Abstract

Title
A STUDY ON SOME PREVALENT DISEASES AMONGST NEONATES OF NORTH-EASTERN PARTS OF INDIA AND DEVELOPMENT OF KNOWLEDGE-BASED DECISION SUPPORT SYSTEM FOR TREATMENT PLANNING

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ABSTRACT

A famous quote “Children are the future of the nation” is often used by many people all over the world. This really good listen and appears to be right. But the actual picture is in dark side, that there are a plenty number of sick, filthy, hungry, beggarly kids all around us without having any hope of a secured future. Many children have been deprived of basic needs like food, proper shelter and sanitation, basic education, basic training and access to health care facilities. But every child has the right to protection, basic education, and proper healthcare, a healthy environment and good livelihood opportunities. It is important to look after the children’s health status carefully by the parents or guardians. Particularly new born babies should be given ultimate care to maintain of his/her the future growth.

Neonates, i.e. babies of just few hours/weeks of old after birth, not only constitute a large population group, but also are vulnerable or special risk group. The risk is related with growth, development, disease pattern and survival. Thus by improving the health status of neonates, we contribute to the health of the general population. These considerations have led to the formulation of special health service for children all over the world. The health care system in North Eastern parts of India is not sufficient enough to provide all the necessary medication properly. Mostly, in village areas, there has been acute problem of neonatal prevalent diseases. Some of the identified prevalent diseases and health related problem of neonates are Birth Asphyxia, Neonatal Sepsis, Hypoxic-Ischemic Encephalopathy (HIE), Preterm, Low birth weight, Delayed breastfeeding, Problems in breastfeeding, Diarrhea, Hemorrhage, Conjunctivitis, Skin Infection, Abnormal Jaundice, Meconium Aspiration, Hyaline Membrane Disease (HMD), Pneumonia, Upper Respiratory Infection (URI), Hypothermia, Umbilical Sepsis, Tetanus, Convulsive Disorder, Unexplained fever, Failure to Gain Weight etc.

A Decision Support System (DSS) is actually assists decision making processes based on the available knowledge base of alternatives. It is one of the important and vastly used branches of Artificial Intelligence. DSS supports diagnosis and its probable action that has to be taken on the real time basis. Even a medical decision support system helps to make a diagnosis of diseases and selects an appropriate treatment plan for a sick neonate patient. In some situation, DSS allows for complete automated process of decision making, and provides the mechanism for operational diagnostic intelligence. As we automate more of our decision making process, it increases the speed and consistency in predicting the diseases. This has been a direct impact on productivity, accurateness and time. Knowledge base decision support system helps to filter out inaccurate experiential results and biases around personal judgments. This is particularly important in medical decisions, where a wrong decision has life impacting consequences, particularly for the new born babies. Doctors, medical practitioners and domain related personnel are suffering from high stress levels around decision making. When the concern cases are complex and the outcome of the decision has significant consequences, DSS proves itself to be an important expert hand. In a decision making system, expert involvement is a must. Experts are engaged in their intuitive decision making rather than structured approaches. There are various roles played by Artificial Intelligence in medical informatics and medical scientific research, especially, AI systems have the capacity to learn, leading to the discovery of new phenomena and the creation of medical knowledge.
First part of this work have explored the current status of some prevalent disease amongst neonates of North-Eastern parts of India and the second part have dealt with the development of a Knowledge-Based Decision Support System for Treatment Planning applying several techniques of Artificial Intelligence. Issues like knowledge acquisition (KA), knowledge representation (KR), formalization, tools selection, uncertainty management etc. have been considered in detail in the process. The Object Oriented (OO) approach considered as a suitable candidate for the purpose of knowledge representation and implementation. The validity of the system has tested with live cases of the domain. The issues like Ruled-Based approach, Case Based approach, Learning Mechanisms has also been considered in the process of making decision support system.

Different Data Mining techniques shows significant results to find significant pattern attempted on the collected data. Classification problems have been successfully produced with the use of Decision Tree, ID3, C4.5, and Feed Forward Neural Networks. For human like decisions making, Soft Computing Techniques are being applied in neonatal domain. Several Soft Computing methodologies like Artificial Neural Network, Rough Set Theory have shown great efficiency in decision making and prediction process with higher accuracy rate. The increasing demand of Artificial Neural Network application for predicting the disease shows better performance in the field of medical decision making. The proposed technique involves training a Multi Layer Perceptron (MLP) with a Back Propagation (BP) learning algorithm to recognize a pattern for the diagnosing and prediction of neonatal diseases. Comparative study of using different training algorithm of MLP, Quick Propagation, Conjugate Gradient Descent, shows the higher prediction accuracy.

The Neuro-Genetic fusion process of Artificial Neural Network with Genetic Algorithm has been established by using GA to optimize the parameters for an ANN with specific topology architecture. Back propagation neural network learning done by frequent changing of the weights at the output layer. Neuro-genetic fusion approach shows substantial improvement in predicting the neonatal disease for the development of decision support system. Computational Intelligence (CI) is a sub-branch of Artificial Intelligence. It is the study of adaptive mechanisms to enable or facilitate intelligent behavior in complex and changing environment. In case of neonatal disease diagnosis and management it can also be a great part for decision making and useful tool for domain experts.

Finally, for the fast growing fields in the intelligent system development for any organization, Decision Support System becomes one of the most vital, important, and strategic and most demanded tool. Though the study successfully evident its objectives, still one must know that decision support system is not suppose to replace the domain expert’s knowledge, rather it is being helpful for those personnel related with neonatal health care management by giving reliable assistance.

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