

MiRNAs as Potential Diagnostic Tool for Diabetes-linked Myocardial Infarction

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Introduction

- Cardiovascular diseases affect millions of people worldwide with a prevalence of 17.9 deaths in 2019¹.
- Myocardial infarction (MI) is the initial indicator of heart failure associated with reduced blood flow causing cardiac cell apoptosis².
- Diabetic patients exhibit a 2-4-fold increase in risk in the development of cardiovascular disease, especially MI³.

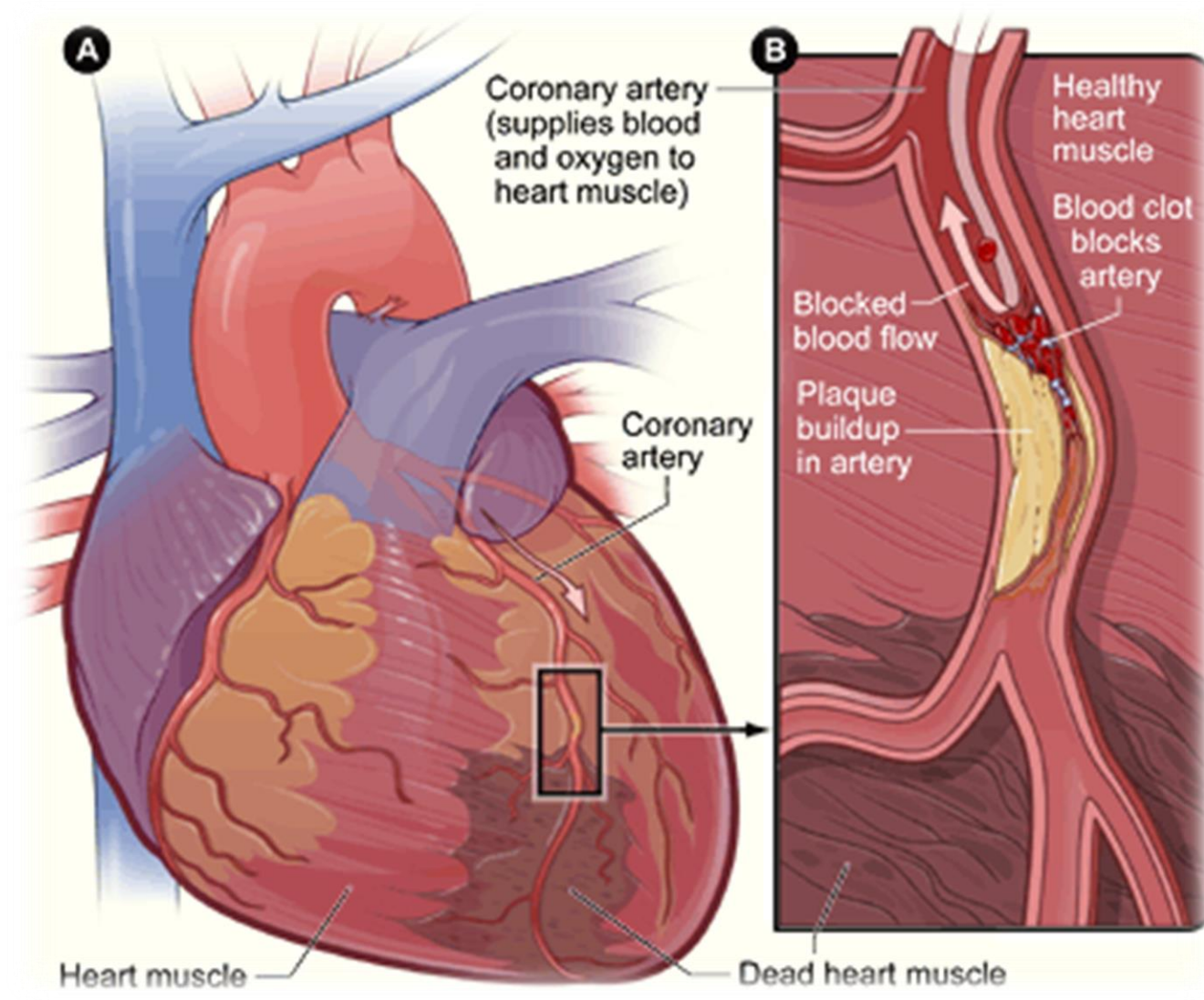


Figure 1: Cardiac ischemia and apoptosis leading to Myocardial infarction
<https://nurseslabs.com/myocardial-infarction/>

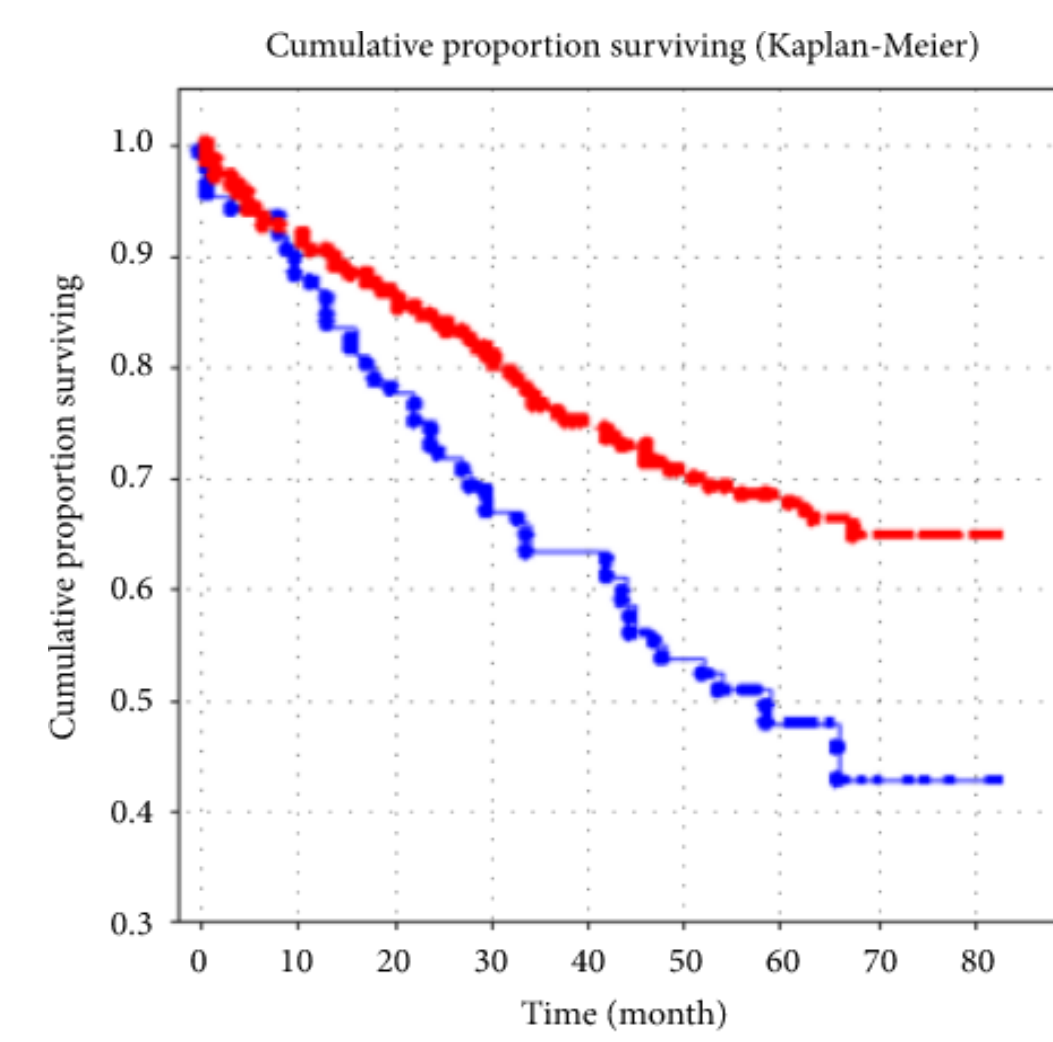


Figure 2: Impact of diabetes mellitus on long-term prognosis of the disease in MI patients
<https://www.hindawi.com/journals/jdr/2018/1780683/>

Material and Methods

- We have used Gene Target Registry (GTR) and National Center for Biotechnology Information database to find dysregulated genes in diabetes-linked MI patients.
- Insilico analysis was done to find miRNAs targeting the dysregulated genes by using Targetscan, miRBase, and miRanda databases.
- MicroRNAs (miRNAs) were isolated from peripheral blood of diabetic MI patients admitted in Lady Reading Hospital Peshawar
- Western blot was used to assess its target protein expression – reciprocal conformation of miRNA expression levels with its target protein inhibition.
- qRT-PCR and various biochemical assays were performed to explore the diagnostics potential of circulatory miRNAs including miR-15 in a diabetic MI patients' blood.

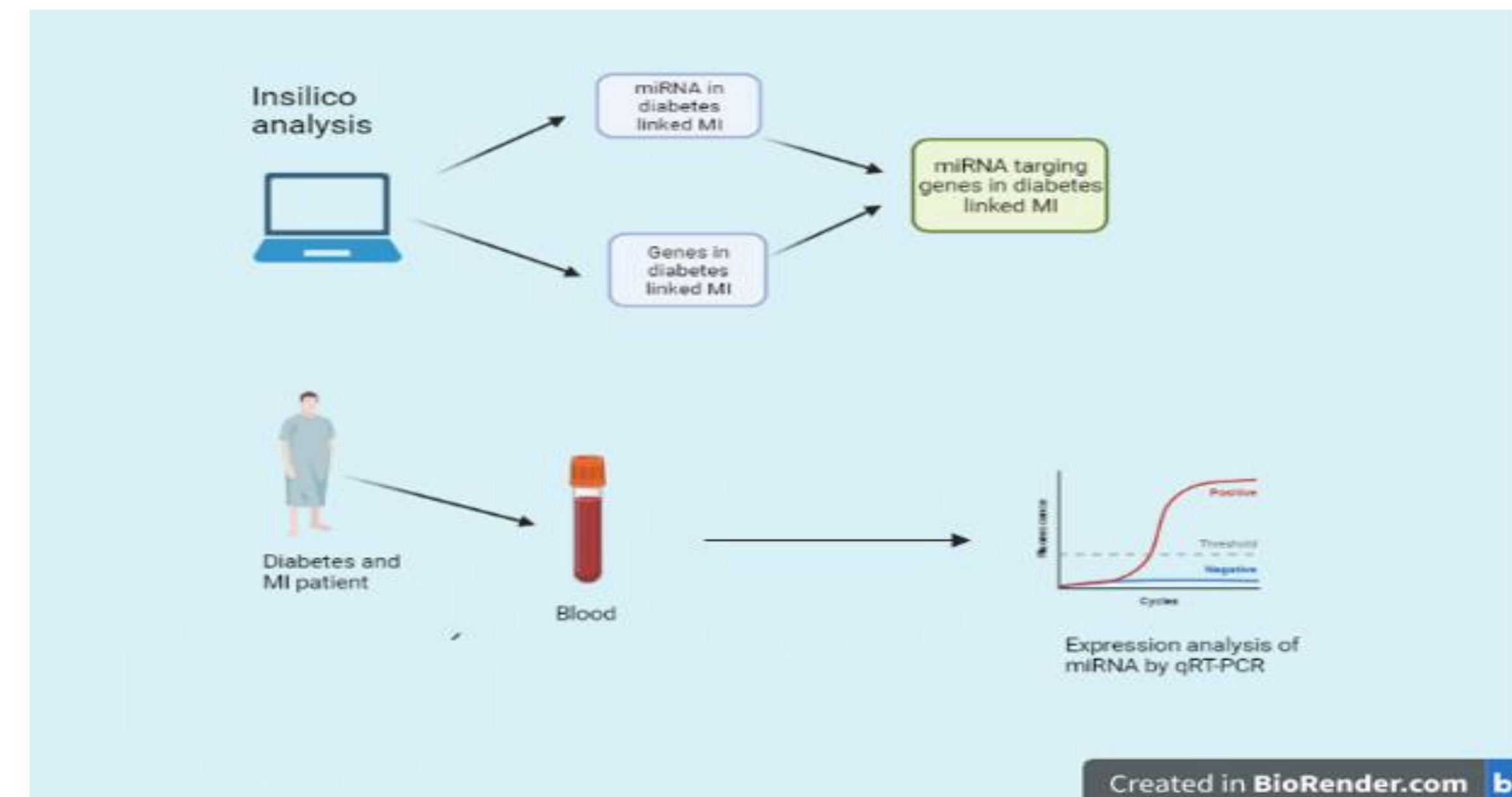


Figure 3: Brief demonstration of study

Results

- We identify many genes which have the 8-mers binding site of miRNA by using various bioinformatics tools.
- We find out that various genes including KCNQ1, CDKN2A, CDKN2B-AS1, and VEGF are dysregulated in diabetes-linked MI.
- KCNQ1 is a putative target of miRNA-365a and miRNA-365b.
- CDKN2A is another target of miR-484, miR-3155, miR-4466, miR-675, miR-6804, and miR-500. miR-15a is upregulated in diabetes linked MI patients, Vascular endothelial growth factor (VEGF) is the putative target of miRNA-15a.
- In addition, the bioinformatics analysis showed that VEGF has the target site for other miRNAs including miRNA-16, miRNA-195, miR-6838, miR-497, miR-424, miR-15a.
- Further expression analysis have confirmed miR-15a to be upregulated in diabetic MI patients' blood.

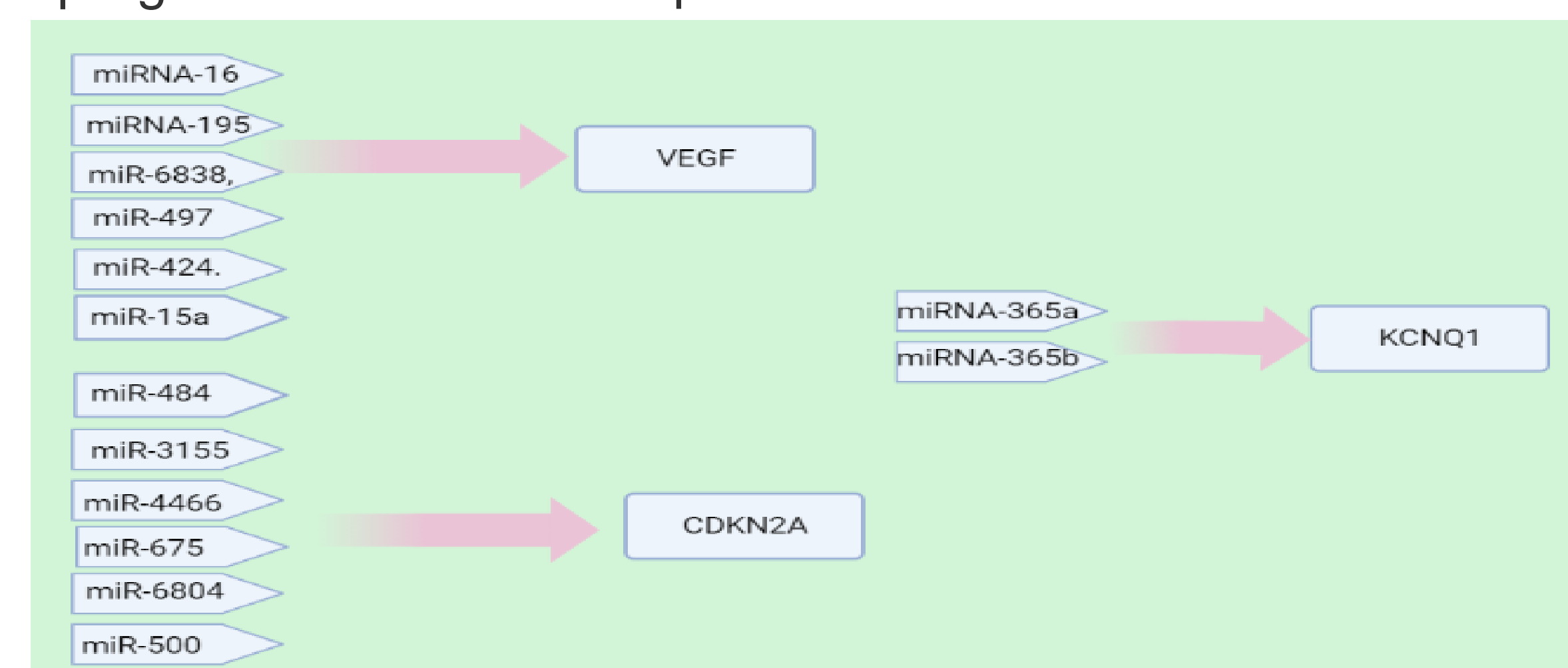


Figure 4: Putative target of miRNAs in in diabetes-linked MI

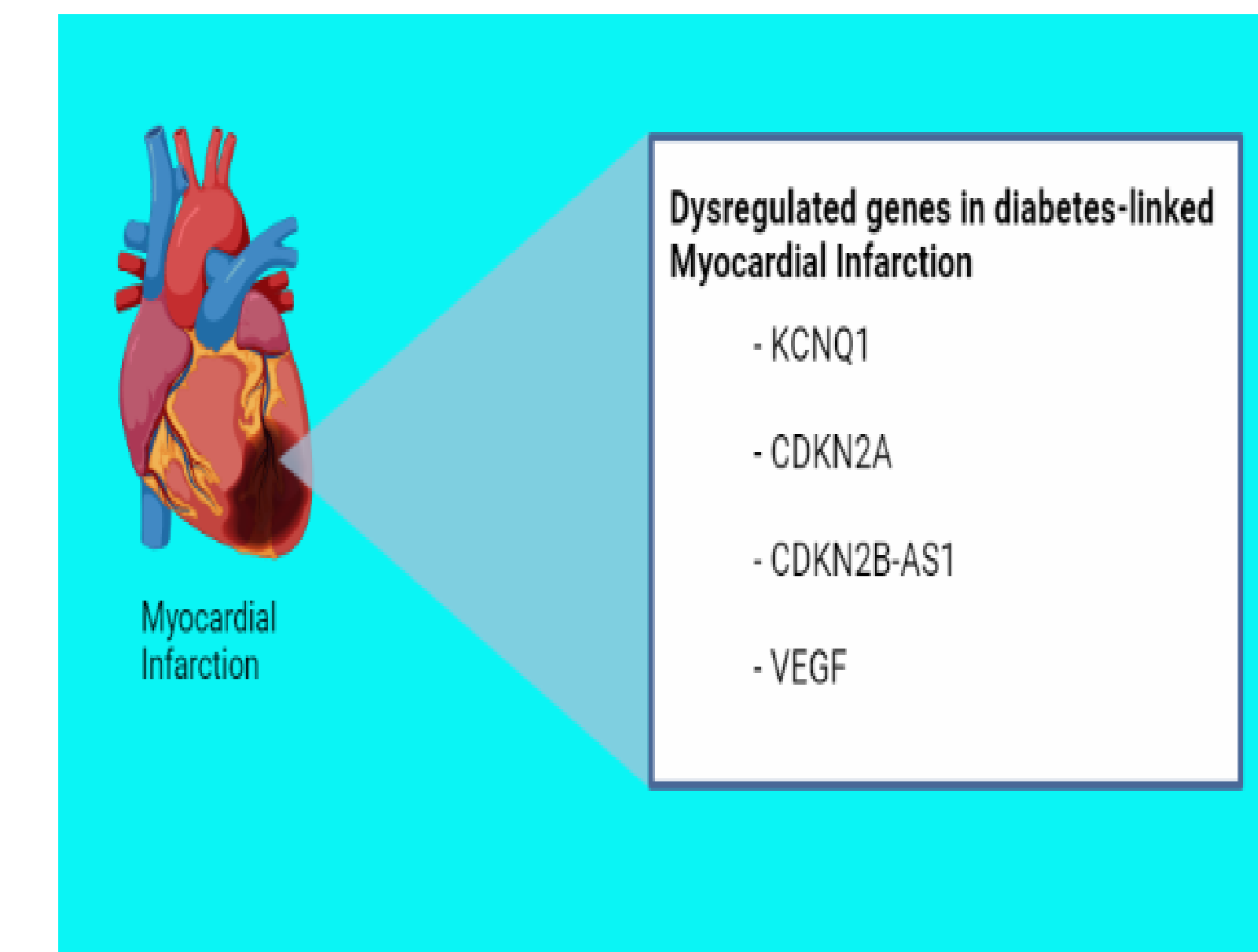


Figure 5: Dysregulated genes in diabetes-linked MI

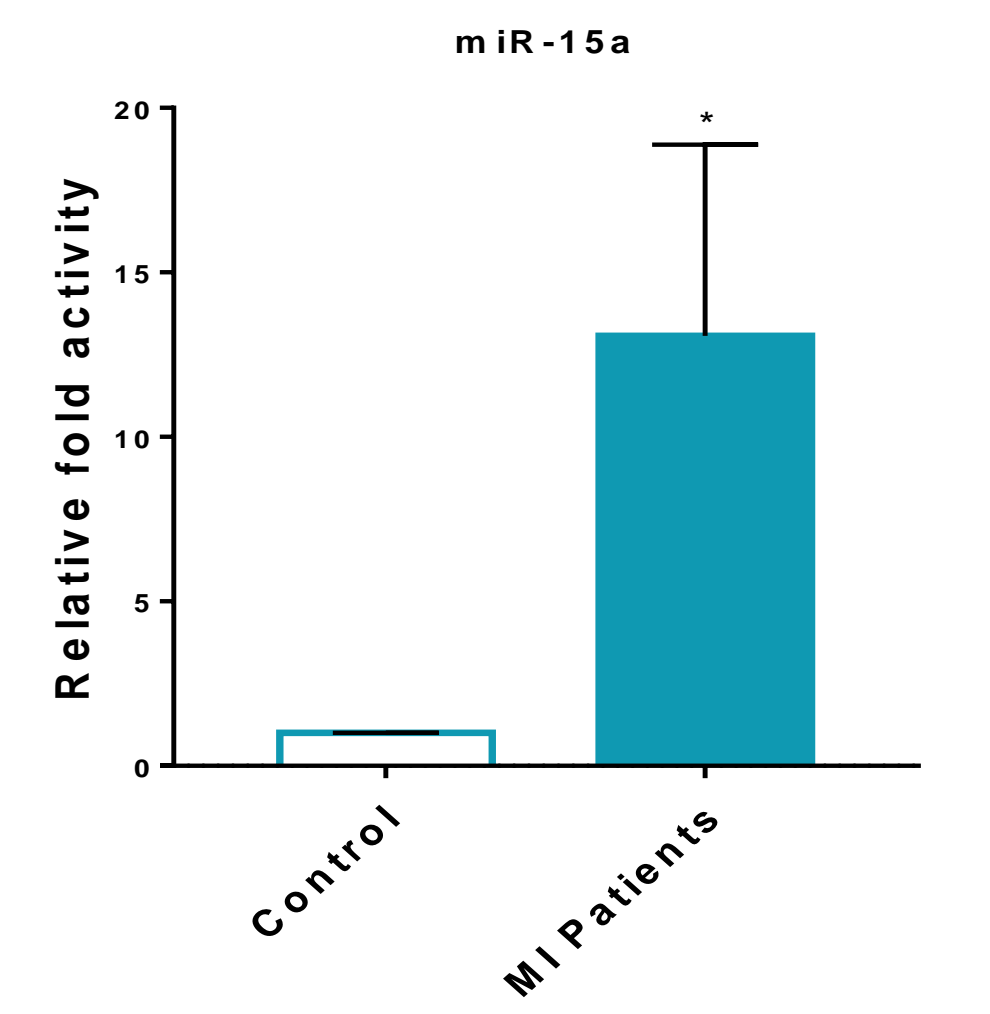


Figure 6: miR-15a levels in MI patient's blood

Conclusion

- Conclusively, these miRNAs may sever as a diagnostic marker for diabetes link MI.
- Furthermore, the circulatory miR-15a exhibits diagnostic potential for diabetes link MI and provide a therapeutic target for MI in diabetic patients.

References

- World Health Organization, 2021, https://www.who.int/health-topics/cardiovascular-diseases#tab=tab_1
- Jinawong *et al.*, 2021, *Acta Physiol*, <https://doi.org/10.1111/apha.13642>
- Canto *et al.*, 2019, *Eur. J. Prev. Cardiol.*, <https://doi.org/10.1177/2047487319878371>

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Diagram was created in BioRender.com

