88565.docx

WORD COUNT 1285
TIME SUBMITTED 25-JAN-2024 08:41AM
PAPER ID 106404488

Name of Journal: *World Journal of Diabetes*

Manuscript Type: Editorial

Unlocking New Potential of Clinical Diagnosis with Artificial Intelligence (AI): finding new patterns of clinical & lab data

Short Title:AI-Driven Clinical Diagnosis: Uncovering New Data Patterns

ABSTRACT

Recent advancements in science and technology, coupled with the proliferation of data, have also urged laboratory medicine to integrate with the era of artificial intelligence and machine learning (AI/ML). In the current practices of evidence-based medicine, the laboratory tests analysing disease patterns through the association rule mining (ARM) have emerged as a modern tool for the risk assessment and the disease stratification, with the potential to reduce cardiovascular disease (CVD) mortality. Cardiovascular diseases are the well recognised leading global cause of mortalitywith the higher fatality rates in the Indian population due to associated factors like hypertension, diabetes, and lifestyle choices.

AI-driven algorithms have offered deep insights in this field while addressing various challenges such as healthcare systems grappling with the physician shortages. Personalized medicine, well driven by the big data necessitates the integration of ML techniques and high-quality electronic health records (EHRs) to direct the meaningful outcome. These technological advancementsenhancethe computational analyses for both research and clinical practice. ARM plays a pivotal role by uncovering meaningful relationships within databases, aiding in patient survival prediction and risk factor identification.

AI potential in laboratory medicine is vast and it must be cautiously integrated while considering potential ethical, legal, and privacy concerns. Thus, an AI ethics framework is essential to guide its responsible use. Aligning AI algorithms with existing lab practices, promoting education among healthcare professionals, and fostering careful integration into clinical settings are imperative for harnessing the benefits of this transformative technology.

KEY WORDS

Laboratory Medicine, Artificial Intelligence (AI), Machine Learning (ML), Association Rule Mining (ARM), cardiovascular diseases (CVD)

CORE TIP

The integration of artificial intelligence (AI) and machine learning (ML) in laboratory medicine presents a promising opportunity to improve the patient care, particularly in the context of multi-factorial cardiovascular diseases. However, it is essential to approach this transformation carefully, side by side addressing ethical considerations, biases, while ensuring its responsible implementation through the collaboration between the technology experts and the healthcare professionals. Education and training are key to unlocking the full potential of AI while safeguarding patient privacy and data.

INTRODUCTION

Recent developments with advancements of science and technology and production of massive data have helped laboratory medicine to reach the era of artificial intelligence and machine learning (AI/ML). In the era of evidence-based medicine, combining laboratory testing with associated disease patterns using association rule mining (ARM) can prove to be modern tool for the risk assessment & disease stratification to reduce mortality in cardiovascular diseases (CVD) patients. AI based algorithms have brought more insights and addressed a variety of problems in this field and can be considered as emerging interdisciplinary field [1].

The available literature suggests that the CVDs had occurred earlier in the Indian population as compared to the European population. Further, the fatality rate has found to be even two-fold increase in Indian population in comparison with the same age group. Thus, CVDs have become the leading cause of mortality and source of much needed attention as a global threat. The hypertension, diabetes, metabolic syndrome, smoking, physical inactivity, diet pattern, and other environmental factors were counted as the major responsible factors for the higher rate of CVD in the Indian population [2]. Further, the available data supports the increased mortality with acute coronary syndrome in the young MI (myocardial infarction) patients of less than 45 years of age. It is pertinent to note that the cardiovascular diseases & associated risk in the early stage are typically treated with the greatest probability of success. In another study which is conducted by Dabla et al. 2021, the researchers found the diagnostic edge with the with lipid indices like Lipid Tetrad Index (LTI) and Lipid Pentad Index (LPI) to evaluate the Atherogenic Index of Plasma (AIP) with respect to the higher risk of premature CAD [3].

Traditionally, physicians diagnose CVDs based on their knowledge from their previous experience with patients with similar clinical presentations. It cannot be ignored that many countries are currently dealing with the shortage of skilled physicians, where AI can prove to be hopeful solution for the overburdened healthcare system. The growing requirement of personalized medicine for modern laboratory practices cannot be denied, resulting in an increasing amount of big data. ML-based techniques and high-quality cleaned data utilising electronic health records (EHRs) presented in the right format, can help to raise the computation analysis, not only for research but for clinical practice as well. The predictive power of computational analysis of EHRs can be enhanced when coupled with imaging & clinical attributes [4]. This unique technique can prove to be a potential tool for the early detection and intervention while applying practical rules to assist doctors and patients in early detection and intervention. There are various methods and rules are applicable in data mining, out of which the association rule mining (ARM) technique can extracts potential associations or causal relationships between the sets of patterns present in the given databases [5].

The Advanced Relation Mapping (ARM) method explores the informative index of specified persistent entities or occurrences, establishing connections between elements or events. Consequently, these guidelines unveil noteworthy associations among factors in the data repository, offering a powerful instrument for foreseeing the longevity of individuals experiencing symptoms of cardiac insufficiency. Moreover, it facilitates the identification of crucial clinical attributes (or risk elements) associated with the onset of heart failure. Soni et al. in 2016 employed an association rule algorithm to assess the potential risks for individuals with diabetes. Their study involved the application of this algorithm to extract relationships within an authentic dataset [6]. Shehabi and Baba et al. in 2021 proposed a novel approach known as MARC (Mining Association Rules Classification) to extract significant association

rules, addressing challenges associated with symbolic methods. This method aims to overcome issues arising from generating an excessive number of association rules in the context of small datasets, a common problem leading to the production of redundant rules in large datasets [7]. In 2022, Anju Singh et al. employed the hotspot algorithm to identify patterns and associations among various attributes. The analysis encompassed a comprehensive set of biochemical evaluation tests, coupled with a detailed patient history that included physical examinations and electrocardiograms (ECGs). The biochemical markers measured comprised the lipid profile, encompassing total cholesterol, triglyceride, LDL-C, HDL-C, Apo A1, Apo B, and Lp(a) levels [8]. Moreover, it is imperative to acknowledge that the rapid pace of technological evolution and integration demands vigilant consideration of potential medical, ethical, legal, and reputational risks. In this context, ethical considerations are becoming topic of concern and soon necessary requirements. Though, AI application in lab medicine is limited till date compared to other healthcare facilities, however its realization also requires addressing risk of bias tools, algorithm auditing, error managements and most importantly privacy concerns & ethical issues. The significance of an AI ethics framework lies in its ability to illuminate both the potential risks and benefits associated with AI tools, while also setting forth guidelines for their responsible and ethical utilization.

We cannot deny that advantages of new technologies require careful alignment and optimization of AI based algorithms with existing lab practices [8]. Hence, rather than hastily implementing technology, a more prudent approach involves directing its adoption through education and careful integration into clinical practices, ensuring its appropriate use by healthcare professionals.

CONCLUSION

The integration of AI in laboratory medicine holds immense potential to transform healthcare, particularly in combating cardiovascular diseases. However, its responsible implementation, addressing ethical concerns, and collaboration between technology and healthcare experts are crucial to harnessing the benefits and improve patient outcomes.

88565.docx

ORIGINALITY REPORT

5%
SIMILARITY INDEX

PRIMARY SOURCES

1	e-journal.unair.ac.id Internet	50 words — 4%
2	www.ncbi.nlm.nih.gov Internet	14 words — 1%

EXCLUDE QUOTES	ON	EXCLUDE SOURCES	< 12 WORDS
EXCLUDE BIBLIOGRAPHY	ON	EXCLUDE MATCHES	< 12 WORDS