MEDINFO 2013
C.U. Lehmann et al. (Eds.)

doi:10.3233/978-1-61499-289-9-1178

Noninvasive Diagnosis of Nonalcoholic Steatohepatitis Disease Based on Clinical Decision Support System

Nassim Douali[*ac], Meriem Abdennour[*abc], Magali Sasso[b], Veronique Miette[b], Joan Tordjman[ac], Pierre Bedossa[e], Nicolas Veyrie[af], Christine Poitou[ac], Judith Aron-Wisnewsky[ac], Karine Clément[ac], Marie Christine Jaulent[a], Jean Daniel Zucker[acd]

[a] Inserm, URMS 872 Team 7 and 20, Pierre and Marie Currie University-Paris6, Cordeliers Research Center, Paris – France, [b] Echosens, R&D Department, Paris, France, [c] Institute of Cardiometabolism and Nutrition, APHP, Pitié-Salpêtrière Hospital, [d] IRD, UMI 209, UMMISCO, IRD France Nord, F-93143, [e] Assistance Publique-Hôpitaux de Paris, Hôpital Beaujon, Département de Pathologie Clichy.[f] Department of General, Digestive and Metabolic Surgery, Ambroise Paré Teaching Hospital, France.

Abstract

Non-alcoholic fatty liver disease (NAFLD) is a hepatic disease associated with metabolic syndrome. NAFLD covers a spectrum of liver disease from steatosis to non-alcoholic steatohepatitis (NASH) and cirrhosis.
NASH is a disease evolving under the influence of various stimuli still poorly understood. In this paper we present new clinical decision support system (CDSS) for the diagnosis of NASH and the comparison of this system with machine learning algorithms.

Keywords :

Non alcoholic fatty liver disease, Liver Disease, Nonalcoholic steatohepatitis, clinical decision support system, knowledge representation.

Introduction

NAFLD is a clinical syndrome and pathologically characterized by diffuse macrovesicular fatty change in the hepatocytes. NAFLD includes simple nonalcoholic fatty liver disease, nonalcoholic steatohepatitis (NASH) and hepatic cirrhosis [1].
NASH is a disease evolving under the influence of various stimuli still poorly understood, but where insulin resistance prominently [2]. It is necessary to develop a knowledge-based system to diagnose NASH. In this paper we describe a new diagnosis support system based on validated knowledge from scientific literature and clinical practice guidelines (CPG) and comparison of this system with machine learning algorithms.

Materials and Methods

162 morbidly obese subjects involved in a gastric surgery program, prospectively recruited between 2005 and 2009 in the Department of Nutrition of Pitié-Salpêtrière.

Prediction analyses were performed using the following commonly used methods: logistic regression and fuzzy data-mining. All algorithms were implemented within the R environment.

Case Based Fuzzy Cognitive Map (CBFCM) is a hybrid decision-making computing technique [3]. CBFCM is represented as nodes (concepts) that illustrate the different aspects of the system's behavior. The construction of CBFCM for the modeling of a medical decision making task is consisting of three parts: (a) to determine concepts and (b) to determine the strength of cognitive relationships between concepts (c) to explicit the fuzzy control rules [4].

Results

Logistic regression gives an accuracy of 77.3% and Fuzzy Data Mining gives an accuracy of 75%. With CDSS, the accuracy was 91.9% and gives AUROC=91.7%

Discussion and conclusion

On our data, prediction NASH with decision support system gives performance higher than logistic regression and fuzzy data mining. The conducted study allowed us to test cognitive approaches reasoning to enable personalized medicine.

Acknowledgments

We thank Dr Florence Marchelli. The constitution of the obese cohort and data base was funded by the (0702/Microbaria), French National Agency of Research (ANR Adipofib and ANR-IHU ANR-10-IAHU-05.) and European Union (FLIP_FP7).

References

[1] Sanyal AJ. AGA technical review on nonalcoholic fatty liver disease. Gastroenterology. 2002;123:1705-25. doi: 10.1053/gast.2002.36572

[2] Venables, W. N. and Ripley, B. D. (2002) Modern Applied Statistics with S. Fourth edition. Springer.

[3] Douali N, De Roo J, Jaulent MC. Clinical diagnosis support system based on case based fuzzy cognitive maps and semantic web. Stud Health Technol Inform. 2012;180:295-9

[4] Douali, N. et Jaulent, M.-C. Integrate personalized medicine into clinical practice to improve patient safety. IRBM, 2013. Doi : 10.1016/j.irbm.2013.01.001

Address for correspondence:

Nassim Douali**:** nassim.douali@crc.jussieu.fr

[*] First authors