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EARLY SELF-DIAGNOSIS MODEL FOR DENGUE FEVER ASSESSMENT USING FUZZY RULES BASE SYSTEM

INTRODUCTION

Dengue fever (DF) is one of the main concerns in the public health center especially in tropical and subtropical countries. It is a mosquito-borne disease and once infected, the patient may experience sudden high fever, severe headaches, fatigue, severe joint and muscle pain and at worse cases DF can cause death. Recently, the increasing number in DF cases is at alarming rate with potential of life threatening and becoming a global pandemic. Therefore, in an effort to save lives, an early self-diagnosis is important to better detect early signs and symptoms of dengue fever. There are a number of model produced for DF assessment, but for early self diagnosis are still not widely explored as most of the developed models are only suitable for patient's early diagnosis with the assistance of patient's symptoms together with the clinical results (Saikia and Dutta, 2016; Anitha and Wise, 2018; Gambhir, Malik and Kumar, 2018). While, patients identification of DF should be done earlier by only utilising the physical symptoms before any medical procedure. There's still gap in the DF assessment study that need to be fulfil.

PURPOSE

Thus, this study developed an accurate system to give an early self-notification on dengue fever assessment. This system is able to alarm patients whether they are suspected to have DF or not and to advise patients to seek medical care immediately before the symptoms get worse.

MATERIALS & METHOD

Rules were extracted from an interview with the experts from University of Malaya in dengue domain and tested for their accuracy

General rule:
HF+ more than 1 other symptoms + IP>2 = Positive,
Else = Negative

Table 1: Dengue Symptoms

Id	Dengue Fever	Dengue Haemorrhagic Fever
1	Sudden, high fever, HF	Abdominal pain, AP
2	Severe joint and muscle pain, JP	Persistent vomiting, PV
3	Vomiting, V	Clinical fluid accumulation, FA
4	Skin rash, SR	Inner mouth bleeding, MB
5	Pain behind the eyes, PE	Exhaustion, E
6	Fatigue, F	
7	Severe headaches, SH	
8	Nausea, N	
9	Loss of appetite, LA	
10	Incubation period more than 2 days, IP>2	

Table 2: Extracted Rules

Id	Symptoms	Status
1	HF+ SH+ PE+ JP+ F+ N+ V+ SR+ LA+ AP+ MB+ E+ IP>2	Positive
2	HF+ JP+ F+ N+ V+ IP<2	Positive
3	HF+ SH+ PE+ IP>2	Positive
4	HF+ SH+ PE+ IP>2	Positive
5	HF+ SH+ PE+ JP+ IP>2	Positive
6	HF+ SH+ JP+ IP>2	Positive
7	HF+ SH+ V+ + IP>2	Positive
8	HF+ V+ SR+ + IP>2	Positive
9	HF+ SH+ LA+ AP+ MB+ E+ + IP>2	Positive
10	HF+ AP+ E+ + IP>2	Positive
11	SH+ V+ + IP>2	Negative
12	V+ SR+ IP>2	Negative
13	SH + LA+ AP+ MB+ E+ + IP>2	Negative
14	AP+ E+ IP>2	Negative
15	HF+ V+ SR+ + IP<2	Negative
16	HF+ SH+ SR+ + IP<2	Negative
17	HF+ MB+ SR+ + IP<2	Negative
18	MB+ SR+ + IP<2	Negative
19	MB+ SR+ + IP>2	Negative
20	SH+ PE+ JP+ F+ N+ V+ SR+ LA+ AP+ MB+ E+ + IP>2	Negative

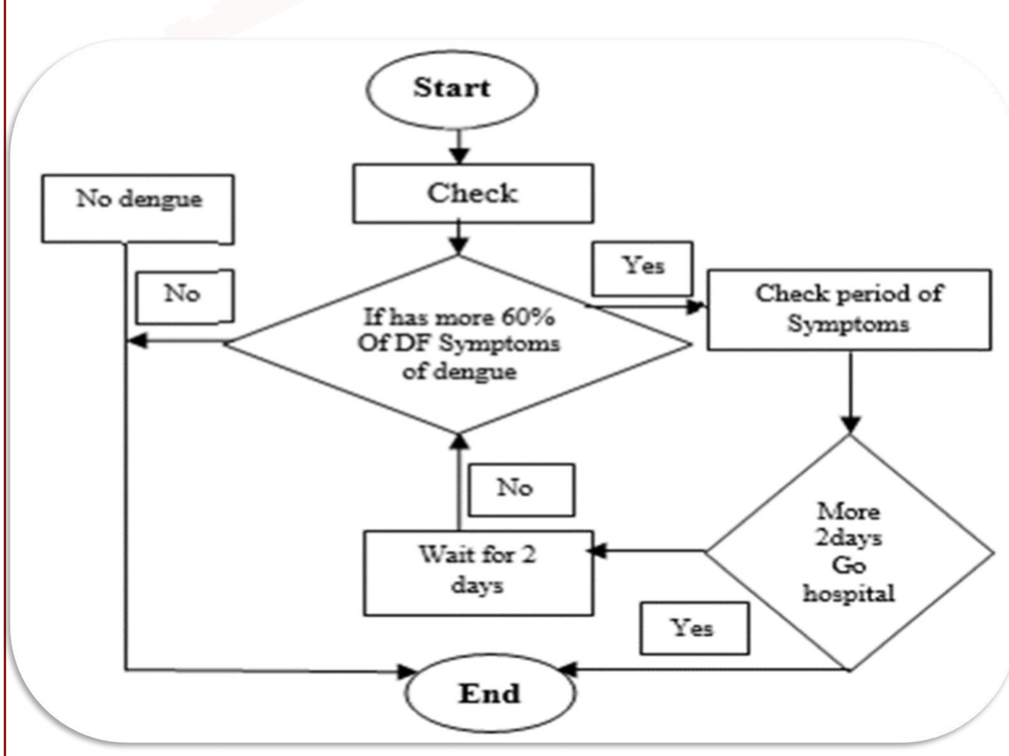

Figure 1: System Flow Chart

The system developed make used two techniques namely the fuzzy expert system and data mining technique. The rules for dengue diagnosis was first determined based on an interview with medical doctors and later those rules were set in the expert system using a fuzzy logic.

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RESULTS & DISCUSSION

The validation of the extracted rules was determined using data mining tools. The model was evaluated using a real dengue related dataset form a hospital in Iran with 1055 and 20 instances was set as training and testing data, respectively.

Finding of the study showed that the accuracy of the developed model for self-diagnosis of dengue symptoms able to produce a reliable result with 100% accuracy.

Table 3: Dataset Information

	Training data	Testing data
Sources	Hospital dataset	Extracted rules
Instances	1055	20
Algorithm	Multilayer Perceptron Neural network	

Table 4: Training and Testing Results

Evaluation training dataset	Training rate	Testing rate
Correctly Classified Instances	1055	29
Incorrectly Classified Instances	0 (0%)	0 (0%)
Kappa statistic	1	1
Mean absolute error	0.0009	0.0009
Root mean squared error	0.0011	0.0011
Coverage of cases (0.95 level)	100%	100%
Mean rel. region size (0.95 level)	50%	50%
Total number of Instances	1055	29

CONCLUSION

This system has many benefits in collecting and analyzing the data by using various resources for the data. In addition, this system has used fuzzy logic neural network model based on authoritative information provided by qualified doctors for getting accurate results. Our system assists doctors to make their work easier and it provides a practical platform for infected patient to get the information whether they need to seek medical care immediately before the symptoms get worse. Furthermore, the user will find the system useful because it helps them to save their time and cost while experiencing as though they are directly getting consultation with the experts.

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