

Low-Intensity Continuous Training Vs. Metformin for Managing Pre-Diabetic Patients

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Abstract:-

INTRODUCTION: Pre-diabetes is characterised by the presence of impaired fasting glucose (IFG) and/or impaired glucose tolerance (IGT).^[1]

Management options for pre-diabetes patients included intake of a low-carbohydrate and low-fat diet along with regular physical exercise and ^[2] usage of medications like pioglitazone or metformin. Continuous training is physical training that involves activity without resting. This contrasts with interval training, which doesn't involve any rest periods. It includes aerobic activities like walking, running, biking, swimming, water aerobics and rowing.

OBJECTIVES: The current study was done to assess the effect of Low-Intensity Continuous Training (LICT) versus Metformin on patients diagnosed to have pre-diabetes.

MATERIAL AND METHODS: This interventional study was carried out at the department of physiology, Government Medical College, Kurnool, Andhra Pradesh, India, during the period of August 2022 to January 2023. Sixty patients were divided into two groups by randomisation. Group A – Included 30 pre-diabetic adults who were exposed to only LICT for 16 weeks.

Group B - Included 30 pre-diabetic adults who were given only Metformin for 16 weeks. Student's T-test was done to compare the two interventions.

RESULTS: Most patients were males aged 51-60 years old. There was a significant improvement in HbA1c, FBG, PPBG over 16 weeks in all 60 patients. Body weight and BMI reduced significantly in both groups. LICT was better in glycaemic control over Metformin in the current study in terms of FBG and PPBG.

CONCLUSION: The results indicate that regular physical exercise in the form of LICT could provide better glucose control and controlled body weight than pharmacological treatment in the form of Metformin. More knowledge on glycaemic management in the pre-diabetic stage can prevent the onset of type-2-diabetes Mellitus in many patients.

Keywords:- Pre-diabetes, LICT, Metformin, glycaemic control, T-test.

I. INTRODUCTION

When compared to healthy, non-diabetic adults, people with T2DM have a greater prevalence rate of cardiovascular illnesses (CVD). Patients with T2DM also have a higher incidence of cancer, neuropathy, nephropathy, and an overall higher risk of all-cause death, in addition to the morbidity and mortality of CVD. The main management objectives should be lowering the prevalence of obesity and controlling blood sugar. Modifying one's lifestyle is a key component of T2DM treatment, frequently in conjunction with oral hypoglycemic, insulin-sensitizing, and other medications that lessen insulin resistance.[1]

Modifying one's lifestyle is a key component of T2DM treatment, frequently in conjunction with oral hypoglycemic, insulin-sensitizing, and other medications that lessen insulin resistance (IR). Due to their similar effects on glucose control, exercise and metformin are the two treatments that are most frequently given to manage type 2 diabetes (T2DM); nevertheless, new research have suggested that combining these two treatments may have the opposite effect. It is well known that physical activity causes metabolic changes that reduce T2DM risk. Exercise appears to improve active tissue's absorption and oxidation of glucose and fatty acids, which appears to be beneficial for IR. It has been shown that modulation of fat and glucose absorption during exercise via the aforementioned transporters occurs through an insulin-independent mechanism after AMPK activation. Exercise has a favourable impact on IR by increasing insulin sensitivity and improved glycemic control, and it is a crucial tool for the therapy of T2DM. Although exercise brings about a number of beneficial effects, an increased AMPK activation is mostly responsible for improvements in glycemic control. The biguanide class of medications with insulin-sensitizing characteristics includes metformin. Metformin has been and continues to be a favoured pharmacological agent for the treatment of T2DM on a national and worldwide level, despite the fact that the mechanisms of its action are not entirely known. [2]

II. OBJECTIVES

To assess the effect of Low-Intensity Continuous Training (LICT) versus Metformin on patients diagnosed to have pre-diabetes.

III. MATERIALS AND METHODS

This interventional study was carried out at the department of physiology, Government Medical College, Kurnool, Andhra Pradesh, India, during the period of August 2022 to January 2023. Sixty patients were divided into two groups by randomisation. Parameters assessed include age, gender, HBA1C baseline and at the end of 16 weeks, body weight reduction by 16 weeks with both the treatment modalities.

IEC clearance and informed consent was obtained.[3][4][5]

- **Study design:** A Comparative study
- **Study area:** Department of Physiology, Kurnool Medical College, Kurnool
- **Study participants:** 21 to 60 years old individuals
- **Sampling method:** Simple Random Sampling
- **Study period:** August 01, 2022 - January 31, 2023
- **Sample size :**60.
- **Inclusion criteria:** Age group of 35-55 years.
- **Exclusion criteria:** Insulin dependent individuals, On medication for DM or any other diseases, any orthopedic problems.
- **Study tool:** Sixty patients were divided into two groups by randomisation. Parameters assessed include age, gender, HBA1C baseline and at the end of 16 weeks, body weight reduction by 16 weeks with both the treatment modalities.
- **Statistical analysis:** Data analysis was done by using SPSS-21.

A. Figures and Tables

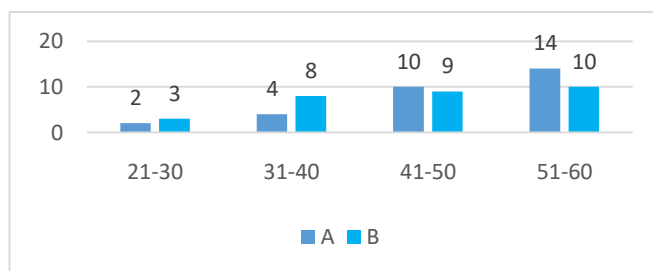


Fig. 1: Distrubution of study population

| Gender | A Group (No of patients and Percentage) | B Group | P value |
|---------|---|------------|---------|
| Males | 16(53.33%) | 22(73.33%) | 0.0539 |
| Females | 14(46.6%) | 8(26.67%) | 0.0558 |
| Total | 30 | 30 | |

Table 1: Gender distribution of study population

IV. RESULTS

Fig.1 Most patients were males aged 51-60 years old.

Fig.2 Out of 60 subjects 30 are male & 30 are female. There was no significant gender difference

There was a significant improvement in HbA1c over 16 weeks in all 60 patients.[6]

There was a significant improvement in FBG over 16 weeks in all 60 patients.[7]

There was a significant improvement in PPBG over 16 weeks in all 60 patients. [8]

Body weight and BMI reduced significantly in both groups. LICT was better in glycaemic control over Metformin in the current study in terms of FBG and PPBG.

V. CONCLUSION

The results indicate that regular physical exercise in the form of LICT could provide better glucose control and controlled body weight than pharmacological treatment in the form of Metformin. [9]

More knowledge on glycemic management in the pre-diabetic stage can prevent the onset of type-2-diabetes Mellitus in many patients.[10]

The study is self-sponsored.

| Group | Mean and SD of BW in kgs at baseline | Mean and SD of BW in kgs at the end of 16 weeks | % Reduction in body weight | P value |
|--------------------------------------|--------------------------------------|---|----------------------------|---------|
| A | 70.21±2.38 | 68.0±5.43 | 3.14% | 0.045 |
| B | 69.98±2.34 | 67.9±4.42 | 2.97% | 0.02 |
| P value- between A and B at 16 weeks | 0.48 | | | |

Table 2: Reduction of body weight in study population

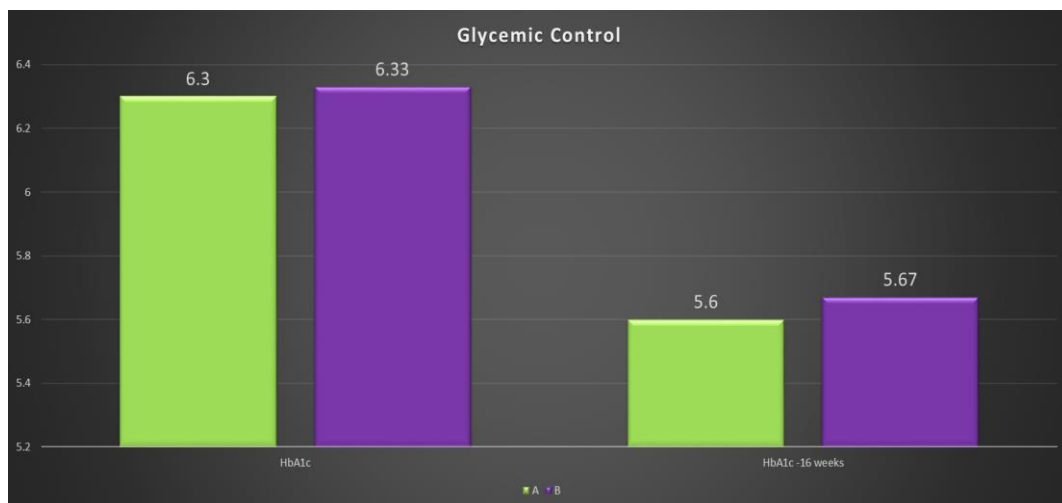


Fig. 2: Glycemic control of study population

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REFERENCES

[1.] Buysschaert M, Bergman M. Definition of prediabetes. *Med Clin North Am.* 2011;95(2):289–97, vii. Available from: <http://dx.doi.org/10.1016/j.mcna.2010.11.002>

[2.] American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes Care.* 2014;37 Suppl 1 (Supplement_1):S81-90. Available from: <http://dx.doi.org/10.2337/dc14-S081>

[3.] Nathan, D. M., Davidson, M. B., DeFronzo, R. A., Heine, R. J., Henry, R. R., Pratley, R., Zinman, B., & American Diabetes Association (2007). Impaired fasting glucose and impaired glucose tolerance: implications for care. *Diabetes care*, 30(3), 753–759. <https://doi.org/10.2337/dc07-9920>

[4.] <https://www.cdc.gov/diabetes/prevent-type-2/guide-prevent-type2-diabetes.html>

[5.] Armstrong L. ACSM’s guidelines for exercise testing and prescription. Philadelphia: Lippincott Williams & Wilkins; 2006.

[6.] Jette M, Sidney K, Blümchen G. Metabolic equivalents (METS) in exercise testing, exercise prescription, and evaluation of functional capacity. *Clin Cardiol.* 1990; 13:555–65. doi: 10.1002/clc.4960130809.

[7.] Ainsworth BE, Haskell WL, Herrmann SD, Meckes N, Bassett DR, Jr, Tudor-Locke C, et al. 2011 Compendium of Physical Activities: a second update of codes and MET values. *Med Sci Sports Exerc.* 2011; 43:1575–1581. doi: 10.1249/MSS.0b013e31821ece12.

[8.] https://www.accessdata.fda.gov/drugsatfda_docs/label/2017/020357s037s039,021202s021s0231bl.pdf

[9.] Johansen K. Efficacy of metformin in the treatment of NIDDM. Meta-analysis. *Diabetes Care [Internet].* 1999;22(1):33–7.

[10.] Lily M, Godwin M. Treating prediabetes with metformin: systematic review and meta-analysis. *Can Fam Physician.* 2009 Apr;55(4):363-9. Erratum in: *Can Fam Physician.* 2010 Jan;56(1):18. Lilly, Muriel [corrected to Lily, Muriel]. PMID: 19366942; PMCID: PMC2669003.