

Obese Diabetic Subjects - Dietary Management

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Abstract: The global population will be increasing day by day and suffering from non-communicable diseases, especially Diabetes mellitus, which is related to faulty dietary habits, including low fiber intake, high intake of carbohydrates, and a lack of intake of multinutrients. Obesity and overweight are the most important risk factors for diabetes compared to other factors. During 2017, the present study investigator conducted a study on Obesity as a predisposing factor for diabetes mellitus, and the results showed the majority of the subjects (88%) were obese because of their faulty dietary patterns. Keeping this in view, which is abundant for human consumption, there is interest in looking for new bioactive compounds to treat this disease, including metabolites of marine origin. The present study aimed to check the anti-diabetic activity of *Halodule uninervis* powder. It is a seagrass that is rich in dietary fiber, magnesium, zinc, iron, and polyphenols. Carbohydrates are low. Additionally, it was observed that this grass has no toxicity. So it can be used for human consumption to control blood glucose levels in subjects with diabetes. The present study investigator used 250mg/kg b.w.t. of *Halodule uninervis* powder for human supplementation for a period of ninety days, along with nutritional counselling and diabetic music therapy. Divided the human subjects into control and experimental groups. The findings on body weight show that there was a significant ($p \leq 0.01$) decrease in the experimental groups compared to control groups. The final results show that biochemical parameters were statistically significant ($p < 0.000$) and higher in supplementation groups. From the results, it was found that 250 mg/kg b.w.t. of *Halodule uninervis* powder decreased their body weight in a significant manner ($p \leq 0.01$) throughout the study period in experimental group when compared with control groups.

Keywords: Obesity, Diabetes, *Halodule uninervis*, blood glucose levels

1. Introduction

Diabetes is a chronic metabolic disorder, which occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. It leads to hyperglycaemia. If left untreated, can cause many complications include macro and micro vascular which leads to high mortality and morbidity rates. Now a days, due to their faulty dietary habits include low fiber intake and high intake of carbohydrates and lack of intake of multi nutrients, which are prone to suffering with non-communicable diseases especially Diabetes mellitus of the population.

The average age at onset of diabetes seen in middle or elderly people. But according to WHO, 8.7 percent of population in the age group of 20 and 70 years suffering with diabetes. Currently, one in every four people are suffering with adult-onset of diabetes (type-2) under the age group of 25 years and 2.5 percent in the urban and 1.8 percent in the rural population above the age of 15 years, according to ICMR. India currently represents 49 percent of the world is diabetes burden, with an estimated 72 million cases in 2017, and almost double to 134 million by 2025.

Keeping this in view, the researcher had taken a lot of experiments which are abundant to human consumption, which are in turn to control the blood glucose levels. In recent years, there has been a growing interest in looking for new bioactive compounds to treat this disease, including metabolites of marine origin. Both in vitro and in vivo screenings have been used to test anti-hyperglycaemic and anti-diabetic activities of marine organisms. In that, sea grass is the one of the hypoglycaemic food, to control blood glucose levels.

2. Materials and Methods

Collection of material:

- These sea grasses grow on the intertidal zone of the ocean. It is impossible to collect them without the permission of CMFRI (Central Marine Fisheries Research Institute), which is located in Mandapam, Tamilnadu.
- *Halodule uninervis* has 2-4 leaves in each branch. The leaves are the edible portion, to consume only after processing
- The sea grass are washed under running tap water and removed waste particles and kept it at room temperature for five days and sundry thoroughly for two days especially in the early morning, after that, it is powderized.

Biochemical analysis:

The prepared sample were selected and standardized by checking the anti diabetic properties through the nutrient analysis was carried out in SGS lab through standardized procedures. It is rich in dietary fiber, magnesium, zinc, iron, and polyphenols. Carbohydrates are low and acidic in nature. The limit range for microbial growth on food sample is 20-25 colonies. If the number of colonies is more than that, the food sample is not consumable. In the sample the microbial growth was seen, but it was less than limit range, which implies that it is consumable.

Experiment

A sample of 240 subjects aged between 40 – 60yrs of both gender were selected as per inclusion and exclusion criteria. Divided into eight groups, such as control and seven experimental groups with a minimum of 30 subjects in each.. The clinical condition used for the selection of the subjects was diabetes and BMI 25 -35 (obesity). Divided into eight groups, such as control and seven experimental groups with a minimum of 30 subjects in each. Diabetic subjects who are not intervened but underwent all other study methods. They are called as controls. Ex-1 is diabetic

subgroup intervened with diet counselling. Ex-2 is the diabetic subgroup intervened with Music therapy. Ex-3 is diabetic subgroup with diet counselling and music therapy. Ex-4 is diabetic subgroup with music therapy and supplementation. Ex-5 is diabetic subgroup with supplementation. Ex-6 is diabetic subgroup with supplementation and diet counselling and Ex-7 is diabetic subgroup with supplementation and diet counselling and music therapy.

- For this study standardized questionnaire was developed. Demographic data, disease profiles, anthropometry data, clinical data, dietary history, and laboratory results are all included in this questionnaire. For this study, close-ended questions were used. Before and after supplementation collected the ABCD for all groups.
- Informed consent was obtained from the eligible subjects
- Obtained approval from the human ethical committees before beginning the study.

Supplementation details:

In order to supplement for 90 days, a dose of 250mg/kg of *Halodule uninervis* powder was chosen. The control group has adhered to their regular schedule. For three months, the experimental groups received 250mg/kg bwt powder daily. It was oral to administer each study dose. Selected subjects were advised to take the powder at midday with 50ml of water.

Statistical analysis

After intervention it was observed that the mean FBG and PPG statistically significant ($p < .000$). The overall mean difference in HbA1c was statistically significant ($p=0.00$). The weight findings showed that the interventions were statistically significant at $p < 0.000$.

3. Result

- The base-line results showed that the mean readings of fasting blood glucose (FBG) level and postprandial glucose (PPG) were 156.612 ± 34.86 and 218.5 ± 47.8 mg/dl respectively which were above the normal values. After supplementation it was observed that the mean FBG and PPG were 138.96 ± 36.87 mg/dl and 191.72 ± 52.29 mg/dl respectively. There was statistically significant ($p < .000$) decrease in the means of FBG (17.65%, $p=0.00$) and PPG (26.79%, $p=0.00$) respectively.
- The initial mean HbA1c was 7.43 ± 0.78 percent and post intervention it was 6.85 ± 1.00 percent, the overall mean difference in HbA1c was 0.58 percent point which was statistically significant ($p=0.00$).
- Following the interventions, there was a significant ($p < 0.000$) decrease in mean body weight in supplementation group shows 2.16 percent weight reduction. Where the control group shows weight gain of 4.56 percent after interventions.
- After the interventions, the control group's body weight (77.35 ± 6.101) increased by 4.56 percent, barely at all. The overall findings showed that the interventions were statistically significant at $p < 0.000$.
- Thus from the results of biochemical parameters it is observed that the *Halodule uninervis* powder formulated from the sea grass in the present study has shown to exert

positive impact on the biochemical indices among the subjects of experimental groups. Overall the complex carbohydrates and the fiber content, Magnesium, Zinc and phenols in the *Halodule uninervis* powder may be the responsible factors for lowering the blood glucose levels after the intervention.

4. Discussion

The present study reveals, *Halodule uninervis* act as anti-diabetic to treat diabetes. The study was conducted by following all rules and regulations. The sea grass powder showed anti-oxidant activity to control the complications of diabetes.

5. Conclusion

So, it can be concluded that *Halodule uninervis* is effective for the management of the type 2 diabetes mellitus in order to promote the overall nutritional well-being, blood glucose levels control and decrease the BMI to prevent or decrease the diabetes related complications.

References

- [1] American Diabetes Association (2021) Types of Diabetes
- [2] Baehaki A, Lestari S, Hendri M and Ariska F (2020) Antidiabetic Activity with N-Hexane, Ethyl-Acetate and Ethanol Extract of *Halodule uninervis* Seagrass. Pharmacognosy Journa ;12(4):805-808.
- [3] Barbagallo M and Dominguez LJ (2015), Magnesium and type 2 diabetes. World J Diabetes 6(10):1152-7. doi: 10.4239/wjd.v6.i10.1152. PMID: 26322160; PMCID: PMC4549665.
- [4] Diagnostic criteria for diabetes and prediabetes by ICMR (2018)
- [5] Dias TR, Alves MG, Casal S, Oliveira PF and Silva BM. (2017) Promising Potential of Dietary (Poly)Phenolic Compounds in the Prevention and Treatment of Diabetes Mellitus. Curr Med Chem; 24(4):334-354. doi: 10.2174/0929867323666160905150419. PMID: 27593957.
- [6] IDF Diabetes Atlas,2019
- [7] Gono CMP, Ahmadi P, Hertiani T, Septiana E, Putra MY and Chianese G. A (2022) Comprehensive Update on the Bioactive Compounds from Seagrasses. Mar Drugs, 20(7):406. doi: 10.3390/md20070406. PMID: 35877699; PMCID: PMC9324380
- [8] Immaculate JK, Lilly TT and Patterson J (2018), Macro and micro nutrients of seagrass species from Gulf of Mannar, India. MOJ Food Process Technol;6(4):391-398. DOI: 10.15406/mojfpt.2018.06.0019
- [9] Ismail L, Materwala H and Al Kaabi J (2021) Association of risk factors with type 2 diabetes: A systematic review. Comput Struct Biotechnol J:19: 1759-1785. doi: 10.1016/j.csbj.2021.03.003. PMID: 33897980; PMCID: PMC8050730.
- [10] Jambulingam Vasanthakumar and Sanjay Kamar (2020) Prevalence of obesity among type 2 diabetes mellitus patients in urban areas of Belagavi

- [11] ,vol:13issue: 1 pg.no: 21-27
- [12] Joyita Banerjee, Yogita Dhas and Neetu Mishra (2020) Middle-Aged Indians with Type 2 Diabetes Are at Higher Risk of Biological Ageing with Special Reference to Serum CDKN2A Volume 2020 | Article ID 7569259
- [13] Karthikeyan R and Sundarapandian M (2017) Antidiabetic Activity of Methanolic Extract of *Halodule uninervis* in Streptozotocin-Induced Diabetic Mice J. Pharm. Sci. & Res. Vol. 9(10), 1864-1868
- [14] Leelarani Ravilla, Navaith Ahmed S, Kalaivani P, and Vanitha V (2020) A Review on *Halodule uninervis* – A Potent Seagrass. International Journal of Research in Pharmaceutical Sciences, 11(1), 875–879.
- [15] Mills H, Acquah R, Tang N, Cheung L, Klenk S, Glassen R, Pirson M, Albert A, Hoang DT and Van TN (2022) Type 2 Diabetes Mellitus (T2DM) and Carbohydrate Metabolism in Relation to T2DM from Endocrinology, Neurophysiology, Molecular Biology, and Biochemistry Perspectives. Evid Based Complement Alternat Med: 1708769. doi: 10.1155/2022/1708769. PMID: 35983003; PMCID: PMC9381199.
- [16] Mohamed Ghandourah, Usama W. Hawas, Lamia T. Abou ElKassem, Munir Bamkhrama and Hanan A and A. Taie (2019) Antioxidant and Antitumor Metabolites of Saudi Red Sea Seagrasses *Halodule uninervis* and *Thalassia hemprichii*, Volume 16, Issue 1, Page: [50 - 58] Pages: 9, DOI: 10.2174/1570178615666180525110832
- [17] Mohan V, Unnikrishnan R, Shobana S, Malavika M, Anjana RM and Sudha V (2018) Are excess carbohydrates the main link to diabetes & its complications in Asians? Indian J Med Res, 148(5):531-538. doi: 10.4103/ijmr.IJMR_1698_18. PMID: 30666980; PMCID: PMC6366262
- [18] Pradheeba. M, E. Dilipan, Nobil E.P., T. Thangaradjou and Sivakumar Kannan, (2011) Evaluation of seagrasses for their nutritional value Indian Journal of Marine Sciences, volume- 40
- [19] Reynolds AN, Akerman AP and Mann J (2020) Fibre and whole grains in diabetes management: Systematic review and meta-analyses. PLoS Med. 17(3):e1003053. doi: 10.1371/journal.pmed.1003053. PMID: 32142510; PMCID: PMC7059907
- [20] R. Karthikeyan and M.Sundarapandian (2017) Antidiabetic Activity of Methanolic Extract of *Halodule uninervis* in Streptozotocin-Induced Diabetic Mice J. Pharm. Sci. & Res. Vol. 9(10), 1864-1868
- [21] Ting Mao, Fansu Huang, Xuping Zhu, Dong Wei and Lianmeng Chen, (2021) Effects of dietary fiber on glycemic control and insulin sensitivity in patients with type 2 diabetes: A systematic review and meta-analysis, Journal of Functional Foods, Volume 82, 104500, ISSN 1756-4646.
- [22] WHO,2020 classification of Diabetes