ISSN: 2322 - 0902 (P)
ISSN: 2322 - 0910 (O)

International Journal of Ayurveda and Pharma Research

Research Article

# A COMPARATIVE PLACEBO, CONTROL CLINICAL EVALUATION OF PHALATRIKADI KWATH IN MADHUMEHA WITH SPECIAL REFERENCE TO DIABETES MELLITUS TYPE 2

**Sonalika Jena[1*], B.B.Khuntia[2], Kamdev Das[3]**

*[1]PhD scholar, [2]Proffesor & HOD, PG Dept. of Kayachikitsa, Gopabandhu Ayurveda Mahavidyalaya, Puri, Odisha, India.
[3]Professor, Ex-Principal, Gopabandhu Ayurveda Mahavidyalaya, Puri, Odisha, India.

Received on: 18/09/2015 Revised on: 15/10/2015 Accepted on: 24/10/2015

**ABSTRACT**

The study was aimed to have a conceptual review of the disease *Madhumeha* and its treatment in particular to the use of an herbal drug" *Phalatrikadi Kwath*" and to compare its efficacy with the control drug (metformin) and placebo through scientific parameters in a double blind clinical control trial. *Madhumeha*, also known as Diabetes Mellitus is one of the types of *Vataja prameha*, that has been considered as an incurable disease (*Mahagada)*. Due to indulgence in etiological factors it results in the incomplete formation of *Kapha* and *Meda* which further proceeds downward through the channels of *Mutravaha srotas* and get localized at *Basti mukha* leading to the symptoms like *Prabhoota mutrata* (polyurea), *Avila mutrata* (tubidity of urine) etc. As the disease is *Chirakari,* it requires an effective treatment which can be continued for a long time without any ill effects. Among the many treatment measures mentioned, *Phalatrikadi kwath* has been selected in this study and the effect was evaluated. The clinical study includes 50 patients of either sex between 30-60 years of age with *Madhumeha* (Type2 Diabetes Mellitus) were recruited having range of blood sugar (fasting 126-180 mg/dl, postprandial sugar, 200-250 mg/dl) attending the OPD of G.A.M Puri, Odisha and were divided into three groups. Group I (30 patients) were treated with trial drug (*Phalatrikadi kwatha*), Group II (10 patients) were treated with control drug (Metformin) and Group III (10 patients) were treated with placebo. All the three groups were recommended with uniform classically described diet (*Ahara)* & regimen (*Vihara)*. Patients were evaluated in an interval of 15 days for one month. FBS, PPBS with clinical sign & symptoms were assayed. After evaluating the total effects of the treatment, it was observed that *Phalatrikadi kwath* along with diet and regimen gave satisfactory relief in comparison to control drug (metformin)which is an established drug.

**KEYWORDS:** *Madhumeha*, Diabetes Mellitus, Diet, lifestyle*, Ahara vihara, Phalatrikadi kwath.*

## INTRODUCTION

*Madhumeha*, from time immemorial is acting as a malady troubling the mankind till the present era and continues to increase in numbers and significance as it is a multifactorial disease develops due to abnormal interaction of *Vata* dominant *Tridosha* with ten *Dusyas*[1,2]. Changing lifestyles lead to reduced physical activity and increased obesity. Estimates of the current and future burden of diabetes are important to allocate community and health resources and to emphasize the role of lifestyles and encourage measures to counteract trends for increasing prevalence. Amongst the many dreadful conditions arising because of modern-day living, *Madhumeha*, a comparable condition of Diabetes Mellitus Diabetes Mellitus is a metabolic disorder in which carbohydrate utilization is reduced and that of lipid and protein enhanced due to deficiency of insulin characterized by hyperglycemia.(4) The high blood sugar produces the symptoms of frequent urination, increased thirst, excessive hunger etc. The mortality rate due to Diabetes is high and is ranked 5th among the ten major causes of death in India. Globally as of 2013, an estimated 382 million people have diabetes worldwide, with type2 diabetes making up about 90% of the cases.[5] The rising prevalence of DM is adults globally estimated to be 150 million and figured to be double by 2025[6]. Although the prevalence of type1 and type 2 DM is increasing worldwide, but the prevalence of type 2 DM is expected to increase more rapidly in future because of increasing obesity and reduced physical activity. The modern concept of DM implicates the impairment of carbohydrates *(Kapha)* and fat (*Meda),* and protein (*Mamsa*) metabolism. The classical description had not touched the concept of insulin, but they have wider concept of *Agni* which includes all enzymes and hormones responsible for all the metabolic activities of the body. Moreover implication of insulin in DM has not fully succeeded in clearing the

doubts. Hence all *Pramehas* (including *Madhumeha*) can be considered metabolic disorder manifested as physical abnormalities of urine. In spite of tremendous advancement of modern system of medicine i.e., oral hypoglycemic agent and insulin, till date there is no such curative remedies owing to its complexity. And still scientists are struggling to search an effective and harmless therapy. So to have a safe and effective Medicare for a long term use, *Phalatrikadi Kwath*[7], reverses or breaks the *Samprapti* is ideal for the particular disease. It is evident that the total effect of all the 6 ingredients in case of the formulation rather than the action of individual drugs plays a vital role in the therapeutics; the drugs in this formulation have anti diabetic properties as well as having *Kaphahara, Pittahara* and *Medohara* properties hence helpful in the *Samprapti Vighatana* of the disease. So to get a better management in patients of *Madhumeha* by palliative management, this clinical study is planned.

## AIMS AND OBJECTIVES

A comparative, placebo control clinical evaluation of *Phalatrikadi Kwath* in *Madhumeha* with special reference to Diabetes Mellitus Type 2.

## MATERIALS & METHODS

**Plan Protocol**: Present study was done in 50 number of patients suffering from *Madhumeha* (DM Type2) were selected from the OPD of *Gopabandhu Ayurveda Mahavidyalaya* and Hospital, following the selection criteria's were finally enrolled in the study after thorough baseline screening. Informed consent was taken from the patient before including them in the trial. viz. Patients were selected respective of duration of disease (not more than 1 years chronicity) and therapeutic status as per the plan protocol and excluding criteria. All the 50 patients were divided into three groups randomly Group I: - 30 patients were treated with Trial drug (*Phalatrikadi Kwath*) in a dose of 50ml twice daily 1/2hr before principal meal. (in 12hrs interval) with 1gm of *Haridra Churna* (Turmeric powder) and 10ml of *Madhu* (Honey). Group II: 10 patients were treated with Control drug (metformin)- 1 tab (500mg) twice daily 1/2hr before principal meal (in 12hrs interval) Group III: 10 patients were treated with placebo in a dose of 50ml twice daily 1/2hr before principal meals (in 12hrs interval) with 1gm of *Haridra Churna* (Turmeric powder) and 10ml of honey. All the above 50 patients were advised with recommended classical diet regimen. The patients were registered and their data for demographic and clinical profile was maintained.

**Duration:** 1 month.

**Type of Study:** Double blind control clinical trial.

### Trial Drug Review

### Formulation of *Phalatrikadi kwath*

The *Kwath* containing six drugs Fruit of *Haritaki* (*Terminalia Chebula*), *Bibhitaki* (*Terminalia bellarica*), *Amalaki* (*Emblica officinalis*), Root of *Musta* (*Cyperus rotundus*), Stem of *Daruharidra* (*Berberis aristata*), and Root of *Indrayaan mula* (*Citrullus colocynthis*), were taken in equal quantity[7]. All the individual drugs were checked for their safety profile in identity, quality and quantity. The individual drugs were mixed and subjected to size reduction in a pulverize to get coarse powder. The coarse powder (*Kwatha Churna*) of 25gm was packed and the 14 packets are sealed in a single pack. This pack can be used for a week. The medicine was dispensed for 30 days to all patients and advised to report after 15 days interval and noted the nature of frequency and other symptoms of the disease.

**Table 1: Diet and lifestyle modification[8]**

| ***Aahara*** | **Name of *Pathya Ahara* (Advisable)** | ***Apathya Ahara*(non advisable)** |
|---|---|---|
| Cereals | Old barley, wheat, rice | New rice, wheat |
| Pulses | Old Moong Dal | New *Urad dal, Rajma, kabuli chana* |
| Vegetables | Bitter guard, brinjal, carrot, Lauki | Potato, sea foods, cabbage, *Arbi* |
| Fruits | *Jamun*, guava, *Amla* some dry fruits like almond, walnut | Fruits having high sugar content, cashew nut, resins |
| Liquids | Luke warm water, *Triphala* water, *Amla* juice | All types of cold & sweet drinks |
| Oils | Mustard, flax seed | Ground nut oil, *Til* oil |
| Milk & Milk products | Double toned milk | Full cream milk, curd ghee, cheese |

### Physical Exercise

The disease *Prameha* disappear quickly by use of various physical exercises including *Yogasanas*, massage, anointing, bathing and sprinkling with the infusion of some drugs like *Vijayasara. Khadira Sara* also anointing the paste of *Ushira, Dalchini, Ela, Aguru, Chandan* etc destroys the disease at an early date otherwise accepting these procedures daily prevents the person being affected from the disease. [7] different types of physical exercises, walking, jogging were advised to do regularly according to the age, gender and body built.

**Follow up:** The patients were followed- up once in 15 days up to 1 month.

**Laboratory Investigations:** Blood sugar level was tested in FBS, PPBS was tested for presence of sugar.

The above mentioned laboratory investigations were carried out before and after treatment.

**Study Sample**- Patients of either gender between 30-60 years of either age, satisfying the inclusion criteria were enrolled for the clinical trial.

**Study Settings:** All the patients attending the OPD of G.A.M. & Hospital, *Puri* & were selected for the study. Trial was started on march 2014 and completed on April 2015. Informed consent was taken from the patients before including them in the trial. The selected patients were categorized randomly.

**Diagnostic Criteria:** Diagnosis was made on the basis of classical features of *Prameha* with elevated blood sugar level.

**Inclusion Criteria**

- Willing to give consent to participate in the study.
- Age Group limit -30-60 years
- Sex- Both male and female
- Type of disease- *Madhumeha* (DM Type2)
- Fasting blood sugar range- 126mg/dl-180mg/dl
- Post Prandial blood sugar range- 200mg/dl-250mg
- Recently diagnosed not more than 1 year chronicity.

**Exclusion criteria**

- DM type1
- Patients with severe grade blood glucose levels
- *Madhumeha* (DM type 2) patients with complications like Nephropathy, Neuropathy, and Retinopathy
- Patients with any other chronic disease that would interfere with the clinical study.
- Atherosclerosis, pregnancy, pyrexia, UTI, diabetic coma
- Thyroid disorders
- lactating mothers
- Any other current acute illness
- Patient not willing to participate in the study or not in a position to give consent.

**Clinical features**

**Subjective**

- *Pipasa Adhikyata* (Polydipsia)
- *Khudha Adhikyata* (Polyphagia)
- *Alasyata* (Lethargy)
- *Atisweda* (Excessive perspiration )
- *Karapada daha* (Burning sensation in palms and soles)
- *Karapada suptata* (Numbness in palms and soles)
- *Dourbalya* (Weakness)
- *Kandu* (Itching)
- *Nidraadhikyata* (Excessive sleep)
- *Pindikavestanam* (Cramping in legs)

**Objective**

- *Avila Mutrata* (turbidity of urine)
- *Prabhuta Mutrata* (excessive urination)

Assessment of the condition will be done based on detailed Performa adopting standard scoring methods of subjective & objective parameters & will be analyzed statistically.

**Statistical Assessment of Result**

The mean value ± standard deviation (S.D) of different sign and symptoms before treatment was compared with mean ± S.D after 15th ($A.T_1$) and 30th days ($A.T_2$) of treatment. For the purpose of the test of significance I have used unpaired 't' test of significance. The effectiveness of the trial drug, Control drug, Placebo was assessed through the 'P' value.

**Severity Assessment Scales**

For the purpose of the assessment of results I have used some grade points taking into consideration the different sign and symptoms as follows.

**Severity Grade points**

Highly severe (++++) G4

Severe (+++) G3

Moderate (++) G2

Mild (+) G1

No sign/symptoms (-) G0

Alike other sign and symptoms polyurea, fasting blood sugar (FBS), and Post prandial blood sugar (PPBS) values were converted into range and grades for statistical analysis, thus given below.

**1) *Prabhuta Mutrata* (Polyuria)**

**Frequency of urine**

0 : 3 – 6 times per day, no or rarely at night
1 : 7 – 10 times per day, 1 – 2 times per night
2 : 11– 14times per day, 3 – 4 times per night
3 : > 15 times per day, > 4 times per night

**2) *Pipasa - Adhika* (Polydipsia)**

0 : Feeling of thirst 5– 6 times/24 hours
1 : Feeling of thirst 7- 8 times/24 hours
2 : Feeling of thirst 9 – 10 times/24 hours
3 : Feeling of thirst 11-12 times/24 hours
4 : Feeling of thirst 13-14 times/24 hours

**3) *Avila Mutrata* (Turbidity in urine)**

0 : Crystal clear fluid
1 : Faintly cloudy or hazy with slight turbidity.
2 : Turbidity clearly present and newsprint easily read through test tube
3 : Newsprint not easily read through test tube
4 : Newsprint cannot be visualized through test tube

**4) *Kshudha- Adhika* ( Appetite)**

0 : As usual / routine ( 0-1 meals)
1 : Slightly increased (2 – 3meals)
2 : Moderately increased (4 – 5 meals )
3 : Markedly increased (6 – 7 meals)

**5*) Kara-Pada Suptata***

0 : No *Suptata*
1 : Kara-*Pada Suptata* incontinuous
2 : Kara-*Pada Suptata* continuous but bearable & not severe
3 : Kara-*Pada Suptata* severe & unbearable

**6) *Swedadhikya* (Perspiration)**

0 : Sweating after some strenuous or heavy work or in hot & humid weather
1 : Profuse sweating after moderate work and movement
2 : Sweating after little extra work than routine and movement
3 : Profuse sweating after routine work
4 : Sweating even at rest or in cold climate

**7) *Daurbalya* (Weakness)**

0 : Can do routine exercise/work
1 : Can do moderate exercise with hesitancy
2 : Can do mild exercise only, with difficulty
3 : Cannot do mild exercise too

**8) *Alasya/Utsahahani* (General Debility)**

0 : No Alasya (doing satisfactory work with proper vigor and in time)
1 : Doing satisfactory work with late initiation, likes to stand in comparison to walk
2 : Doing unsatisfactory work with late initiation, likes to sit in comparison to stand
3 : Doing unsatisfactory work with very late initiation, likes to lie down in comparison to sit.
4 : Does not want to do work with no initiation, likes to sleep in comparison to lie down

**9) *Nidradhikya* (Sleep)**

0 : Normal & sound sleep for 6 – 8 hrs. /24 hrs. with feeling of lightness
1 : Sleep> 8 -9 hrs. /24 hrs. with slight heaviness in the body.
2 : Sleep >9- 10 hrs. /24 hrs. with heaviness in the body associated with Jrimbha.
3 : Sleep >10 hrs. /24 hrs. with heaviness in the body associated with Jrimbha & Tandra

**10) *Pindikodveshtana* (Cramps)**

0 : No cramps
1 : Cramps after walking more than 1 km.
2 : Cramps after walking ½ km
3 : Inability in walking even ½ km

**11) Fasting blood sugar (mg/dl)**

0 : <126
1 : 127- 142
2 : 143- 158
3 : 159-174
4 : 175- 190

**12) Postprandial blood sugar (mg/dl)**

0 : < 200
1 : 201 – 216
2 : 217 – 232
3 : 233 – 348
4 : 249 – 264

**Biochemical Assessment**

It was done by assessing change in blood sugar level in fasting and postprandial state before and after treatment.

**Observation and Result**

In this study, out of total 50 enrolled patients were enrolled who were between the age of 30-60 years it was observed that 37 (74%) were found in the age group of 40-60 years in which males (62%) are more prone to the disease than females. Which supports to the statement and corroborates with the outcome of the research reference that Diabetes Mellitus is a disease of middle age group which is also prone to weight gain and now a days to overcome social burdens one has to bear utmost stress and monotonous food which favors for the disease condition? As regards to occupation, higher incidence among the sedentary habits (50%) was observed than the physically active individuals. Thus observation bears striking with the verse of authentic text books that *Swapna Sukham* and *Asaya Sukham* (sedentary habits) is a major causative factor for the disease. In consideration to socio economic status it has been observed that the maximum cases i.e., middle class, 56% and higher economic class 36% people are more prone to the disease due to under the utmost stress & strain both socially and economically which is a predisposing factor of *Madhumeha*.

**Table 2: Showing the pattern of causative factor (*Nidan)* in patients of *Madhumeha* (n=50)**

| S.No. | *Nidan* (causative factor) | No. of patients | percentage |
|---|---|---|---|
| 1 | *Asayasukham* (enjoying long sitting) | 41 | 82 % |
| 2 | *Swapnasukham* (enjoying long sleeping) | 09 | 18 % |
| 3 | *Dadhi Sevan* (taking curd) | 23 | 23% |
| 4 | *Gramya, Anupa, Udaka Mamsa sevan* (meat) | 18 | 36% |
| 5 | *Paya*(Milk and milk products) | 33 | 66% |
| 6 | *Navanna* (>1 year old cereals) | 09 | 18% |
| 7 | *Guda vikar* (jagerry and its products) | 09 | 18% |

On analyzing the *Nidan sevan,* habit of enjoying long sitting was found to be present in 82% patients, while taking milk & its products etc in 66% of patients, eating *Mamsa (*flesh) was found in 66% of patients, eating of curd was found in 23% of patients and 18% was found in the patients who were taking jagerry products, *Navanna* and enjoying sleeping habits.

**Table 3: Showing the incidence of clinical sign and symptoms among 50 *Madhumeha* patient**

| Signs & Symptoms | N=30 Gr-I | | N=10 Gr-II | | N=10 Gr-III | | N=50 | |
|---|---|---|---|---|---|---|---|---|
| | F | (%) | f | (%) | f | (%) | f | (%) |
| *Prabhuta Mutrata* | 30 | 100% | 10 | 100% | 10 | 100% | 50 | 100% |
| *Pipasa Adhikya* | 14 | 46.66% | 6 | 60% | 1 | 10% | 21 | 42% |
| *Khuda Adhikya* | 28 | 93.33% | 10 | 100% | 7 | 70% | 45 | 90% |
| *Avila Mutrata* | 25 | 83.33% | 10 | 100% | 6 | 60% | 41 | 82% |
| *Daha & Suchikidhavat Pida* | 8 | 26.66% | 4 | 40% | 0 | 0% | 12 | 24 |
| *Dourbalya* | 28 | 93.33% | 10 | 100% | 7 | 70% | 45 | 90% |
| *Kara- pada Suptata* | 16 | 53.3% | 3 | 30% | 3 | 30% | 22 | 44% |
| *Utsahahani/ Alasyata* | 24 | 80% | 3 | 30% | 4 | 40% | 35 | 70% |
| *Kandu* | 7 | 23.3% | 5 | 50% | 0 | 0% | 13 | 26% |
| *Pindikaveshtam* | 24 | 80% | 10 | 100% | 10 | 100% | 44 | 88% |
| *Nidradhikya* | 18 | 60% | 2 | 20% | 2 | 20% | 22 | 44% |
| *Swedadhikya* | 3 | 10% | 6 | 60% | 0 | 0% | 9 | 18% |
| FBS | 30 | 100% | 10 | 100% | 10 | 100% | 50 | 100% |
| PPBS | 30 | 100% | 10 | 100% | 10 | 100% | 50 | 100% |

**Table 4: Showing the percentages of the patient got improvement (on totality) of different sign and symptoms after treatment**

| Signs & Symptom | $AT_1$ | | | $AT_2$ | | |
|---|---|---|---|---|---|---|
| | Group-I | Group-II | Group-III | Group-I | Group-II | Group-III |
| *Prabhuta mutrata* | 100% | 90% | 90% | 100% | 100% | 100% |
| *Dourbalya* | 85.71% | 80% | 71.43% | 100% | 90% | 100% |
| *Pindikaveshtam* | 79.16% | 100% | 70% | 100% | 100% | 100% |
| *Pipasa adhikyata* | 95.65% | 100% | 66.66% | 100% | 100% | 100% |
| FBS | 100% | 100% | 100% | 100% | 100% | 100% |
| PPBS | 100% | 100% | 100% | 100% | 100% | 100% |

**Table 5: Showing the percentages of change (improvement) to the sign & symptoms after treatment**

| Signs & Symptoms | $AT_1$(%) | | | $AT_2$(%) | | |
|---|---|---|---|---|---|---|
| | Group-I | Group-II | Group-III | Group-I | Group-II | Group-III |
| *Prabhuta mutrata* | 26.62 | 18.75 | 26.86 | 54.19 | 52.77 | 54.48 |
| *Dourbalya* | 42.37 | 42.10 | 27.78 | 74.58 | 73.68 | 55.55 |
| *Pindikaveshtam* | 41.30 | 30 | --- | 84.78 | 60 | --- |
| *Pipasa adhikyata* | 64.90 | 62.50 | 50 | 94.34 | 81.25 | 75 |
| FBS | 10.24 | 10.94 | 4.36 | 19.55 | 20.36 | 15.73 |
| PPBS | 9.25 | 5.70 | 4.16 | 16.66 | 12.55 | 7.92 |

**%=percentage Change**

**Table 6: Showing the Clinical Assessment of the Result**

| Clinical Assessment | After 15 days of treatment | | | | | | After 30 days of treatment | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Group I | | Group II | | Group III | | Group I | | Group II | | Group III | |
| | f | % | F | % | f | % | f | % | f | % | f | % |
| 100% (Cure) | 0 | Nil | 0 | Nil | 0 | Nil | 3 | 10 | 3 | 30 | 0 | Nil |
| 75-99% (Max. improved) | 0 | Nil | 1 | 10 | 0 | Nil | 21 | 70 | 7 | 70 | 0 | Nil |
| 50-74% (Mod. improved) | 18 | 60 | 6 | 60 | 0 | Nil | 7 | 23.33 | 0 | Nil | 2 | 20 |
| 25-49% (Mild. improved) | 11 | 36 | 3 | 30 | 2 | 20 | 0 | Nil | 0 | Nil | 8 | 80 |
| <25% (Unsatisfactory) | 1 | 3.33 | 0 | Nil | 8 | 80 | 0 | Nil | 0 | Nil | 0 | Nil |

Above clinical assessment has been made basing on the sign and symptoms along with two cardinals laboratory investigation. The percentage of results obtained was made into range and described below. Clinical assessment of the result shows that, after 15days of treatment 3.33% of Group I, 80% in Group II got unsatisfactory result, 36% in Group I, 30% in Group II and 20% in Group III got mild improvement,

60% in both Group I & II got moderate improvement, 10% in Group II got maximum improvement and no one in all the three groups got totally cure. But after 30 days of treatment, 80% in Group III got mild improvement, 23.33% in Group I and 20% in Group III got moderate improvement,70% in both Group I & II got maximum improvement and only 10% in Group I and 30% in Group II got totally cure.

**Table 7: Statistical Analysis Showing the Effectiveness of the Group-I (30 Patients), Group-II (10 Patients) and Group- III (10 Patients) According to Sign and Symptoms**

| Sign and Symptoms | Treatment Group | Duration of treatment in days | Mean + SD | d-f (n-1) | 'T' value (test of significance) | P- value (Probability of error) | Remarks |
|---|---|---|---|---|---|---|---|
| POLYUREA | GROUP-I | BT | 14.73±1.2 | 29 | | | |
| | | $AT_1$ | 10.96±2.22 | | 14.71 | <0.001 | *** |
| | | $AT_2$ | 06.73±1.79 | | 26.39 | <0.001 | *** |
| | GROUP-II | BT | 15.60±3.06 | 9 | | | |
| | | $AT_1$ | 10.10±1.73 | | 9.15 | <0.001 | *** |
| | | $AT_2$ | 05.90±0.99 | | 11.15 | <0.001 | *** |
| | GROUP-III | BT | 14.20±1.61 | 9 | | | |
| | | $AT_1$ | 11.80±1.87 | | 7.9 | <0.001 | *** |
| | | $AT_2$ | 09.10±1.79 | | 13.55 | <0.001 | *** |
| WEAKNESS | GROUP-I | BT | 02.10±0.49 | 27 | | | |
| | | $AT_1$ | 01.2±0.46 | | 7.63 | <0.001 | *** |
| | | $AT_2$ | 0.78 ±0.56 | | 14.72 | <0.001 | *** |
| | GROUP-II | BT | 01.9 ±0.73 | 9 | | | |
| | | $AT_1$ | 01.1 ±0.56 | | 6.02 | <0.001 | *** |
| | | $AT_2$ | 0.30 ±0.48 | | 9.92 | <0.001 | *** |
| | GROUP-III | BT | 2.57 ±0.53 | 6 | | | |
| | | $AT_1$ | 1.85 ±0.37 | | 3.91 | <0.01 | ** |
| | | $AT_2$ | 1.71 ± 0.48 | | 3.98 | <0.01 | ** |
| MUSCLE CRAMPS | GROUP-I | BT | 2.00 ±0.72 | 23 | | | |
| | | $AT_1$ | 1.37 ±0.82 | | 9.43 | <0.001 | *** |
| | | $AT_2$ | 0.70 ±0.55 | | 11.49 | <0.001 | *** |
| | GROUP-II | BT | 2.00±0.81 | 9 | | | |
| | | $AT_1$ | 1.2 ±0.63 | | 6.32 | <0.001 | *** |
| | | $AT_2$ | 0.4± 0.51 | | 10.11 | <0.001 | *** |
| | GROUP-III | BT | 2.1 ±0.56 | | | | |
| | | $AT_1$ | 1.5±0.52 | 9 | 3.72 | <0.01 | ** |
| | | $AT_2$ | 1.1±0.56 | | 4.79 | <0.001 | *** |
| POLYDIPSIA | GROUP-I | BT | 2.21 ±1.27 | 22 | | | |
| | | AT1 | 0.53±0.75 | | 3.60 | <0.001 | *** |
| | | AT2 | 0.30±0.55 | | 7.04 | <0.001 | *** |
| | GROUP-II | BT | 1.18±0.59 | 7 | | | |
| | | AT1 | 0.5±0.46 | | 7.69 | <0.001 | *** |
| | | AT2 | 0.06±0.17 | | 5.46 | <0.001 | *** |
| | GROUP-III | BT | 0.85±0.47 | 9 | | | |
| | | AT1 | 0.6±0.21 | | 2.25 | <0.05 | # |
| | | AT2 | 0.35 ±0.33 | | 4.79 | <0.001 | *** |
| FBS | GROUP-I | BT | 167.7± 12.44 | 29 | | | |
| | | AT1 | 132.27±7.94 | | 30.80 | <0.001 | *** |
| | | AT2 | 101.43±13.09 | | 21.60 | <0.001 | *** |
| | GROUP-II | BT | 167 ±12.61 | 9 | | | |
| | | AT1 | 118.3±13.58 | | 17.32 | <0.001 | *** |
| | | AT2 | 88.8±7.23 | | 14.72 | <0.001 | *** |
| | GROUP-III | BT | 166.2±11.55 | 9 | | | |
| | | AT1 | 154.3±13.82 | | 8.69 | <0.001 | *** |
| | | AT2 | 147.6±13.54 | | 15.60 | <0.001 | *** |
| PPB | GROUP-I | BT | 237.23±18.23 | 29 | | | |
| | | AT1 | 202.8±14.08 | | 18.78 | <0.001 | *** |
| | | AT2 | 177.36±9.60 | | 20.71 | <0.001 | *** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| S | GROUP-II | BT | 247.6±15.77 | 9 | | | |
| | | AT1 | 192.2 ±28.74 | | 5.07 | <0.001 | *** |
| | | AT2 | 174.1±4.99 | | 13.58 | <0.001 | *** |
| | GROUP-III | BT | 237.7 ±17.23 | 9 | | | |
| | | AT1 | 228 ±16.15 | | 17.42 | <0.001 | *** |
| | | AT2 | 214.8±13.13 | | 9.65 | <0.001 | *** |

From the above table it is revealed that unpaired test of significance shows that the effectiveness of trial drug as compared to control drug & placebo after 30 days of treatment in case of polyurea and FBS is highly significant with p value 0.001, where as in case of weakness, muscle cramps and polydipsia is insignificant with p value> 0.05 and in case of PPBS the result is significant with (p value<0.01).

**DISCUSSION**

*Madhumeha* is a widely evidential disease since ancient age till today and evidence is increasing day by day with lips and bound with their complications and complexes. It is known as diabetes mellitus in modern medicine which is a metabolic disorder having a deep relation with diet and lifestyle habits. The chronic nature of diabetes and its tendency to affect various organs and damages the organs very slowly and on average reduces the life span of the patient by a decade. It has been appropriately termed as "silent killer" and some people call it 'a disease of complications'. The prevalence of this dreadful disease is almost increased due to the incorporation of fast food, junk food, lack of physical activity etc. it is no longer considered as a disease of rich rather it has been rapidly in increasing among the poor, in the urban slum dwellers, middle class group and even in the rural areas. It may be due to rapid changes in the physical activity and the dietary habits even among the poorer sections of the society. Significant improvement was observed following 1 month of administration of drugs in all assessment parameters of *Prameha*. The trial drug is indicated in all types of *Prameha*[7]**.** *Prameha* is caused by vitiation of all the three *Dosasa,* i.e *Vata*. *Pitta* and *Kapha* along with ten *Dusyas* they are *Meda, Rakta, Sukra, Jala, Vasa*, *Lasika, Majja, Rasa, Oja and Mamsa*.[10] In its clinical feature there is increase in amount and frequency of abnormal urine. The main cause given for *Prameha* mainly are sedentary lifestyle and abnormal food habits which is responsible for the formation of *Aama* in the body. This *Aama* reduces the digestive power and vitiates the three Dosas in the body. This *Aama* produces *Aalasyata, Tandra, Hridaya Vishudhi, Dosha Pravritti, Akulmutrata, Guru Udaratva, Aruchi, Suptata*[11]. Also if we analyze the pathogenesis in modern point of view there is two types of mechanism responsible for the DM, that is insulin resistant and another is pancreatic beta cell failure. In both these causes, target tissue defect and deposition of amyloid body are found as the main cause. These amyloid body are found as the main cause. These amyloid bodies deposit on the tissues and disrupt them physically by coating the channels thus causing insulin resistance[11]. These amyloid bodies are also responsible for apoptosis of the islet cells by two mechanisms, first by calcium deregulation and second is mitochondrial dysfunction in the beta cells.[12]

As regarding the trial drug i.e., *Phalatrikadi Kwath*, the 6 drugs present in it acts on the basic pathology of *Prameha.* The *Triphala* (*Haritaki, Bibhitaki, Amalaki*) is *Kaphapitta Samak, Prameha Nasak*, *Deepan* etc. *Triphala* is having *Rasayan* property[13]. It enhances free radicals and reduce oxidative stress and alleviate diabetic complications[19]. The methanolic extract of *Triphala* inhibit lipid peroxide formation and to scavenge hydroxyl and superoxide radicals in vitro and oral administration of the extract reduced the blood sugar levels in normal and alloxan diabetic rats.[14]

*Daruharidra* (*Berberis artistata*) root extract also have potential anti hyperglycemic and antioxidant effect that was found in a study done in CSIR, Lucknow[15].The extract of *Daruharidra* has strong potential to regulate glucose homeostasis through decreases gluconeogenesis and oxidative stress. The roots of *Indrayaan Mula* (*Citrullus colocynthis*) have hypoglycemic effect. As well as insulin tropic action in alloxan induced diabetic rats. *Musta* (*Cyperus rotundus*) have anti diabetic effect and was found in a study that it significantly lowers the blood sugar levels. This antihyperglycemic activity can be attributed to its antioxidant activity as it showed the strong DPPH radical scavenging action in vitro[17]. Mustak is well known *Amapachak* & *Deepan*[9].

The trial drug is considered to be fit for easy administration having no side effect. Inspite of its bitter and astringent taste it was well tolerated accepted & accomplish by the patients.

Physiochemical analysis demonstrated that the PH is favorable for early absorption in stomach as it remains acidic. Moreover the qualitative test reveals that the *Kwath* contains tannins, steroids. Alkaloids in abundant. Recently tannins have received considerable attention as health promoting component in various plant foods and several studies have reported on its nutraceutical properties, the candebsed tannin extracts showed promising antidiabeteic effects.[18]

Thus along with the trial drug, the rigid dietary restriction and suitable physical exercise programme helps at maximum levels. The observation recorded in the present study suggest that though the trial drug possess hypoglycemic activity and treats the basic pathology of type2 DM and further additional studies may be performed on this formulation to reduce the

over load of the medicine & to overcome the side effects of modern medicine.

## CONCLUSION

*Madhumeha* is caused due to Sedentary life style, increased stress and strain, and inclusion of junk and high calorie diet. The causative factor of *Prameha* reduces the digestive power and promotes the formation of *Aama* (undigested substances) which is responsible for the vitiation of all the three *Doshas*. The study confirms in the pathogenesis of the disease that there is dominancy of *Kapha Dosha, Medo Dusti, Rasavaha* and *Medovaha Srotodusti*. The study confirms that *Phalatrikadi Kwath* is effective in treatment of *Madhumeha* as it has the property of *Aama Pachana*. Along with this *Kwath* the *Pathya* and apathy are equally important in controlling diabetes. People between the age group of 40-60 are more prone to the disease so they should be aware of the causative factors of the disease with its *Pathya Apathya*. Thus *Phalatrikadi Kwath* treats the basic pathology of type 2 DM and definitely reduces the symptoms of the illness that include polyurea, weakness, muscle cramps, polydipsia, FBS and PPBS.

## ACKNOWLEDGEMENT

Authors would like to acknowledge to the dispensing and pharmacy staff for their technical support for the study.

## REFERENCE

1. Agnivesha Prameha Chikitsa(2007) Acharya Trikamji jadavji. In: Charaka, et al.(Eds.), Charaka Samhita Chowkhamba Prakahsan, Varanasi, pp.242
2. Susrut Prameha nidanam(2007) Ayurveda Tattva Sandipika. Kaviraja Ambikadutta Sastri(Ed.), Susruta Samhita, Chowkhamba Prakasan, Varanasi, India, pp.251.
3. Madhav nidan of Shri madhavakara, vidyotini hindi commentary by shri shastri chaukhambhasanskrit sansthan, Varanasi, 30th edition Uttarardha, Prameha Nidan.PP25
4. Williams Textbook of Endocrinology (12th ed ) Philadelphia:Elsevier/saunders pp.1371-1435.ISBN978-1-4377-0324-5.
5. Davidsons principles and practice of medicine, 19th edition, editor:john AA hunter, chapter 15 Diabettis Mellitus. By B.M.Fisher, pd:655
6. Shi, yuanki; Hu frank B."The global implications of diabetes and cancer'. The Lancet 38399933);1947-8,doi;10.1016/s0140-6736914060886-2.PMID 24910221.
7. Sharangdhar Samhita of Acharya Sharandhar, jiwanprada hindi commentary by dr. Smt shailaja Shrivastav, Chaukamba Orientalla Varanasi,forth edition 2005, Madhyamkhand, chapter 2, pp152, shlok 111
8. Charak samhita of Agnivesha by charak and dridhbala, with introduction by shri satyanarayan Sastri, with hindi commentary by pt, kasiinath sastri and Dr.Gorakhnath chaturvedi, second part, chaukamba bhrti academy Varanasi, reprint 2011, Prameha Chikitsa chapter 6, pd236, slok 20-21.
9. Charak samhita of Agnivesha by charak and dridhbala, with introduction by shri satyanarayan Sastri, with Hindi commentary by pt, kasiinath sastri and Dr.gorakhnath chaturvedi, second part, chaukamba bharti academy Varanasi, reprint 2011, Grahani chikitsa chapter 15, pd461, slok48.(1)
10. Charak samhita of agnivesha by charak and dridhbala, with introduction by shri satyanarayan Sastri, with hindi commentary by pt, kasiinath sastri and Dr. gorakhnath chaturvedi, second part, chaukamba bharti academy Varanasi, reprint 2011, Prameha chikitsa chapter 6, pd229, slok8.
11. Kayachikitsa 2nd part, by prof Ram harsh singh, edition 2007, chukambha Sanskrit pratisthan, delhi.
12. Westermark P.Andersson A, Westermark GT Islet amyloid polypeptide, islet amyloid, and diabetes mellitus Physiol Rev.2011 jul;91(3):795-826. Doi:10.1152/physrev.00042.2009.
13. Sushrut Samhita of maharsi Sushrut, edited with Ayuveda Tatva sandipika, hindi commentary by Kaviraj Ambikadutta Shastri, Chaukamba Sanskrit Sansthan Varanasi, reprint2010, first part, sutra sthan, 38th chapter Dravya sangrahaniya, pd 188/ 57th shlok.
14. Sabu Mc, Kuttan r, Antidiabetic activity of medicinal plants and its relationship with their antioxidant property. Amala cancer research centre, amals Nagar, kerela Trichur 680553, India.J Ethnopharmacol. 2002 jul:81(2): 155-60.
15. Singh j, kakkar P, Antihyperglycemic and antioxidant effect of Berberis aristata root extract and its role in regulating carbohydrate metabolism in diabetic rats: J Ethnopharmacol. 2009 May 4;123(1):22-6 dol:10.1016/j.jep-2009.02.038.Epub 2009 Mar 5.
16. Vipin Agarwal, Ashish Kumar Sharma, Ansu upadhya, Gopendra Singh and Rajiv Gupta. Hypoglycemic effects of Citrullus colocynthis roots. Acta Poloniae Pharmaceutica and Drug Research. Vol.69 No.1 pp.75n79, 2012 ISSN 0001-6837.Polish Pharmaceutical Society.
17. Nishikant a Raut, naresh J Gaikwad. Antidiabetic activity of hydro ethanolic extract of Cyperus rotundus in alloxan induced diabetes in rats. J Fitoterapia, volume 77, issues 7-8, December 2006, pages 585-588.
18. J Food.2011 may;76(4):c560-7.doi:10.1111/j. 1750-3841.2011.02116.x.Epub 2011 Apr 5,

Antioxidant & antidiabetic properties of condensed tannins in acetonic extract of selected raw & processed indegeneous food ingredients from Kenya.kuyangaCN, Imugi JK, Okoth M, Vadivel V.

19. Roja Rahimi, Shekufeh Nikfer Bagher Larijani. A review on the role of antioxidants in the management of diabetes and its complications, Biomedicine and pharmacotherapy, volume 59, issue 7, August 2005, pd 365-373.

**Cite this article as:**
Sonalika Jena, B.B.Khuntia, Kamdev Das. A Comparative Placebo, Control Clinical Evaluation of Phalatrikadi Kwath in Madhumeha with Special Reference to Diabetes Mellitus Type2. International Journal of Ayurveda and Pharma Research. 2015;3(10):71-79.
***Source of support: Nil, Conflict of interest: None Declared***

***Address for correspondence**
**Dr. Sonalika Jena**
C/o: R.N.Das
Bodhi Bhavan, At-Chandmari padia
Po-Sahadevkhunta, Dist- Balasore
Pin- 756001, Odisha, India
Ph: 09437281398
Email: drsonalikajena@gmail.com