ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 08 | August - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

EFFECT OF ETHYL ACETATE EXTRACT OF CINNAMOMUM ZEYLANICUM BARK ON DEXAMETHASONE INDUCED HYPERGLYCAEMIA IN ALBINO RATS

Pharma

Surjit Nongthombam — Senior Resident, Department of Pharmacology, Regional Institute of Medical Sciences, Imphal, Manipur, India, Pin code: 795004

Thokchom Priyalakshmi Devi — Post graduate student, Department of Physiology, JNIMS, Imphal, Manipur, India, Pin code: 795005.

Saumyakanti Sinha — Pharmacologist, Medical officer, Tripura Health Services, Pin code: 799001

Nameirakpam Meena Devi — Professor and Head, Department of Pharmacology, Regional Institute of Medical Sciences, Imphal, Manipur, India, Pin code: 795004

Usham Dharmaraja Meetei* — Associate Professor, Department of Pharmacology, Regional Institute of Medical Sciences, Imphal, Manipur, India, Pin code: 795004 *Corresponding Author

ABSTRACT

Aim: To evaluate the effect of ethyl acetate extract of *Cinnamomum zeylanicum* (EAECZ) bark on dexamethasone induced hyperglycaemia in albino rats. **Materials And Methods:** Twenty four healthy albino rats of either sex with weight within the range of 100-200 g were divided into four groups of six animal each and kept overnight fasting and hyperglycaemia was induced in all the animals by dexamethasone (10mg/kg) intraperitoneal injection. Different groups were treated as follows- control group with 2% gum acacia (1ml/100g), standard group glibenclamide (0.5mg/kg p.o) and test groups with EAECZ(200 and 400 mg/kg respectively. Fasting blood glucose samples were collected using glucometer after stipulated time of treatment. Data were analysed using One way ANOVA and Bonferroni test. P value less than 0.05 was considered significant **Results:** EAECZ at the dose of200mg/kg and 400mg/kg showed the significant reduction in blood sugar compared to control after 1 hour and 2 hours of drug administration. There was significant difference when EAECZ 400mg/kg was compared to EAECZ 200mg/kg after 2 hours of drug administration. **Conclusion:** *Cinnamomum zeylanicum* lowers blood sugar level due to to inhibitory effect on gluconeogenesis and promoting peripheral uptake of glucose or insulin released by beta cells.

KEYWORDS

Diabetes mellitus, *Cinnamomum zeylanicum*, glibenclamide

INTRODUCTION

Diabetes mellitus is a spectrum of metabolic disorders that arises from myriad of pathogenic mechanisms, all resulting in hyperglycaemia. Major causes of morbidity seen with diabetes are the chronic complications of which that arise from prolonged hyperglycaemia, including retinopathy, neuropathy, nephropathy and cardio vascular diseases.[1]

The International Diabetes Federation projects that 642 million individuals will have diabetes by the year 2040. The countries with the greatest number of individuals with diabetes in 2019 were China(116.4 million), India(77 million), United States (31 million), Brazil (16.8 million) and the Mexico (12.8 million).[2]

The atlas estimates that as of 2020, there are 33 million children in India who are living with overweight and obesity. This works out to an overall prevalence of 9% of overweight and obesity among children below the age of 20 years.[3]

The aetiology of diabetes in India is multifactorial and includes genetic factors coupled with environmental influences such as obesity associated with rising living standards, steady urban migration and lifestyle changes.[4] Emphasis has been given on the underlying molecular mechanisms, the new technologies that have been introduced to facilitate early diagnosis, and the new potential therapies for these complications includes diabetic neuropathy, nephropathy, retinopathy, macrovascular and miscellaneous complications.[5] The drugs used to overcome the insulin resistance like biguanides, thiazolidinediones and alpha glucosidase inhibitors, the major limitation is inability to achieve normoglycaemia by themselves in many patients, especially moderate to severe cases.[6]

Many potential anti diabetic drugs are currently being studied. There is a great interest in inhibitors of protein kinase C because of the implicating activation of this pathway in the development of vascular diabetic complications.[7]

Cinnamomum zeylanicum locally known as 'Ushingsha' in Manipuri and 'Dalchini' in Hindi is a small tree or shurbs.[8] Every part of the plant including bark, leaves, flower , fruits and roots have some medicinal properties. The bark is flavoured and used in bronchitis, diarrhoea, itching, disease of heart and urinary diseases. The oil is also used as emmenagogue, in inflammation, abdominal pains and cold.[9]

Therefore, considering the various claims made so far and in view of present orientation toward the complementary and alternative systems of medicine, it will be an interesting effort to evaluate the effect of *Cinnamomum zeylanicum* on blood sugar in albino rats and hence, we take up the present study.

Dexamethasone is a very potent and highly selective glucocorticoid. Its is also long acting causes marked pituitary-adrenal suppression.It stimulates gluconeogenesis in the liver.[10]

MATERIALS AND METHODS

Place of study: The study was conducted in the chemical laboratory of Department of Pharmacology, Regional Institute of Medical Sciences (RIMS), Imphal, Manipur, after getting a clearance from Institutional Animal Ethics Committee, RIMS, Imphal (registration no: 156/GO/a/12/CPCSEA). The study was non-randomised experimental study conducted on healthy albino rats of either sex were obtained from Central animal house, RIMS, Imphal

Plant Extract Preparation:

The Plant *Cinnamomum zeylanicum* was identified and authenticated by Botany Department, D.M College, Imphal, having the Acc. No. DM 11:40.The barks were cleansed, dried under shade and powdered by mixer grinder, collected during the month of September to October 2018 from the foothills of Langol Range, Imphal, Manipur.The ethanolic extract of *Cinnamomum zeylanicum* barks were obtained by using Soxhlet apparatus. The percentage yield was 7%.

Phytochemical analysis:

The preliminary phytochemicals analysis of the extract was carried out using standard procedure to identify various constituents.[11-14] It revealed the presence of tannins, flavonoids, saponins, triterpenoids and proteins.

Acute Toxicity Testing

Acute toxicity testing was done in healthy albino rats according to OECD guidelines 423.[15] Limit test with 2000 mg/kg was carried out with six animals (three animals per step). The extract was dissolved in 2% gum acacia and freshly prepared extract was given at uniform volume of 1mL/100 g of body weight in a single dose by gavage. Animals were observed for 14 days. There was no mortality at the dose of 2000mg/kg. Therefore 1/10th of maximum dose i.e. 200mg/kg and 400mg/kg of EAECZ were selected for the study as tests1 and test 2 respectively.

Experimental Animals:

24 healthy albino rats Wistar strain weighing between 100-200gm of either sex were used for each experiment after acclimatized to laboratory condition. Pregnant albino rats were excluded. They were divided into 4 groups of 6 animal each and fasted overnight before the experiment. They were maintained at a temperature of 22 ± 1^0 C in a 12 hr light/ dark cycle with free access to water and standard diet. Glibenclamide 0.5 mg/kg and test drugs were suspended in 2% gum acasia and administered orally to standard and test groups respectively. The control group were given 2% gum acasia in distilled water (DW).

Dexamethasone Induced Hyperglycaemia

Table 1: Allotment Of Animals To Different Groups And Their Treatment.

Groups	Drugs
1 (Control)	2% Gum acacia (10ml/kg p.o) followed by dexamethasone (10mg/kg) intraperitoneal injection.
2 (Standard)	Glibenclamide 0.5mg/kg in 2% Gum acacia followed by dexamethasone (10mg/kg) intraperitoneal injection.
3(Test 1)	EAECZ(200mg/kg in 2% Gum acacia p.o.) followed by dexamethasone (10mg/kg) intraperitoneal injection.
4(Test 2)	EAECZ(400mg/kg in 2 % Gum acacia p.o.) followed by dexamethasone (10mg/kg) intraperitoneal injection.

Blood was collected by cutting the tip of rat tail with proper aseptic, antiseptic condition under general anesthesia.(cutting tip)[16]

Estimation of blood glucose level was measured using glucometer (ACCU-CHEK® Active strips in Accu-Chek® Active test meter, Roche Diagnostics, Germany).

Statistical Analysis:

The results were analysed for statistical significance using One-way ANOVA followed by Bonferroni test using IBM SPSS software version 21(IBM Corp., Armonk, NY, USA). P value less than 0.05 was considered significant.

RESULTS

Table 2. Effect Of *Cinnamomum Zeylanicum* On Dexamethsone Induced Hyperglycaemia

Groups (N=24)	Blood glucose(mg/dl)		
	Fasting	1hr	2hr
Control	76.67±3.363	149.50±2.96	130.83±4.94
Standard (Glibenclamide 0.5mg/kg)	75.33±2.404	107.33±4.06**	95.17±2.83*
Test 1 (200mg/kg)	76.7±2.028	127.33±1.96*	124.67±3.57*
Test 2 (400mg/kg)	75.17±2.120	112.67±1.73*#	99.67±1.42*# $$
One way ANOVA			
Df	3	3	3
F	0.105	53.59	25.48
P	0.956	0.001	0.001

According to table 2, the results were expressed as mean + SEM, n=6, P<0.05 was considered significant ** p<0.001, *p<0.01 when compared with control group, # indicates P<0.001 when test 1 group (EAECZ 200mg/kg) was compared with test 2(EAECZ 400mg/kg) group, p<0.001, $$p<0.05 when compared with standard . (One way ANOVA followed by Bonferroni test).

There were significant decreases in blood sugar in standard, test 1(EAECZ 200mg/kg) test 2(EAECZ 400mg/kg) groups at 1 hr and 2 hrs when compared to control group.

When standard therapeutic dose of glibenclamide 0.5mg/kg compared with other groups, the group receiving test 2 (EAECZ 400mg/kg) show comparable results.

When test 1(EAECZ 200mg/kg) compared to test 2(EAECZ 400mg/kg) , there was significant decrease in blood sugar in test 2 (EAECZ 400mg/kg) group.

DISCUSSION

In the above study, the hypoglycaemic activity of *Cinnamomum zeylanicum* was evaluated in dexamethasone induced hyperglycaemia in albino rats. Glibenclamide is an sulfonylureas group of antidiabetic drugs that enhance insulin secretion by blocking K^+ ATP channel. Glibenclamide at the dose of 0.5mg/kg a was used as standard drugs.[6]

Phytochemical constituents of *Cinnamomum zeylanicum* from the bark gives alkaloids, glycosides, terpenoids, saponins, flavonoids, anthraquinones, phlobatanins, steroids, phenolic, amino acids, proteins, quinones, tanins, reducing sugars.[17] Tannins may be employed medicinally in antidiarrheal, haemostatic, and antihemorrhoidal compounds. They have been also reported to have anti-viral, antibacterial, and antiparasitic effects. Flavonoids are also known to regenerate the damaged β-cells and act as insulin secretagogues. Steroids, terpenoids and phenolic acids are known to be bioactive anti-diabetic components.[18]

The method of dexamethasone induced hyperglycaemia was evaluated by the method of Munna S.[19] Following an overnight fast, blood sugar of fasting, 1hr and 2hrs blood glucose samples were collected and measured using glucometer after dexamethasone 10mg/kg intraperitoneally. The test drug at a doses of 400mg/kg and standard drug glibenclamide 0.5mg/kg was given before dexamethasone and significant decreased in blood sugar after 1hr and 2hr of drug administration was evaluated. The result in this present study were corresponds to the previous workers.[18] The blood glucose lowering effect of EAECZ after dexamethasone may be due to inhibitory effect on gluconeogenesis.

CONCLUSION

In the study entitled " Effect of *Cinnamomum zeylanicum* on blood sugar in albino rats" the ethyl acetate extract *of Cinnamomum zeylanicum*(EAECZ) at the dose of 400mg/kg showed the significant reduction in blood sugar level in dexamethasone induced hyperglycaemia. However, more studies are needed to elucidate the exact mechanism of reduction of blood sugar effect offered by its phytoconstituents and its clinical application in lowering of blood sugar.

REFERENCES

1. Powers AC, D'Alessio D. Endocrine pancreas and pharmacotherapy of diabetes mellitus and hypoglycaemia. In:Brunton LL, Hilal-Dandan R, Knollmann BC, editors. Goodman and Gilman's The pharmalogical basis of therapeutics. 14th ed. New York:McGraw- Hill education;2023.p.1023-47.
2. Powers AC .Diabetes Mellitus:Diagnosis, Classification and Pathophysiology. In:Kasper DL, Hauser SL, Jameson JL, Fauci AS, Longo DL, Loscalzo J, editors. Harrison's Principles of Internal medicine. 21st ed. The United States of America:McGraw Hill Education;2022.p.3094-104.
3. Jacob JJ. Tackling the Rising Tide: Understanding the prevalence of childhood obesity in India.Indian J Endocrinol Metab; 28(2):101-03.
4. Kaveeshwar SA, Cornwall J. The current state of diabetes mellitus in India. Australas Med J 2014; 7(1): 45-48
5. Papatheodorou K, Banach M, Edmonds M, Papanas N, Papazoglou D. J Diabetes Res 2015;10:1-5
6. Tripathi KD. Essentials of Medical Pharmacology.8th ed. New Delhi: Jaypee Brothers Medical Publishers(P) Ltd; 2023.p.281-305.
7. Rang HP, Dale MM, Ritter JM, Moore PK. Pharmacology . 5th ed. New York:Churchill Livingstone;2003.p.382-93.
8. Sinha SC. Medicinal plants of Manipur.Imphal:Manipur Association for Science and Society; 1996.
9. Kirtikar KR, Basu BD. Indian Medicinal Plants. 2nd ed. Dehradun International Book Distributors;1987.
10. Tripathi KD. Essentials of Medical Pharmacology.8th ed. New Delhi: Jaypee Brothers Medical Publishers(P) Ltd; 2023.p.306-19.
11. Kumar U, Kumar B, Bhandari A, Kumar Y. Phytochemical investigation and comparison of antimicrobial screening of clove and cardamom. Int J Pharm Sci Res 2010;1(12):138-47.
12. Shah B, Seth AK. Textbook of pharmacognosy and phytochemistry. 2nd ed. New Delhi:Elsevier; 2014.
13. Dhanasekaran M, Abraham GC, Mohan S. Preliminary phytochemical and histochemical investigation on Kigelia pinnata. Int J Pharm Sci Res 2014;5(7):413-9.
14. Bargah RK. Preliminary test of phytochemical screening of crude ethanolic and aqueous extract of Moringa pterygosperma. J Pharmacogn Phytochem 2015;4(1):7-9.
15. OECD. OECD guideline for testing of chemical 423: Acute oral toxicity-Acute toxic class method. Paris; 2001. Available from: ntp.niehs.gov/iccvam/feddocs/oecd/oecd_gl423.pdf. Accessed on 20th July, 2018.
16. Nitz de Carvalho E, Schmidt de Carvalho NA, Ferreira LM. Experimental model of induction of diabetes mellitus in rats. Acta Cirurg Bras 2003;18:120–67.
17. Gajula RG, Rao NB, Kumari S. Phytochemical analysis and anti -fungal activity of Cinnamomum zeylanicum. Int J Recent Sci Res 2016;7(5):10887-90.
18. Beji RS, Khemir S, Wannes WA, Ayari K, Ksouri R. Antidiabetic, antihyperlipidemic and antioxidant influences of the spice cinnamon (Cinnamomum zeylanicumon) in experimental rats. Braz J Pharm Sci 2018;54(2):1-8.
19. Munna S, Saleem MTS. Hypoglycemic and hypolipidemic activity of Ficus mollis leaves. Rev Bras Farmacogn 2013;23(4):687-691.