ORIGINAL ARTICLE

MALE INFERTILITY EXPERT SYSTEM DIAGNOSES AND TREATMENT

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|Received | 18 March 2016| |Accepted | 01 April 2016| |Published 19 April 2016 |

ABSTRACT

Background: Infertility affects up to 15% of couples of reproductive age all over the world, the prevalence of infertility is said to be increasing globally and Male infertility is the most prevalent. Infertility means no pregnancy after one year of marriage, 40% due to male factor and 40% due to female factor and 20% due to both factors. Many men do not know something about infertility. **Objectives**: this paper is going to resolve the exiting problems of male infertility by correctly diagnosing and offering the proper treatment . **Methods**: In this paper we present an expert system for male infertility diagnosis which will helps men to explore everything related to the problems of infertility and infertility diseases such as: Azoospermia, O.T.A syndrome which mean oligo-terato-astheno spermia, Aspermia and Sexual transmitted disease. We look forward to offer simplified answers to most of the male infertility diseases. This expert system for male infertility diagnosis used a very high level 5th generation language called: SL5 Object language for its design and implementation. **Results**: The male infertility expert system was evaluated by a number of specialists and found to be promising. **Conclusions**: This male infertility expert system will benefit infertility male specialists and patients suffering from infertility.

Keywords: *Artificial Intelligence, Expert Systems, SL5 Object, male Infertility.*

1.INTRODUCTION

Male infertility still challenges too many families and doctors, due to many factors affecting male infertility i.e. physical health, integrity of endocrinal system hormone as:

- FSH: Follicle-stimulating hormone.
- LH: Luteinizing hormone.

Male infertility produced by pituitary gland, also many hormone shared in regulation spermatogenesis as tyrosine and growth hormone and testosterone. Spermatogenesis occurs in seminiferous tubules in test under control of these hormones and need temperature less than the body temperature as found in scrotum (As shown in the Figure 1) [13].

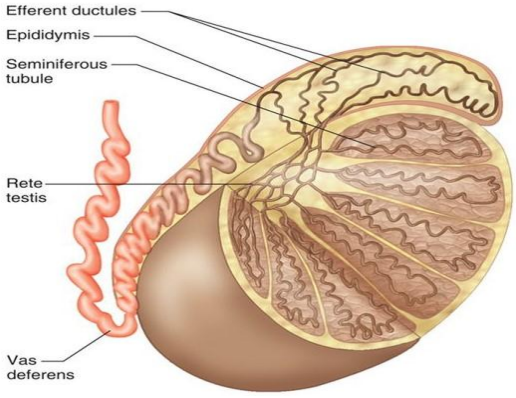

Figure 1: The figure presents the seminiferous tubules.

The first line of investigation is to do semen analysis in lab. It must fulfill World Health Organization criteria of normal semen analysis after that we go step by step to reach final diagnosis of infertility. A futile man often doing semen analysis that contains many of the causes of infertility whether simple or complex and also similar causes, therefore we have developed this expert system help infertile men in diagnosing some causes of infertility and diagnosing semen analysis to find out cause of infertility, in order to describe the appropriate treatment [15].

2.EXPERT SYSTEM

An expert system is one of the strongest branches of Artificial Intelligence (AI)[23-27], which aims to transfer the human intelligence to computer systems through the design of software and computing devices that simulate the behavior and thinking of humans [1,3]. An expert system consists of a knowledge base and an inference engine [2, 4]. Knowledge base is generated through two main components: human expert and knowledge engineer which convert this experience to knowledge base that consists of rules. Inference engine is an intermediary between the end user and the knowledge base, see Figure 2 for details.

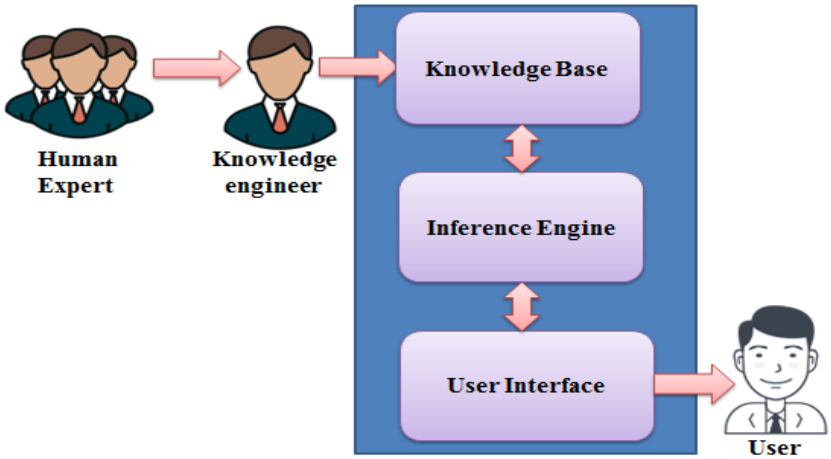

Figure 2: The figure presents the main Components of an Expert System.

The expert system for male infertility diagnosis was implemented by using Simpler Level 5 Object (SL5 O) [5] , which was influenced by Official Production System (OPS5) and Level 5 (L5) [5, 6]. SL5 Object was developed by Prof. Dr. Samy S. Abu Naser. SL5 Object is a forward chaining expert system language, multi-paradigm programming language (rule based and object oriented) and pattern matching.

3. LITERATURE REVIEW

There are many clinical tasks that can be implemented by expert systems such as:

- Help in diagnosis: When the patient's condition is complex or the person that doing the diagnosis is not an experienced one, an expert system provides meaningful diagnoses based on patient data.
- Proposing treatment: Expert system that can formulate a treatment plan based on the patient's condition and evidence-based treatment.

There are a few expert systems that diagnose male infertility; Infertility Expert System (IES) architecture for early diagnosis is an expert system for diagnosing man and women infertility using web based application [7], but does not include all the causes of infertility and its symptoms. The IES is an expert system that provides diagnosis for infertility in women is a web based application [8], which means diagnosing the symptoms of the women's infertility only, runs online. DX plain is a well-known expert system, this expert system is used to assist in diagnosis [9, 10], offers a justification for each diagnosis, suggest further tests. This expert system contains a Knowledge base of more than 2000 different disease including some infertility disease [11].

Some of these expert systems specialize in women infertility only and some others did not include all the causes of infertility and its symptoms. Furthermore, these expert systems do not contain knowledge about the semen analysis through which we know the cause of infertility and diagnosis. The current proposed expert system is specializes in the diagnosis of all the causes and symptoms of infertility and diagnoses infertility diseases based on the semen analysis (as Azoospermia, O.T.A syndrome, Aspermia and Sexual transmitted disease).

4. MATERIALS AND METHODS

In this system expert there are four basic diseases and one of them is divided into several cases (disease)[15,20]:

1. Azoospermia:
    - Azoospermia with no fructose in semen.
    - Azoospermia with fructose in semen.
    - Azoospermia with high FSH, LH.

- Azoospermia with low FSH, LH.

2. O.T.A syndrome.
3. Aspermia.
4. Sexual transmitted disease.

The present Expert system requires the user to answer the question displayed on the screen (see Figure 4 for a snapshot screen of the expert system), starting with the first question (Do you have one year pass no pregnancy or baby?) and ending with the diagnosis of the disease and a recommendation of the treatment. This expert system not only displays to the user the diagnose of the disease but the appropriate treatment also at the end of the dialogue between the end user and the expert system. See figures 5, 6, and 7 for expert system that diagnosing the male infertility diseases.

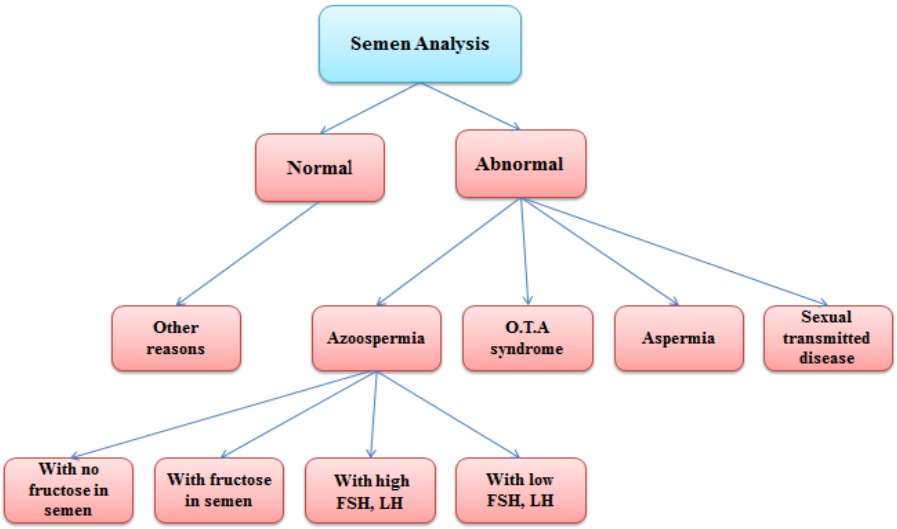

Figure 4: The figure presents the expert system for diagnosing male infertility diseases.

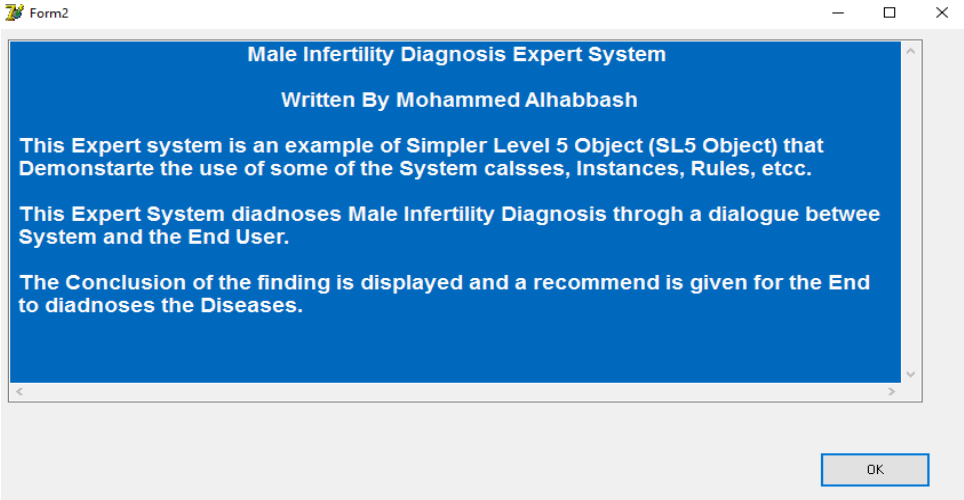

Figure 5: The figure presents the **s**creen expert system.

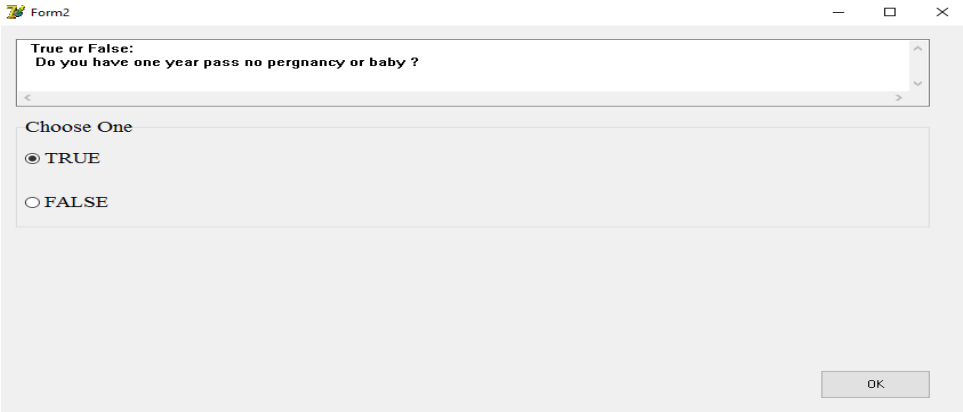

Figure 6: The figure presents the male infertility diseases.

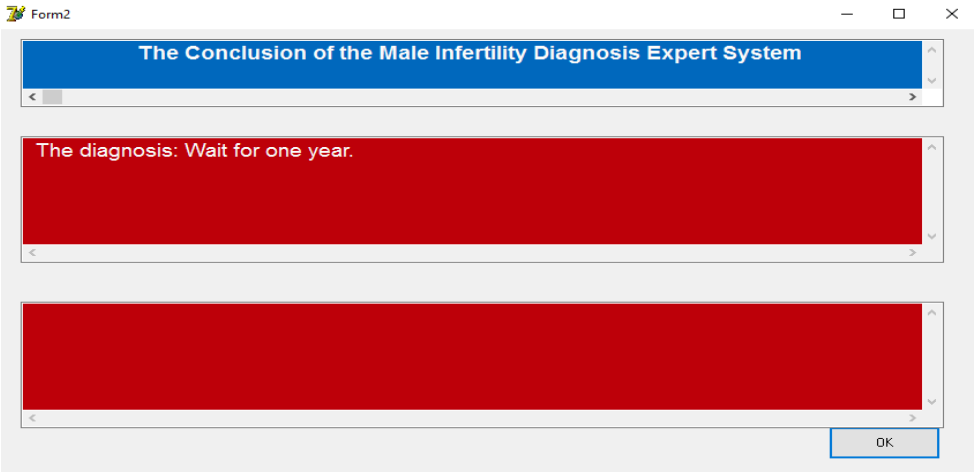

Figure 7: The figure presents the male infertility diseases.

5.KNOWLEDGE ACQUISITION REPRESENTATION

All sources of knowledge and infertility diseases, causes and symptoms of infertility for this expert system are solicited from Dr. Ibrahim I.I. Alhabbash who holds the Egyptian fellowship 2007, Master degree Gyn&Obst and infertility, Ein Shams University, Palestine Board in Gyn&Obst and websites related to infertility diseases and its reasons. Knowledge acquired has been converted into SL5 Object Knowledge base syntax: objects, rules and facts. Currently the expert system has 46 rules that includes all male infertility diseases, infertility causes, infertility symptoms.This expert system helps the user in diagnosing the following diseases[12]-[20]:

Azoospermia: Means no sperm in seminal fluid, may be due to obstruction in vas or no sperm to genesis, which may be primary due to testicular failure caused by genets cause or exposure to reduction or undescending testicle or may be secondary due to pituitary gland disease, so we can treat it by hormonal therapy. Figure 8 shows Azoospermia and Vasectomy Reversal.

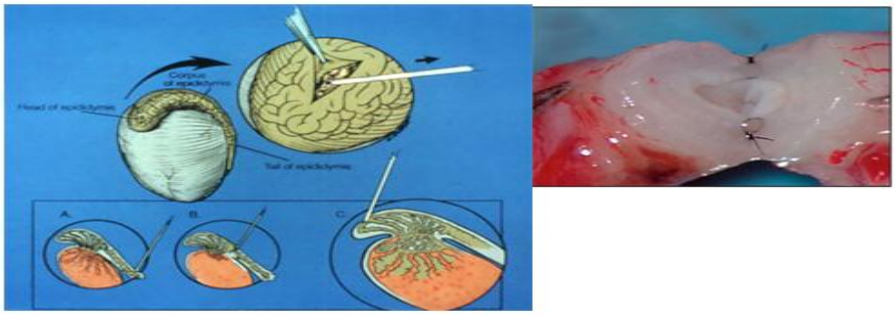

Figure 8: The figure presents the Azoospermia and Vasectomy Reversal [12].

O.T.A syndrome: May be caused by varicocele (varicose vein) or by STDs as chlamydia, gonorrhea and some viral infection as mumps or may due to hormonal imbalance. (Defect or increase prolactin hormone), may be due to general disease as hypertension or diabetes. Figure 9 shows one cases of O.T.A syndrome.

Figure 9: The figure presents the one of cases O.T.A syndrome [13].

Varicocele: Scrotum which carries the testicles contains the arteries and veins that feed the reproductive system, a vein abnormality inside the scrotum leads to varicocele. Varicocele is expansion inside the scrotum. Varicocele leads to reduced sperm production and also can lead to infertility. Figure 10 shows varicocele.

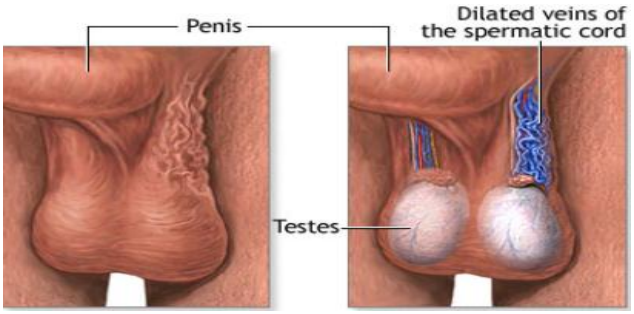

Figure 10: The figure presents the person with varicocele [14].

Sexual transmitted disease (STDs): Are caused by infection transmitted among humans through sexual contact, caused by bacteria that live on the genital areas, transmitted over blood or semen. Such as chlamydia, genital herpes, genital warts, gonorrhea or syphilis. Figure 11 shows person with chlamydia.

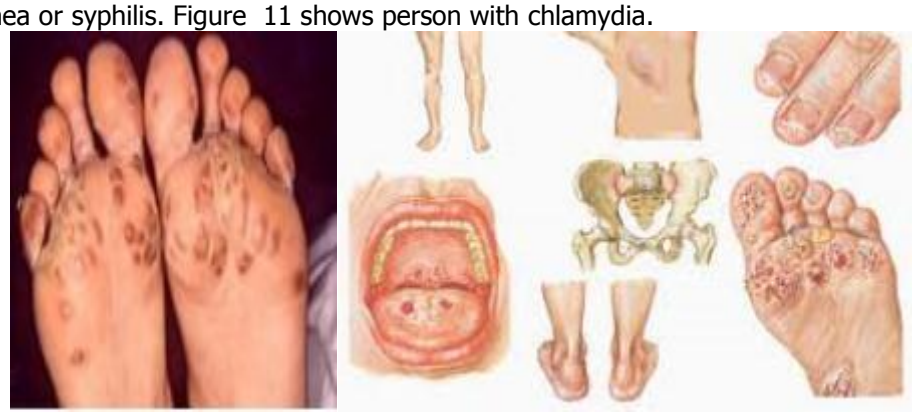

Figure 11: The figure presents the person with Chlamydia [17].

Aspermia: Means no seminal fluid (Dry orgasm) which may be due retrograde ejaculation via urinary bladder caused by defect in prostate or some neurological disease or spinal cord injury. Figure 12 shows Aspermia may be caused by complications from surgical treatment for prostate cancer.

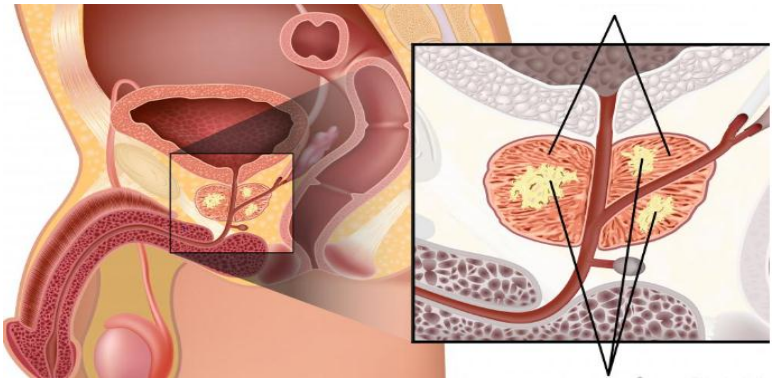

Figure 12: The figure presents the one of cases Aspermia [18].

Here are the Infertility reasons:

1. Irregular sexual life.
2. Use condom, lubricant, local anesthesia.
3. The man does not know time of ovulation of his wife.
4. Smoke and drug abuse.
5. Work in hot weather i.e. baker stand for long time, work in chemical factory i.e. x-ray exposure.
6. General disease (diabetes, hypertension)
7. Surgical treatment in childhood.
8. Mumps: A viral disease because of tumors in the parotid salivary glands, Sometimes causes infertility in men. Figure 13 shows person with mumps.

Figure 13: The figure presents person with mumps [19].

6.LIMITATIONS

The current expert system limited to the following infertility diseases: Azoospermia, O.T.A syndrome which mean oligo-terato-astheno spermia, Aspermia and Sexual transmitted disease.

7.SYSTEM EVALUATION

A number of doctors have tested this expert system and also several patients who suffer from infertility diseases have tested it. They were satisfied with the efficiency of the expert system. Patients with infertility who tried the expert system were marveled about the accuracy, ease and speed of the diagnosis of the infertility; because the system contains all the causes, diseases of infertility and easily obtained the data from the patient to diagnose his/her condition.

8.CONCLUSION AND FUTURE WORK

This paper has presented an expert system for male infertility diagnosis, which provides the patients with the diagnosis, recommendation and treatment; based on the expert system knowledge base and data collected from the patients. The aim of the proposed expert system was to recognize the symptoms of the disease by the user to enable him/her to identify diseases and causes of male infertility. This expert system save the patient the time and effort by allowing the patient to diagnose infertility seamlessly and easily through a simple user interface, so often is dispensed with the traditional diagnosis. This expert system was designed and developed using SL5 Object language.

In fact, there is a growing in infertility rate, it became necessary to propose several expert systems to support the diagnosis of diseases and causes of infertility and recommendations and treatment. There are several directions to carry out further research, this means adding more from diseases and causes of infertility. We confined the current expert system to specializes in male infertility, some of which we plan to build in the future such as expert system that combines the sterility of men and women and the system includes a diagnosis of infertility for each disease whether male or female, using other Expert system languages.

9. EXPERT SYSTEM SOURCE CODE

```
! Written By Mohammed I.I Alhabbash
!
ATTRIBUTE Do you have one year pass no pregnancy or baby SIMPLE INIT TRUE
ATTRIBUTE Are you far away from the house such as travelling at any time SIMPLE INIT TRUE
ATTRIBUTE Are you using condom or lubricant or local anesthesia SIMPLE INIT TRUE
ATTRIBUTE Is your wife used post coital vaginal douche SIMPLE INIT TRUE
ATTRIBUTE Do you know time of ovulation of your wife SIMPLE INIT TRUE
ATTRIBUTE Do you have semen analysis SIMPLE INIT TRUE
ATTRIBUTE Do you have Normal semen analysis according to criteria of W H Organization SIMPLE INIT TRUE
ATTRIBUTE Do you have Abnormal semen analysis SIMPLE INIT TRUE
ATTRIBUTE gotoo SIMPLE INIT TRUE
ATTRIBUTE goto SIMPLE INIT TRUE
ATTRIBUTE Do you have pus in urine and dysuria and fever and pain in scrotum SIMPLE INIT TRUE
ATTRIBUTE Do you have no ejaculation and no seminal fluid SIMPLE INIT TRUE
ATTRIBUTE Do you have seminal fluid without sperm means count zero SIMPLE INIT TRUE
ATTRIBUTE Do you have Azoospermia with no fructose in semen SIMPLE INIT TRUE
ATTRIBUTE Do you have Azoospermia with fructose in semen SIMPLE INIT TRUE
ATTRIBUTE gotooo SIMPLE INIT TRUE
ATTRIBUTE Do you have Oligo or Teruto or Asthenia sperm in your seminal analysis SIMPLE INIT TRUE
ATTRIBUTE Do you have azoospermia with Low FSH LH PRL SIMPLE INIT TRUE
ATTRIBUTE Do you have azoospermia with High FSH LH PRL SIMPLE INIT TRUE
ATTRIBUTE Is your job affect semen analysis ie hot writher or chemical Factories SIMPLE INIT TRUE
```

```
ATTRIBUTE Do you Smoke or use Drugs SIMPLE INIT TRUE
ATTRIBUTE Do you have general diseases such as Diabetes or Hypertension SIMPLE INIT TRUE
ATTRIBUTE Do you have mass or varicose veins in your scrotum SIMPLE INIT TRUE
ATTRIBUTE Do you have Orchids in child hood after viral infection of parotid gland SIMPLE INIT TRUE
ATTRIBUTE Do you have Surgical treatment in child hood SIMPLE INIT TRUE
ATTRIBUTE If there is no cause SIMPLE INIT TRUE
ATTRIBUTE start SIMPLE

INSTANCE the domain ISA domain
   WITH start := TRUE

INSTANCE the application ISA application
 WITH title display := introduction
 WITH conclusion display :=  Conc
 WITH numeric precision := 8
 WITH simple query text :="
 True or False:
  *?
is
  *"
INSTANCE introduction ISA display
  WITH wait := TRUE
  WITH delay changes := FALSE
  WITH items [1 ] := textbox 1

INSTANCE textbox 1 ISA textbox
  WITH location := 10,10,800,350
  WITH pen color := 250,250,250
  WITH fill color := 0,104,189
  WITH justify IS left
  WITH font := "Arial"
  WITH font style IS bold
  WITH font size := 14
  WITH text :="
                                Male Infertility Diagnosis Expert System
                                  Written By Mohammed Alhabbash

This Expert system is an example of Simpler Level 5 Object (SL5 Object) that
Demonstrate the use of some of the System classes, Instances, Rules, etc.

This Expert System diagnoses Male Infertility Diagnosis through a dialogue between the
System and the End User.

The Conclusion of the finding is displayed and a recommend is given for the End User
to diagnoses the Diseases."

INSTANCE Conc ISA display
  WITH wait := TRUE
  WITH delay changes := FALSE
  WITH items [1] := title textbox
  WITH items [2 ] := diagnosis textbox
  WITH items [3 ] := recommend textbox

INSTANCE title textbox ISA textbox
  WITH location := 20,10,800,70
  WITH pen color := 250,250,250
  WITH fill color := 0,104,189
  WITH justify IS centre
  WITH font := "Arial"
  WITH font style IS bold
  WITH font size := 14
  WITH text := "The Conclusion of the Male Infertility Diagnosis Expert System"

INSTANCE diagnosis textbox ISA textbox
  WITH location := 20,110,800,130
  WITH pen color := 250,250,250
  WITH fill color := 189,0,9
  WITH justify IS left
```

```
  WITH font := "Arial"
  WITH font size := 14
  WITH text :="--===--"

INSTANCE recommend textbox ISA textbox
  WITH location := 20,280,800,130
  WITH pen color := 250,250,250
  WITH fill color := 189,0,9
  WITH justify IS left
  WITH font := "Arial"
  WITH font size := 14
  WITH text :=" --===--"

RULE R0
IF start
THEN  ASK Do you have one year pass no pregnancy or baby

RULE R1
IF Do you have one year pass no pregnancy or baby
THEN  text OF diagnosis textbox := " The diagnosis: Wait for one year."
AND text OF recommend textbox := ""
ELSE   NOT Do you have one year pass no pregnancy or baby

RULE R2
IF NOT Do you have one year pass no pregnancy or baby
THEN  ASK Are you far away from the house such as traveling at any time

RULE R3
IF Are you far away from the house such as travelling at any time
AND NOT Do you have one year pass no pregnancy or baby
THEN text OF diagnosis textbox := "The diagnosis: Irregular sexual life."
AND  text OF recommend textbox := "The Recommendation: Try to regulate sexual life, Not stay for long time."
ELSE   NOT Are you far away from the house such as travelling at any time

RULE R4
IF NOT Are you far away from the house such as travelling at any time
THEN  ASK Are you using condom or lubricant or local anesthesia

RULE R5
IF Are you using condom or lubricant or local anesthesia
AND NOT Are you far away from the house such as travelling at any time
THEN text OF diagnosis textbox := "The diagnosis: All are birth control."
AND  text OF recommend textbox := "The Recommendation: Stop using the condom or lubricant or local anesthesia."
ELSE   NOT Are you using condom or lubricant or local anesthesia

RULE R6
IF NOT Are you using condom or lubricant or local anesthesia
THEN  ASK Is your wife used post coital vaginal douche

RULE R7
IF Is your wife used post coital vaginal douche
AND NOT Are you using condom or lubricant or local anaesthesias
THEN text OF diagnosis textbox := "The diagnosis: Vaginal douche is spermicidal."
AND  text OF recommend textbox := "The Recommendation: Stop using post coital vaginal douche."
ELSE   NOT Is your wife used post coital vaginal douche

RULE R8
IF NOT Is your wife used post coital vaginal douche
THEN ASK Do you know time of ovulation of your wife

RULE R9
IF Do you know time of ovulation of your wife
AND NOT Is your wife used post coital vaginal douche
THEN text OF diagnosis textbox := ""
AND text OF recommend textbox := "The Recommendation: do intercourse at time of ovulation day 14,15 of menstrual cycle"
ELSE  NOT Do you know time of ovulation of your wife

RULE R10
```

IF NOT Do you know time of ovulation of your wife
THEN ASK Do you have semen analysis

RULE R11
IF Do you have semen analysis
AND NOT Do you know time of ovulation of your wife
THEN NOT gotoo
ELSE Do you have semen analysis

RULE R12
IF NOT gotoo
THEN ASK Do you have Normal semen analysis according to criteria of W H Organization

RULE R13
IF Do you have Normal semen analysis according to criteria of W H Organization
AND NOT gotoo
THEN text OF diagnosis textbox := ""
AND
text OF recommend textbox := "The Recommendation: Ask your wife for investigation female factors."
ELSE NOT Do you have Normal semen analysis according to criteria of W H Organization

RULE R14
IF NOT Do you have semen analysis
THEN text OF diagnosis textbox := ""
AND text OF recommend textbox := "The Recommendation: do semen analysis after 3 days of abstinence by masturbation In lab and Use dry wide cup."

RULE R15
IF NOT Do you have Normal semen analysis according to criteria of W H Organization
THEN ASK Do you have Abnormal semen analysis

RULE R16
IF Do you have Abnormal semen analysis
AND NOT Do you have Normal semen analysis according to criteria of W H Organization
THEN NOT goto
ELSE Do you have Abnormal semen analysis

RULE R17
IF NOT goto
THEN ASK Do you have no ejaculation and no seminal fluid

RULE R18
IF Do you have no ejaculation and no seminal fluid
AND NOT goto
THEN text OF diagnosis textbox := "The diagnosis: Aspersion is Dry orgasm, Retrograde ejaculation in the urinary bladder."
AND text OF recommend textbox := "The Recommendation: Ask for post coital urine, wash sperm and do IVT or Artificial segmentation."
ELSE NOT Do you have no ejaculation and no seminal fluid

RULE R19
IF NOT Do you have Abnormal semen analysis
THEN ASK Do you have pus in urine and dysuria and fever and pain in scrotum

RULE R20
IF Do you have pus in urine and dysuria and fever and pain in scrotum
AND NOT Do you have Abnormal semen analysis
THEN text OF diagnosis textbox := "The diagnosis: Infection, S.T.D: SEXUAL TRANSMITTED."
AND text OF recommend textbox := "The Recommendation: Ask your doctor for treatment,
After culture, sensitivity and give Antibiotic."
ELSE NOT Do you have pus in urine and dysuria and fever and pain in scrotum

RULE R21
IF NOT Do you have no ejaculation and no seminal fluid
THEN ASK Do you have seminal fluid without sperm means count zero

RULE R22
IF Do you have seminal fluid without sperm means count zero
AND NOT Do you have no ejaculation and no seminal fluid

THEN text OF diagnosis textbox := "The diagnosis: Azoospermia."
AND text OF recommend textbox := "The Recommendation: Ask your the doctor for more investigation."
ELSE NOT Do you have seminal fluid without sperm means count zero

RULE R23
IF NOT Do you have seminal fluid without sperm means count zero
THEN ASK Do you have Azoospermia with no fructose in semen

RULE R24
IF Do you have Azoospermia with no fructose in semen
AND NOT Do you have semenal fluid without sperm means count zero
THEN text OF diagnosis textbox := "The diagnosis: Obstructive Azoospermia."
AND text OF recommend textbox := "The Recommendation: Surgical treatment for Sperm aspiration and IVF or ICSI."
ELSE NOT Do you have Azoospermia with no fructose in semen

RULE R25
IF NOT Do you have Azoospermia with no fructose in semen
THEN ASK Do you have Azoospermia with fructose in semen

RULE R26
IF Do you have Azoospermia with fructose in semen
AND NOT Do you have Azoospermia with no fructose in semen
THEN NOT gotooo
ELSE Do you have Azoospermia with fructose in semen

RULE R27
IF NOT gotooo
THEN ASK Do you have azoospermia with High FSH LH PRL

RULE R28
IF Do you have azoospermia with High FSH LH PRL
AND NOT gotooo
THEN text OF diagnosis textbox := "The diagnosis: Primary testicular failure."
AND text OF recommend textbox := "The Recommendation: No treatment, YOU ARE STERILE."
ELSE NOT Do you have azoospermia with High FSH LH PRL

RULE R29
IF NOT Do you have Azoospermia with fructose in semen
THEN ASK Do you have Oligo or Teruto or Astheno spermia in your seminal analysis

RULE R30
IF Do you have Oligo or Teruto or Astheno spermia in your seminal analysis
AND NOT Do you have Azoospermia with fructose in semen
THEN text OF diagnosis textbox := "The diagnosis: OTA sydrom."
AND text OF recommend textbox := "The Recommendation: Ask your doctor to know cause."

RULE R31
IF NOT Do you have azoospermia with High FSH LH PRL
THEN ASK Do you have azoospermia with Low FSH LH PRL

RULE R32
IF Do you have azoospermia with Low FSH LH PRL
AND NOT Do you have azoospermia with High FSH LH PRL
THEN text OF diagnosis textbox := "The diagnosis: Hypopituitarism."
AND text OF recommend textbox := "The Recommendation: Treatment by hormonal therapy i.e Humegon, chorigon."

RULE R33
IF NOT Do you have pus in urine and dysuria and fever and pain in scrotum
THEN ASK Is your job affect semen analysis ie hot writher or chemical Factories

RULE R34
IF Is your job affect semen analysis ie hot wither or chemical Factories
AND NOT Do you have pus inurin and dysuria and fever and pain in scrotum
THEN text OF diagnosis textbox := "The diagnosis: All these factors are Spermicidal."
AND text OF recommend textbox := "The Recommendation: Avoid all these factors."
ELSE NOT Is your job affect semen analysis ie hot writher or chemical Factories

RULE R35
IF NOT Is your job affect semen analysis ie hot writher or chemical Factories
THEN ASK Do you Smoke or use Drugs

RULE R36
IF Do you Smoke or use Drugs
AND NOT Is your job affect semen analysis ie hot writher or chemical Factories
THEN text OF diagnosis textbox := "The diagnosis: Smoking and drug abuse are spermicidal."
AND text OF recommend textbox := "The Recommendation: Stop smoking and drug abuse."
ELSE NOT Do you Smoke or use Drugs

RULE R37
IF NOT Do you Smoke or use Drugs
THEN ASK Do you have general diseases such as Diabetes or Hypertension

RULE R38
IF Do you have general diseases such as Diabetes or Hypertension
AND NOT Do you Smoke or use Drugs
THEN text OF diagnosis textbox := "The diagnosis: These disease affect general health and Drugs also have side affect."
AND text OF recommend textbox := "The Recommendation: Proper treatment for disease
and Avoid harmful drugs."
ELSE NOT Do you have general diseases such as Diabetes or Hypertension

RULE R39
IF NOT Do you have general diseases such as Diabetes or Hypertension
THEN ASK Do you have mass or varicose veins in your scrotum

RULE R40
IF Do you have mass or varicose veins in your scrotum
AND NOT Do you have general diseases such as Diabetes or Hypertension
THEN text OF diagnosis textbox := "The diagnosis: Varicose."
AND text OF recommend textbox := "The Recommendation: Surgical treatment Bilateral, microscopic ligation of varicose. (no benefit of unilateral classical ligation) (EVIDENSE BASED MEDICINE)."
ELSE NOT Do you have mass or varicose veins in your scrotum

RULE R41
IF NOT Do you have mass or varicose veins in your scrotum
THEN ASK Do you have Orchids in child hood after viral infection of parotid glond

RULE R42
IF Do you have Orchids in child hood after viral infection of parotid glond
AND NOT Do you have mass or varicose veins in your scrotum
THEN text OF diagnosis textbox := "The diagnosis: Mumps."
AND text OF recommend textbox := "The Recommendation: Anti viral treatment."
ELSE NOT Do you have Orchids in child hood after viral infection of parotid glond

RULE R43
IF NOT Do you have Orchids in child hood after viral infection of parotid glond
THEN ASK Do you have Surgical treatment in child hood

RULE R44
IF Do you have Surgical treatment in child hood
AND NOT Do you have Orchids in child hood after viral infection of parotid glond
THEN text OF diagnosis textbox := "The diagnosis: Undiscerning Testicles or Hypostasis."
AND text OF recommend textbox := "The Recommendation: Surgical treatment."
ELSE NOT Do you have Surgical treatment in child hood

RULE R45
IF NOT Do you have Surgical treatment in child hood
THEN ASK If there is no cause

RULE R46
IF If there is no cause
AND NOT Do you have Surgical treatment in child hood
THEN text OF diagnosis textbox := "The diagnosis: Male Infertility of unknown cause."
AND text OF recommend textbox := "The Recommendation: For more information, please talk to doctor."
END

10.REFERENCES

1. John D., Research Review: Application of Expert Systems in the Sciences. *The Ohio Journal of Science*.; 1990; 90(5): 171-179. Available: http://kb.osu.edu/dspace/handle/1811/23417.
2. Dutta.S, Strategies For Implementing Knowledge Based Systems. *IEEE Trans. Engineering Management*. 1997; 44(1):79-90. Available: http://dx.doi.org/10.1109/17.552810
3. James P.I. Introduction To Expert Systems – The Development And Implementation Of Rule Based Expert System. 1st ed. New York: Mcgraw-Hill; 1990.
4. James G., Expert System: Principles and programming. 4th ed. United State of America: Course Technology; 2004.
5. Samy S.A., SL5 Object: Simpler Level 5 Object Expert System Language. *International Journal of Soft Computing, Mathematics and Control (IJSCMC)*. 2015; 4(4):25-37. Available: http://www.wireilla.com/ns/maths/Papers/4415ijscmc03.pdf
6. Lee B. Programming Expert Systems in OPS5: An introduction to Rule-Based Programming. 1st ed. New York: Addison-Wesley. 1985.
7. Nur S. A., Nor L.M., and Ely S.M. Infertility Expert System Architecture for Early Diagnosis, *International Journal of Information Systems and Engineering*. 2014; 2(1):135-140. Available: http://www.ftms.edu.my/journals/images/Document/IJISE/135-140
8. Norhidayah S., and Nor Liyana M. An Expert System Framework for Infertility in Women using Web-Based Application, *International Journal of Information Systems and Engineering*. 2014;2(1):57-64. Available: http://www.ftms.edu.my/journals/index.php/10-ijise/27
9. Barnett G.O, Cimino J., Hupp J., and Hoffer E. DXplain-evolving diagnostic decision-support system. *JAMA*. 1987; 258:67–74. Available: http://www.ncbi.nlm.nih.gov/pubmed/3295316
10. Barnett G.O., Hoffer E., and Packer M. DXplain-demonstration and discussion of a diagnostic decision support system. *Proc. of 16th SCAMC, Baltimore, MD*, November. 1992; 8-22. Available: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2248011/
11. Barnett G., Hoffer E., Kim R., and Famiglietti K. Dxplain on the World Wide Web. *Proc of the 1996 AMIA Annual Fall Symposium*, October 1996; 988. Available: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2233110/
12. Moon M., Kim S., and Cho J. Scrotal US for evaluation of infertile men with azoospermia. *Pubmed citation.* 2006; 239(1): 168-73. Available: http://www.ncbi.nlm.nih.gov/pubmed/16467212
13. Du J, Li F., and Guo Y. Differential diagnosis of azoospermia and etiologic classification of obstructive azoospermia: role of scrotal and transrectal US. Radiology. *Pubmed citation.* 2010;256 (2): 493-503. . Available: http://www.ncbi.nlm.nih.gov/pubmed/20515977
14. Holmes K., Levine R, and Weaver M. Effectiveness of condoms in preventing sexually transmitted infections. *Bull World Health Organ*. 2004;82:454–61. Available: http://www.who.int/bulletin/volumes/82/6/454.pdf
15. Sherman J. and Silber M. St. Louis, Missouri: the infertility center of St. Louis, Call us at (314) 576-1400, Available: http://www.infertile.com/male-infertility-treatment/,2015. Accessed 2 March 2016.
16. The urology care foundation: Medical & Health. Available: http://www.urologyhealth.org/urologic-conditions/varicoceles, Accessed 5 March 2016.
17. Fitness lifestyle: Chlamydia – symptoms , complications and treatment. Available: http://www.healthorum.com/2013/12/chlamydia-symptoms-complications-and-treatment.html, Accessed 5 March 2016.
18. wiseGEEK. Available: http://www.wisegeek.com/what-is-aspermia.htm. Accessed 3 March 2016.
19. How to Get Rid of Mumps. Available: http://www.wisegeek.com/what-is-aspermia.htm#didyouknowout. Accessed 3 March 2016.
20. Male reproductive system fig 17-6. 2 Testis & seminiferous tubules fig 17-5. Available: http://slideplayer.com/slide/4404080/. Accessed 7 March 2016.
21. Samy S.A., and Alaa N.A. A Proposed Expert System for Skin Diseases Diagnosis, *INSInet Publication, Journal of Applied Sciences Research*, 2008; 4(12): 1682-1693. Available: http://www.aensiweb.com/old/jasr/jasr/2008/1682-1693.pdf
22. Samy S.A., El-Hissi H, Abu-Rass M, El-Khozondar N, An expert system for endocrine diagnosis and treatments using JESS, *Journal of Artificial Intelligence*, 2010; 3(4), 239-251. Available: http://docsdrive.com/pdfs/ansinet/jai/2010/239-251.pdf
23. Samy S. A., Al-Dahdooh R., Mushtaha A., and El-Naffar M., Knowledge Management in ESMDA: Expert System for Medical Diagnostic Assistance, AIML Journal, 2010. Available: http://www.ijarcsse.com/docs/papers/Volume_4/11_November2014/V4I11-0509.pdf
24. Samy S.A., and Ola A.Z. An expert system for diagnosing eye diseases using Clips. *Journal of Theoretical and Applied Information Technology*, 2008;4 (10). Available: http://www.jatit.org/volumes/research-papers/Vol4No10/5Vol4No10.pdf
25. Samy S.A., Baraka M., and Baraka A. A Proposed Expert System For Guiding Freshman Students In Selecting A Major In Al-Azhar University, Gaza, *Journal of Theoretical and Applied Information Technology*. 2008;4(9):889-893. Available: http://www.jatit.org/volumes/research-papers/Vol4No9/15Vol4No9.pdf
26. Samy S.A., Kashkash K., and Fayyad M. Developing an Expert System for Plant Disease Diagnosis, *Journal of Theoretical and Applied Information Technology*. 2008; 1(2):78-85. Available: http://scialert.net/abstract/?doi=jai.2008.78.85
27. Samy S.A., and ALmursheidi S. A Knowledge Based System for Neck Pain Diagnosis, *World Wide Journal of Multidisciplinary Research and Development(WWJMRD).* 2016; 2(4):12-18. Available : http://wwjmrd.com/vol%202/issue%204/pdf/13.2.pdf

Cite this article: Samy S. Abu Naser and Mohammed I. Alhabbash. MALE INFERTILITY EXPERT SYSTEM DIAGNOSES AND TREA. Am. J. innov. res. appl. sci. 2016; 2(4): 181-192.