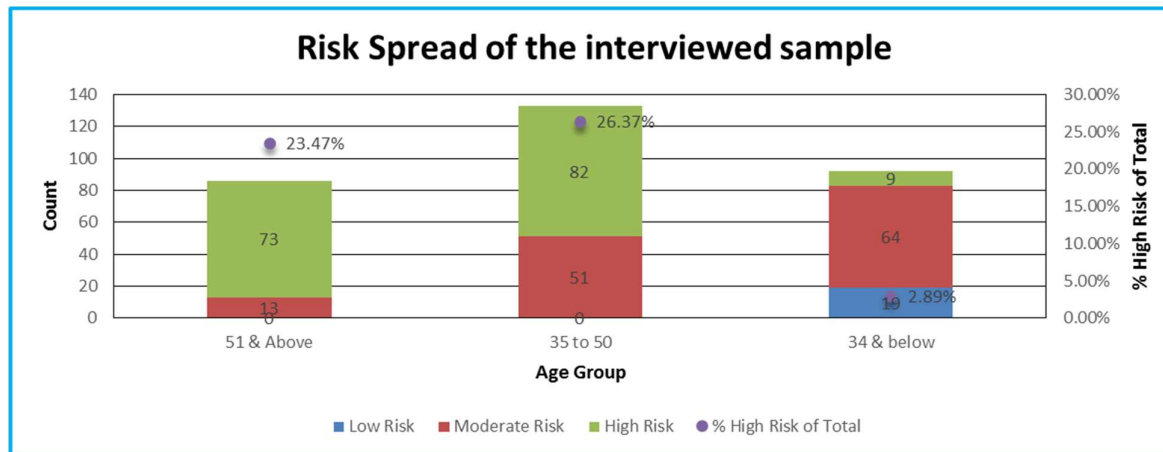
8.DISCUSSION

DISCUSSION

❖ This survey was conducted with the aim to find the prevalence of diabetic risk in Anantapur in the state of Andhra pradesh with population density of 236 in one sq. Km area. The children population in the order of 10.59%.

The record of 311 people surveyed,

1) 164 people are with score of high diabetic risk i.e., 52.73%
2) 128 people are with moderate risk i.e., 41.16% and
3) 19 people with low risk i.e, 6.11%.

There is urgent need to educate the people to have pre-diabetic measures in order to prevent Diabetes. It is true that prevalence of diabetes risk is very much in larger cities in India too.

Similarities and dissimilarities with other studies

➢ Singh PS et al (2017) have demonstrated Prevalence of type 2 diabetes mellitus in rural population of India - a study from Western Uttar Pradesh. They have described that the prevalence of type 2 diabetes in the rural population was found to be 8.03%. Prevalence was higher in female population (9.91%) as compared to males (6.79 %). 10.04% of participants were diagnosed to be prediabetics. Females had more prevalence of prediabetes (14.09 %) as compared to males (7.34 %). Females had a higher prevalence most probably due to poor exposure to health care facilities, poor education and poor health care seeking behavior as evident by more females being newly diagnosed i.e. 54% despite only being 39% of the study population. In our case also we have found more female participants as52% when compare with males are 48% high prevalence of prediabetes. Though the health care facilities were there but lack of awareness, improper lifestyle may be the factors behind the high prevalence[30].

- In another study on prevalence and risk factors of diabetes in a large community-based study in North India: results from a STEPS survey in Punjab, India (Tripathy et al, 2017) concluded that overall prevalence of DM among the study participants was found out to be 8.3% (95% CI 7.3–9.4%) whereas prevalence of prediabetes was 6.3% (5.4–7.3%). Age group (45–69 years), marital status, hypertension, obesity and family history of DM were found to be the risk factors significantly associated with DM. Out of all persons with DM, only 18% were known case of DM or on treatment, among whom only about one-third had controlled blood glucose status. The high prevalence of diabetes, especially of undiagnosed cases amongst the adult population, most of whom have uncontrolled blood sugar levels. This indicates the need for systematic screening and awareness program to identify the undiagnosed cases in the community and offer early treatment and regular follow up. In our study the prevalence of pre diabetes was 26.37% for the population aging between 35 to 50 years, Middle aged group was not there in above study. Prevalence of prediabetes was 23.47% for the population aging between 50 and above[31].

9.CONCLUSION

CONCLUSION

Prevalence of diabetes risk at 52.73% is on higher side.

- ➢ In the higher age group of 51years and above it is 23.47%, where as in
- ➢ 35years to50 years it is 26.37%, and in
- ➢ 34 years and below it is 2.89%.

10. APPRAISAL

STRENGTH OF THE STUDY

- The strength of the study is that the survey done first time in Anantapur population.
- The holistic approach to Diabetes management that would help them in sedentary lifestyle change and long term deference.

LIMITATIONS OF THE STUDY

- Selection of the study that could not be a true representation of the population.
- Small sample size
- IDRS is not a replacement for objects tool for assessment of diabetes risk

SUGGESTIONS FOR FUTURE STUDIES

This study need to be taken in large population with proper briefing on prediabetic counseling to bring awareness. Therefore in large scale educating the people is to be taken up by Government institute.

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