

## An expert system for nausea and vomiting problems in infants and children

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### Abstract

Infants and children are suffering from a lots of nausea and vomiting problems. Doctors, usually face various difficulties dealing with these problems because of their similarities. In this paper, we present an expert system to help users in getting the correct diagnosis of problems of nausea and vomiting in infants and children (Gastro-esophageal reflux, Gastroenteritis, Systemic Infection, Bowel obstruction, Tumors, A bleeding disease, tonsillitis, and Hepatitis pharynx). Furthermore, this expert system provide information about the disease and how to deal with it. SL5 Object expert system language was used to design and implement this expert system.

**Keywords:** Artificial Intelligence; Expert Systems; SL5 Object; Nausea; Vomiting; infants and children

### 1. Introduction

Nausea and vomiting are general in children, and are frequently element of a mild, short-lived illness, normally caused by a viral infectivity. Even though the majority of children get better from nausea and vomiting without any extravagance, it is significant to recognize when to seek out assistant if the child does not get better<sup>[3,4]</sup>. Spitting up in infants (gastroesophageal reflux) is covered separately. For vomiting, nausea, stomach disorders endured by several children one cause for entering the food or polluted air way<sup>[30,31]</sup>.

Vomiting happens when nerves in the body or brain detect a trigger, for instance food poisoning, specific infections or drugs, or movement. Nausea typically, but not at all times, takes place prior to vomiting. Younger children might not be capable of identifying nausea, while they may grumble of a stomach ache or have other wide-ranging grievances.

Vomiting frequently has an advantage because it gives a way for the body to dispose probably hurtful materials. But, medicines and techniques to persuade vomiting (e.g. syrup of ipecac, placing a finger in the throat) are not any more suggested, even if an infant or child has ingested a dangerous materials. In this situation, it is better to right away request emergency medical support<sup>[32]</sup>.



Fig 1: a child

### 2. Expert system language

Expert Systems language is a set of programs which allow the building of an expert system through the creation of knowledge and rules<sup>[11,14]</sup> see figure 2 for details. Expert systems have

three essential components

1. **User interface:** presents questions to the user and accepts inputs from them.
2. **Knowledge base:** contains data, facts, rules and objects in a specific knowledge domain. The knowledge base obtained from the human expert is prepared by a knowledge engineer as most human experts are not skilled in computer programming.
3. **Inference engine:** this is software that matches the users input with data contained in the knowledge base to reach appropriate answers. This is done using inference rules e.g. IF conditions THEN statements ELSE statements rules.

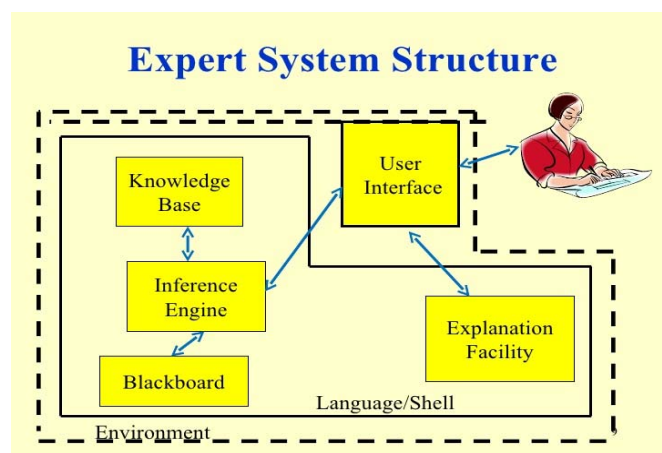


Fig 2: Component of the expert systems

The proposed Expert System for Nausea and Vomiting in Infants and Children Diagnosis was implemented using SL5 Object language which stands for Simpler Level 5 Object expert system language<sup>[2]</sup>. It is a forward chaining expert system that can make inferences about facts of the world using rules, objects and take appropriate actions as a result. The SL5 Object language is implemented in Delphi Embarcadero RAD Studio XE6<sup>[2]</sup>. SL5 Object language is easy for the knowledge engineer to build the expert system and for the end users when they use it.

### 3. Literature Review

There are many expert system that were designed to diagnose diseases [15, 29]. But there is no specialized expert system for diagnosis of the Nausea and Vomiting in Infants and Children available. Although it's linked to several human diseases such as: Diabetes, bacterial, Ear, Eye, Mouth Problems [1, 6, 8, 15, 29]. Talayeh developed an expert system for diabetes diagnosis [13]. MYCIN is a famous expert system for diagnosing bacterial infections [24]. Some of these Expert Systems are specialized in one specific disease and other in a few diseases. However, the current proposed expert system is specialized in the diagnosis of Nausea and Vomiting in Infants and Children.

### 4. Materials and Methods

The proposed expert system perform diagnosis for the Nausea and Vomiting in Infants and Children by asking questions that requires True/False answers. The proposed expert system will ask the user to choose the correct answer in each frame. At the end of the diagnosis session, the proposed expert system provides the proper diagnosis of the problem and offer a recommendation of the symptoms to the users. Figure 3 shows the first screen of the expert system session. Figure 4 shows an example of True/False question and Figure 5 shows how the expert system displays the diagnosis of the problem and the recommendation for treating the patient.

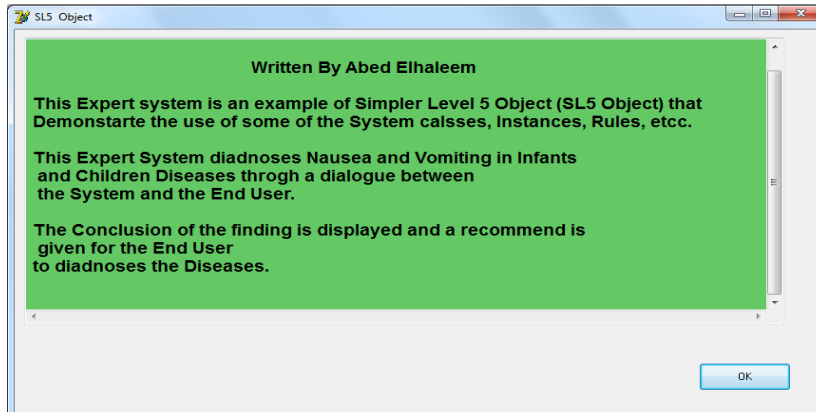


Fig 3: shows first screen of the expert system session

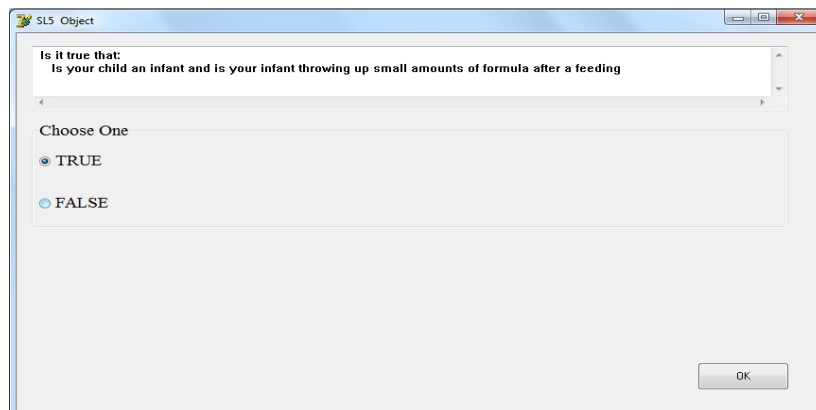


Fig 4: shows an example of TRUE/FALSE question type

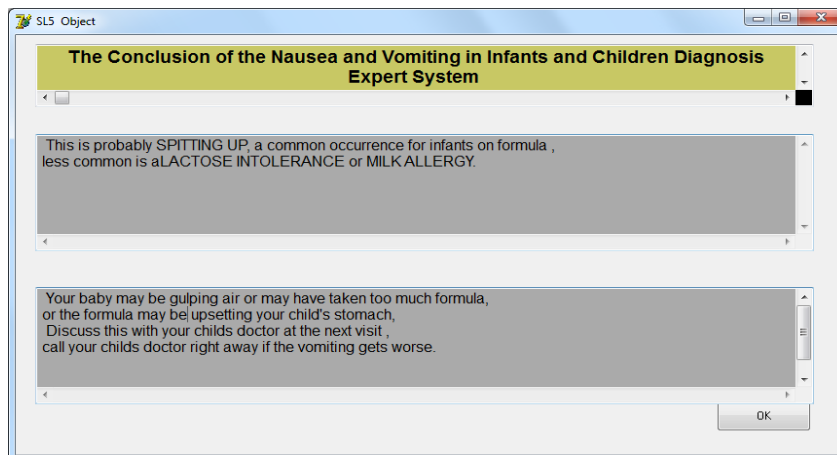


Fig 5: The expert system displays the diagnosis of the problem and the recommendation for treating the patient.

## 5. Knowledge Representation

The main sources of the knowledge for this expert system are Physician and specializes websites for Nausea and Vomiting in Infants and Children. The collected knowledge have been transformed into SL5 Object Knowledge base syntax: Facts, Rules and Objects. Currently the expert system has 11 rules which cover Nausea and Vomiting in Infants and Children. The core cause of the Nausea and Vomiting in Infants and Children may be by a problem in a different part of the body. In numerous cases, physician may not discover a cause for the ache. When a cause is recognized, general explanations take account of [3, 5, 30, 34].

- This is most likely spitting up a general occurrence for infants on formula. Not widespread is a lactose intolerance or milk allergy.
- This form of vomiting may be from an obstruction at the end of the stomach named as pyloric stenosis.
- Child may have an obstruction of the intestines identified as intussusception.
- Vomiting and diarrhea may be from viral gastroenteritis or maybe from a trouble with a formula.
- Infant or child could be on the edge of dehydration.

### 5.1 Causes of nausea and vomiting in children and infants

- Allergies, are general causes of vomiting and feeling to the occurrence of the child to definite foods.
- Food poisoning, in this situation go along with by stints of vomiting, diarrhea and stomach spasm.
- Overeating, in some situations, children lean to eat a vigorous meal.
- Brain disorder, if there exists an Astound to the brain, or due to the existence of a tumor near the spinal cord vomiting happens.
- Intestinal obstruction, this case happen for babies, one of the rare situation not go with by diarrhea or fever.
- Meningitis

### 5.2 Causes of nausea and vomiting in children

- Inflammation of the intestines and bowel viral
- Inflammation of the intestines and colon bacterial
- Food poisoning
- Pelvic
- Peritonitis
- Pharyngitis
- Pneumonia
- Harsh cough

### 5.3 Nausea and Vomiting in Infants and Children

As much as it hurt to observe the child vomits, causing the situation of vomiting serious apprehension him/her, Vagaye suspicious state of the body to get rid of upset stomach things, frequently accompanied by vomiting, diarrhea, but when it occurs without an accompanying symptom of a further fear and may need intervention therapeutically offer on doctor to study the actions one's can take when your child is vomiting. Here are the top causes of vomiting in children:

If the child vomiting take care of feeding him fluids to avoid dehydration and avoid the risk of solids, does not provide for your child and a full meal after vomiting, and bitch about dairy products. Vomiting in children is often caused by a viral infection, the situation has sometimes identified as stomach flu, or gastroenteritis. Typically accompanied by diarrhea case,

even though there is no treatment for the problem, but the good side is that the situation stabilizes on its own within a few days. Attention of feeding the child fluids to avoid the risk of drought.

Allergies, are common causes of vomiting and sensitivity to the presence of the child toward certain foods. If your child is in the weaning phase and try out new foods are possibly to cause him/her eaten sensitivity, such as eggs, or soy, or dairy products, or shellfish, or peanuts. If the cause of vomiting is a sensitive cases will steady on its own, and it is sensible to keep away from this food.

Food poisoning, in this case accompanied by bouts of vomiting, diarrhea and stomach spasm. The situation may be caused by bacteria, or not cooked the meat well, or some dairy products and fatty cream, or eating foods that has been expired for a long period of time.

Overeating, in some cases, children tend to eat a hearty meal, and may be of junk food that causes disruption to the digestive system.

Anxiety and stress, emotional stress can lead to an imbalance in the digestive system, resulting in nausea or vomiting or diarrhea. This condition occurs for adolescents often not for children.

Brain disorder, if there were a shock to the brain, or due to the presence of a tumor near the spinal cord vomiting occurs.

Intestinal obstruction, this situation occur for babies, one of the rare cases not accompanied by diarrhea or fever.

Home procedures to deal with vomiting:

- Do not give the child a meal after vomiting only after 30-60 minutes to give the stomach enough time to recover.
- Start with small amounts of fluids after the stomach break, and better to give the child water or natural juices, not ready-made. Your child does not force on fluid intake, simply eat two tablespoons or 3, and wait 5 minutes and then resume fluid intake.
- Avoid solids, do not provide your child a full meal after vomiting, and avoid dairy products.
- Avoid the causes of vomiting such as strong odors such as onions or perfume may aggravate symptoms.

## 6. Conclusion

In this paper, a proposed expert system was presented for aiding Physicians in diagnosing patients with possible Nausea and Vomiting in Infants and Children. Nausea and Vomiting in Infants and Children patients can get the diagnosis faster and more accurate than the traditional diagnosis done by physicians. This expert system does not require rigorous training to be used; it has a straightforward and user friendly interface. It was developed using SL5 Object expert system language. The results of the preliminary testing of the expert system showed potential.

## 7. Future Work

This expert system is considered to be a base of future ones; more Nausea and Vomiting in Infants and Children are planned to be added to the expert system and to make it more accessible to users from anywhere at any time.

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