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Shaker M. M Al-Jobori*, Waser, S, Khlaf**, Yaseen Khashman. Hussein*** and Mossa M. Marbut***,

Hormonal assessment in women with polycystic ovary syndrome in Tikrit city.

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Abstract

Introduction: Polycystic ovarian disease (PCOS) is probably the most prevalent endocrinological disorder affecting females and is the most common cause of menstrual disturbance during the reproductive age. It is characterized by polycystic ovaries on ultrasound and/or clinical and biochemical signs and symptoms of hyperandrogenism and/or oligo-anovulation. Therefore, this study was designed to determine relationship among LH/FSH ratio, BMI and the clinical profile of females suffering from PCOS. **Methods:** Blood samples were taken from 90 subjects (60 patients with PCOs and 30 normal healthy women as controls) after getting informed consent for hormone profile (FSH and LH) by ELISA kit of Kamiya Biomedical company. Body Mass index (BMI) and Ultrasonogram related findings of polycystic ovarian syndrome patients were recorded. **Result:** There are significant elevations in the concentration of FSH and LH in PCOs patients as compare with normal healthy non pregnant women, ($p \leq 0.01$). Moreover, there is significant increase in the concentration of serum testosterone of patients with PCOs as compare with control women, ($p \leq 0.01$). Also, there is significant increase in the concentration of prolactin of patients with PCOs as compare with control women, ($p \leq 0.01$). However, there is significant reduction in the concentration of progesterone of patients with PCOs as compare with control women, ($p \leq 0.01$). **Conclusion:** LH and FSH were significantly correlated with obesity and infertility in PCOs patients.

Keywords: PCOs, Infertility, BMI, obesity, LH, FSH, prolactin.

التقييم الهرموني في النساء المصابات بمتلازمة تكيس المبايض المتعدد في مدينه تكريت

موسى محمود مربوط، مي نافع يوسف، مهيب صعب احمد و ندى يحيى عواد.

الخلاصه

المقدمة: متلازمة تكيس المبايض المتعدد هو على الأرجح أكثر أنواع اضطراب الغدد الصم انتشاراً التي تؤثر على الإناث وهو السبب الأكثر شيوعاً لاضطراب الطمث خلال سن الإنجاب. ويتم تميز تكيس المبايض المتعدد بواسطة فحص الموجات فوق الصوتية و / أو الاعتماد على العلامات السريرية والفحوصات الكيميائية الحيوية وأعراض فرط الأندروجينية و / أو عدم الإباضة. ولذلك ، تم تصميم هذه الدراسة لتحديد العلاقة بين نسبة LH / FSH ، معيار كتلة الجسم والملف الشخصي السريري للإناث الذين يعانون من متلازمة تكيس المبايض. **طرق العمل:** تم أخذ عينات الدم من 90 امراه (ستون امراه مرضى بمتلازمة تكيس المبايض و ثلاثون امراه سليماً) بعد الحصول على موافقة مستنيرة لهرمون الشخصية (FSH و LH) من قبل ELISA مجموعة من شركة كيميا الطبية الحيوية. تم حساب مؤشر كتلة الجسم من وزن و طول الجسم والنتائج المتعلقة فحص الموجات فوق الصوتيه من مرضى متلازمة المبيض المتعدد الكيسات. **النتائج:** هناك ارتفاعات كبيرة في تركيز هرموني المحفز للجريه و هرهون الاباضة FSH و LH في النساء المرضى بمتلازمة تكيس المبايض PCOs مقارنة مع النساء السليمات، ($p \leq 0.01$). وعلاوة على ذلك ، هناك زيادة كبيرة في تركيز هرمون التستوستيرون في دم المرضى الذين يعانون من PCOs مقارنة مع النساء السليمات في مجموعه السيطرة ، ($P \leq 0.01$). أيضا ، هناك زيادة كبيرة في تركيز البرولاكتين من المرضى الذين يعانون من PCOs مقارنة مع النساء السليمات ، ($P \leq 0.01$). ومع ذلك ، هناك انخفاض كبير في تركيز البروجسترون من المرضى الذين يعانون من PCOs مقارنة مع النساء السليمات ، ($P \leq 0.01$). الخلاصة: ارتبط LH و FSH بشكل كبير مع السمنة والعقم في مرضى PCOs.

الكلمات المفتاحية: متلازمة تكيس المبايض, هرمون محفز الجريه، هرمون الاباضة، التستسترون

Introduction

Polycystic Ovary Syndrome (PCOs) is one of the most common endocrinopathies in women of reproductive age group with a prevalence rate of nearly 5–10% among women of reproductive age (1,2). It is characterized by chronic anovulation, hyperandrogenism, and multiple small subcapsular cystic follicles in the ovary on ultrasonography(2). PCOS is diagnosed by the appearance of at least two of the following criteria: increased androgenic hormones, irregular or absent ovulation, and enlarged ovaries comprising over 12 follicles (3).

Polycystic ovary syndrome (PCOS) is a complex condition characterized by elevated androgen levels, menstrual irregularities, and/or small cysts on one or both ovaries (4,5). The disorder can be morphological (polycystic ovaries) or predominantly biochemical (hyperandrogenemia) and elevated adenosine De aminase, (1,6,7). Hyperandrogenism, a clinical hallmark of PCOS, can cause inhibition of follicular development, microcysts in the ovaries, anovulation, and menstrual changes (8,9).

Medical studies using ultrasound have found that around one in four women has polycystic ovaries, but most of them have none or few of the other symptoms associated with polycystic ovary syndrome. The main features of PCOS are male hormone excess and polycystic ovaries. Some of the problems that women with PCOS may have the followings, (10-11):

1. Excess hair on the body (hirsutism);
2. Acne and other skin problems;
3. Scalp hair loss;
4. Irregular or missing periods;
5. Heavy periods;
6. Fertility problems;
7. Insulin resistance;
8. Weight issues

The **aim** of the study is to compare hormonal behavior between PCOs patients and normal healthy non pregnant women.

Patients and methods

Ninety women were participated in the present study, (60 women with polycystic ovary syndrome

and 30 normal healthy non pregnant women).

The study done in Tikrit teaching hospital- department of Obstetric and gynecology department and private clinic. All patients were diagnosed by special clinician of obstetric and gynecologist. Ultrasound graphy was done for all patients. Five ml of blood samples were taken after overnight fasting.

Inclusion criteria – the diagnosis of PCOS is fulfilled by Rotterdam ESHRE/ASRM sponsored PCOS consensus criteria, when two of the following first three clinical features will be present, (11).

- a. Clinical or biochemical evidence of hyperandrogenism.
- b. Chronic anovulation
- c. Polycystic ovaries on imaging

Age of study subjects were between 14 to 40 years. They readily agreed to participate in the study with an informed consent. Serum LH, FSH was evaluated with the help of chemiluminescence ABBOTT 1000 isr.

Blood was collected on 3rd day of either normal or induced menstrual cycle. LH and FSH value was evaluated from the

serum. Expected value of LH during follicular and luteal phase 5 IU/L and during ovulation 60 IU/L.

Expected value of FSH during Follicular and luteal phase is 10 IU/L and during ovulation it is 15-20 IU/L. Serum FSH, LH, Testosterone, Prolactin and progesterone were done by using commercial kits and according to standard procedures, and were determined by enzyme-linked immunosorbent Assay (ELISA) kit (R&D Systems, Minneapolis, USA). Commercial kits were supplied by Syntron Bioresearch, Inc, (12).

Statistical analysis was done by using student T test. All data were presented as mean and standard deviation and Probability value less than 0.05 was accepted as significant value, ($p \leq 0.05$).

Results

As in table 1, there are significant elevation in the values of body weight and BMI in PCOs patients as compare with healthy control women, ($p \leq 0.01$). Also, there are significant increase in the values of), waist circumference, (WC) and hip circumference (HC) in PCOs patients as compare with

healthy control women, ($P \leq 0.05$).

Table 1 The mean and standard deviation of age, body weight, body mass index (BMI), waist circumference, (WC); hip circumference (HC) of women with PCOS and control subjects.

Parameters	Control women	PCOs patients	P value
Age (years)	28.6 ± 5.1	29.1 ± 4.7	NS
Body weight (Kg)	62.5 ± 2.5	79.1 ± 8.4	0.05
BMI (Kg/M ²)	22.7 ± 2.6	29.9 ± 5.85	0.01
WC (cm)	81.8 ± 8	97 ± 13	0.05
HC (cm)	99 ± 11	121 ± 12	0.05

While table 2 shows the mean and standard deviation (SD) of serum hormones of POCs patients and normal healthy non pregnant women.

Table 2 the mean and standard deviation (SD) of serum FSH, LH, Testosterone, Prolactin and progesterone in POCs patients and normal healthy non pregnant women.

Hormones	Control women	PCOs patients	P value
FSH (MIu/ ml)	6.1 ± 1.3	11.01 ± 2.9	0.01
LH (MIu/ml)	7.8 ± 2.1	17.03 ± 7.2	0.01
Testosterone (ng/ml)	0.34 ± 0.1	0.927 ± 0.24	0.05
Prolactin (ng/ml)	5.4 ± 1.9	26.9 ± 7.6	0.01
Progesterone (ng/ml)	4.9 ± 1.2	0.74 ± 0.23	0.01

There are significant elevations in the concentration of FSH and LH in PCOs patients as compare with normal healthy non pregnant women, ($p \leq 0.01$). Moreover, there is significant increase in the concentration of serum

testosterone of patients with PCOs as compare with control women, ($p \leq 0.01$). Also, there is significant elevation in the concentration of prolactin of patients with PCOs as compare with control women, ($p \leq 0.01$).

However, there is significant reduction in the concentration of progesterone of patients with PCOs as compare with control women, ($p \leq 0.01$).

Discussion

Although PCOS is a relatively common disorder with 5-10% of prevalence among women of reproductive age its etiology remains unknown [10]. In the present study the basic finding on which diagnosis of PCOS was made in the presence of polycystic ovary by ultrasound with clinical finding of oligoamenorrhoea and or hirsutism fulfilling Rotterdam ESHRE/ASRM sponsored PCOS consensus criteria, (11).

Serum level of androgens including androstenedione and testosterone may be elevated, (13, 14). The ratio of LH to FSH is elevated in women with PCOS. High LH / FSH ratio are 2:1 or 3:1 as tested on day three of menstrual cycle. A ratio of 2:1 or higher was present in <50% of women with PCOS in one study, (15). LH/FSH ratio is not characteristic attribute of all PCOS women. Most of the PCOS women with normal gonadotrophin ratio belongs to a

group of patients suffering from hyperinsulinemia and obesity, (15, 16).

There is no cure for Polycystic Ovary Syndrome and it does not go away on its own. Treatment is aimed at reducing its symptoms and preventing further complications. Options depend on the type and severity of the individual woman symptoms and her desire to become pregnant. Diet, exercise and maintaining a healthy body weight may help many women manage the symptoms of PCOS. These life style changes are recommended to help decrease insulin resistance, (17).

The characteristic increase in LH relative to FSH release, have long been appreciated in PCOS. Because of the pulsatile nature of their release a single test fails to detect an increase LH/FSH ratio, (18, 19).

Abnormality of hypothalamo-Pituitary ovarian or adrenal axis has been implicated in PCOS, (20). Disturbance in the pulsatility of Gonadotrophin releasing hormone (GnRH) results in the relative increase in LH to FSH release [19]. An abnormal feedback mechanism

by ovarian estrogen is blamed to play role in this discriminated increase in LH release, (21).

In PCOS women, normal gonadotrophin axis is disturbed. This is reflected by high level of LH, low FSH levels and reversal of LH: FSH ratio. FSH levels in PCOS show lower than normal value and are comparable at different days of menstrual cycle without significant variations. Hormonal milieu in normal weight and overweight/obese women differs. Excessive body weight in PCOS hastens or exacerbates the complications of the disease, (20).

Antimullerian hormone (AMH) is increased in PCOS and may become part of its diagnostic criteria, (16). Although, it is proven that AMH measurement prior to gonadotropin stimulation could provide useful information to direct the application of mild patient-friendly stimulation protocols in order to avoid OHSS (17, 18, 21). In the present study, AMH was not measured.

The fat distribution in women with PCOS and healthy control and reported that PCOS patients showed a significantly higher amount of body fat mass index

than the controls. In this study we found significant differences in fat distribution between women with PCOS and controls, (22, 23, 24).

Upper body fat distribution in women with PCOS has been mainly explained by androgen excess. Reubinoff *et al.* (2009) reported that testosterone inhibits femoral lipoprotein lipase activity. This finding suggests that testosterone may contribute to the upper-half body type fat distribution, (25).

The present study **concluded** that Since FSH and LH, testosterone were elevated in PCOs patients and significantly correlated with obesity and infertility. This finding agree with previous results, (1,3,8,19).

References

- 1-Yousif MN., Ahmed, MS., Mossa M. Marbut. The therapeutic effect of polycystic ovary syndrome on body mass index, lipid profile, and testosterone hormone in PCOs patients in Tikrit. *J. Madenat Alelem College*. 2015: 7(1):137-147.
- 2- Yousif MN., Ahmed, MS., Mossa M. Marbut. The follow up study of the therapeutic effect of some hormonal disorders associated with POCs in

- women in the city of Tikrit. *J. Madenat Alelem College*. 2015; 7(1): 124-136.
- 3- Essach PA., Wickham, EP, Nestler, JE. The metabolic syndrome of POCs. *Clinical Obstet. and Gynecology*. 2007; 50: 205-20.
- 4- Recabarren, SE., Smith, R. Metabolic profile in women with polycystic ovary syndrome. *J. Clin. Endocrinol. Metab.* 2008; 93(5): 156-81.
- 5- Patel S. Polycystic ovary syndrome (PCOS), an inflammatory, systemic, lifestyle endocrinopathy. *J steroid biochem mol boil*. 2018 Apr 17.
- 6- Bellver J, Rodríguez-Taberner L, Robles A, *et al.* Polycystic ovary syndrome throughout a woman's life. *J assist reprod gent*. 2018 Jan 1:1-5.
- 7- Al-Rubaye, FG., Morad, TS, Ahmed, MA. Effect of metformin on adenosine deaminase activity in PCOs patients. *J. Madent Alelem College*. 2014; 6(2): 14- 21.
- 8- Baskind NE, Balen AH. Hypothalamic-pituitary, ovarian and adrenal contributions to polycystic ovary syndrome. *Best Practice & Research Clinical Obstetrics & Gynaecology*. 2016 Nov 1;37:80-97.
- 9- Diamanti-Kandarakis E, Dunaif A. Insulin resistance and the polycystic ovary syndrome revisited: an update on mechanisms and implications. *Endocr rev*. 2012 Oct 12;33(6):981-1030.
- 10- Fulghesu AM, Porru C, Canu E. Diagnosis of Polycystic Ovarian Syndrome in Adolescence. *J pediatr adolesc gynecol*. 2018 (pp. 143-159). Springer, Cham.
- 11- Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. *Fertil Steril* 2004; 81: 19-25.
- 12- Lizneva D, Gavrilova-Jordan L, Walker W and Azziz R. Androgen excess: investigations and management. *Best Pract Res Clin Obstet Gynaecol* 2016; 37: 98-118.
- 13- De Leo V, Musacchio MC, Cappelli V, Massaro MG, Morgante G, Petraglia F. Genetic, hormonal and metabolic aspects of PCOS: an update. *Reproductive Biology and Endocrinology*. 2016 Dec;14(1):38.
- 14- Laksman Lal, Atima Bharti¹, Arshi Perween. To Study The Status of LH: FSH Ratio in Obese And Non-Obese Patients of Polycystic Ovarian Syndrome. *Journal of Dental and Medical Sciences*. 2017; 16(1): 20-24.
- 15- Mani H, Chudasama Y, Hadjiconstantinou M, *et al.* Structured education programme for women with polycystic ovary syndrome: a randomised controlled trial. *Endoc connect*. 2017 Nov 13:EC-17.
- 16- Joham AE, Palomba S and Hart R. Polycystic ovary syndrome, obesity, and pregnancy. *Semin Reprod Med* 2016; 34: 93-101.
- 17- Marzieh Agha Hosseini, MA, Ashraf Aleyasin., Atossa Mahdavi. Relationship between anti-mullerian

hormone and assisted reproductive technique outcome in patients with polycystic ovary syndrome . Iranian Journal of Reproductive Medicine. 2010; 8(4): 161-166.

18- Wang JG, Nakhuda GS, Guarnaccia MM, Sauer MV, Lobo RA. Mullerian inhibiting substance and disrupted folliculogenesis in polycystic ovary syndrome. Am J Obstet Gynecol. 2007; 196: e1-5.

19- Mobeen, H, Hamid, H., Almina Shafiq. LH/FSH, BMI and Clinical Profile in Polycystic Ovarian Syndrome: A Correlative Study. International Journal of Biochemistry Research& Review.2016; 9(1): 1-6.

20-Akgül S, Düzçeker Y, Kanbur N, Derman O. Do Different Diagnostic Criteria Impact Polycystic Ovary Syndrome Diagnosis for Adolescents?. J pediatri adolesc gynecol. 2018 Jun 1;31(3):258-62

21- Skiba MA, Islam RM, Bell RJ, Davis SR. Understanding variation in prevalence estimates of polycystic ovary syndrome: a systematic review

and meta-analysis. Hum Reproduc Update. 2018 Jul 27.

22-Sweed MS, El-Kady OS, AbdElSalam EA, Mostafa MM. Anti-Müllerian hormone and response to ovulation induction with clomiphene citrate in women with polycystic ovary syndrome. Int J Reprod, Contraception, Obstetrics and Gynecology. 2017 Feb 23;5(3):603-8

23- Omar AL-Nozhaa, Fawziah Habib b, Moaz Mojaddidi. Body weight reduction and metformin: Roles in polycystic ovary syndrome. Pathophysiology. 2013; 20: 131–137.

24- S. Kirchengast, J. Huber, Body composition characteristics and body fat distribution in lean women with polycystic ovary syndrome, Human Reproduction. 2001; 16 (6): 1255–60.

25- Reubinoff, BE., A. Grubstein, D. Meirow, Berry, E. Effects of low-dose estrogen oral contraceptives on weight, body composition, and fat distribution in young women, Fertility and Sterility. 2009; 63 (3):516-21.

Study of the impact of some liver enzymes (GOT, GPT, ALP) for the employees at the Tuwaitha nuclear site.

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Abstract

Background: Al Tuwaitha is the center of radiation activity in Iraq and which includes several directorates that have radioactivity such as radioactive waste removal and storage of radioactive sources as well as contain a reactor and a hot cell. In this study, the level of some liver enzymes was determined as the liver is the largest organ in the body and more sensitive to radiation for employees in different site in Tuwaitha and comparison the level of these enzymes with the level of liver enzymes to other people from outside Tuwaitha (as control) that do not contain radioactive activity.

The aim: this study aims to determine the effects of radiation on the level of liver enzymes and to investigate the health of employees.

Method: The level of enzymes was measured by kinetic method using the ready kit (French agappe) and the work all done in the laboratories of the radioisotopes department for the period from 2/1 to 30/5 of 2017. The blood samples were taken from a number of employees at different site in Al-Tuwaitha and a number outside the Tuwaitha site. The control group was compared to the employees. The groups ranged in age from (35 - 55 years) and their weight between (70 - 95 kg). The results were statistically analyzed using spss (version 20).

Results: The results were compared to the mean between two groups it showed no significant differences ($p > 0.05$) for the three enzymes between two groups.

Conclusion: Regularly evaluates the exposed doses of each employee along with the necessary health assessments. Normal values of concentration liver enzymes/ (GOT, GPT, ALP) and may ensure a good hepatic health of the radiation-exposed employees.

Keywords: livers enzymes, (GPT, GOT, ALP), nuclear site.

دراسة تأثير بعض أنزيمات الكبد للعاملين في موقع التويثة النووي

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علي صالح جبار

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BBS

BCS

BBS

عنوان الباحثين/ وزارة العلوم والتكنولوجيا /مديرية البحوث والتطبيقات النووية/قسم النظائر المشعة

الخلفية العلمية: ان التويثة هي مركز النشاط الإشعاعي في العراق والذي يشمل عدة مديريات لديها نشاط إشعاعي مثل إزالة النفايات المشعة وتخزين المصادر المشعة وكذلك تحتوي على المفاعل والخلية الحارة . في هذه الدراسة ، تم تحديد مستوى بعض انزيمات الكبد وهو أكبر عضو في الجسم وأكثر حساسية للإشعاع للعاملين في مواقع مختلفة من التويثة ومقارنة مستوى هذه الانزيمات مع مستوى انزيمات الكبد للأخرين من مواقع مختلفة خارج التويثة التي لا تحتوي على نشاط إشعاعي.

الهدف : تهدف هذه الدراسة إلى تحديد اثار الإشعاع علي مستوى انزيمات الكبد والتحقيق في صحة العاملين.

طريقة العمل : تم قياس مستوى الانزيمات بالطريقة الحركية باستخدام غدة جاهزة (غدة فرنسية) وتم العمل في مختبرات قسم النظائر المشعة للفترة من 1/2 إلى 5/30 من 2017 . وكانت العينات المستخدمة هي عينات دم مأخوذة من عدد من العاملين في مواقع مختلفة في التويثة وعدد اخر من خارج موقع التويثة التي لا تحتوي على نشاط اشعاعي . تمت مقارنة مجموعة السيطرة للعاملين . وتراوحت المجموعات في العمر من (35 - 55 سنة) وأوزنها بين (70 - 95 كيلو غرام) . تم تحليل النتائج إحصائياً باستخدام (spss) اصدار 20.

النتائج : قورنت النتائج للمجموعتين (المتوسط الحسابي) . ولم تظهر النتائج فروق معنوية (p > 0.05) بالنسبة للانزيمات الثلاثة للمجموعتين .

الاستنتاج : من الضروري تنظيم التعرض لجرع الاشعاع لكل عامل وهذا التنظيم ضروري لصحتهم . ان القيم الطبيعية لأنزيمات الكبد تضمن صحة جيدة للعامل المتعرض للإشعاع .

الكلمات المفتاحية : انزيمات الكبد , (GOT,GPT,ALP) , الموقع النووي

Introduction

Al-Tuwaitha nuclear research center is the largest, most complex and most radiological contaminated site in Iraq. Located about 20 km to the south of Baghdad, the Center has separate and distinct nuclear facilities which were destroyed during the Gulf Wars 1991. Radioactive material onsite has an increased potential to be dispersed and contaminate the environments.^{1,2,3}

The principal nuclear site is Al Tuwaitha nuclear research center which contains about 18 facilities, including research reactors, hot cells, waste treatment and storage facilities. Al Tuwaitha site considered as unique case most of its facilities suffer substantial physical damage during the Gulf Wars 2003. Despite the long history of nuclear programs at Al Tuwaitha.^{1,2,3}

Liver

The **liver** is the largest organ in humans, it is located in the upper right quadrant of the abdomen⁴ the liver has a wide range of functions, including **excretory function:**

bile pigments, bile salts and cholesterol are excreted in bile into intestine⁵.

Metabolic function: liver actively participates in carbohydrate, lipid, protein, mineral and vitamin metabolisms⁶.

Hematological function: liver is also produces clotting factors like factor V, VII. Fibrinogen involved in blood coagulation is also synthesized in liver. It synthesizes plasma proteins and destruction of erythrocytes⁷.

Storage functions: glycogen, vitamins A, D and B12, and trace element iron are stored in liver⁸.

Protective functions and detoxification synthetic function of liver.

The liver is considered a radiosensitive organ and therefore there is a need to look into the hepatic function for those employees who are exposed to radiation the current study is focused on the following liver Levels of the enzymes are very useful in following up the progress of liver diseases⁹.

Perhaps the most commonly used indicators of liver (hepatocellular) damage are (GPT) and (GOT), formerly referred to as the SGPT and

SGOT. These are enzymes normally found in liver cells that leak out of these cells and make their way to the blood when liver cells are injured. The GPT is felt to be a more specific indicator of liver inflammation as GOT is also found in other organs such as the heart and skeletal muscle¹⁰.

The alkaline phosphatase is the most frequently used test to detect obstruction in the biliary system found both in the liver and bile, and leaks into the bloodstream in a manner similar to that described for the GPT and GOT, ALP is also found in other organs such as bone, placenta, and intestine¹⁰.

Abbreviation:

GPT glutamate pyruvate transaminase, GOT glutamate oxaloacetic transaminase, ALP alkaline phosphatase, SPSS statistical package social sciences, ALARA as low as reasonable achievable.

Employees and method

The present study was carried out on 50 employee from various site as (pathological) work has been done in the Radioisotope section labs for the period 2/1 – 30/5 of 2017. And 50 other person from various other site as (control) with age range between (35-55 years) and their weight range between (70-90 kg). blood samples were collected and placed in non-heparinized tubes, centrifuged at 3000 rpm for 10 minutes, sera after separation were then taken and used for measuring total, (GOT) 46U/L, (GPT) 49U/L, (ALP) normal range (80-306 U/L),. All the assays were performed based on the standard operating procedures using kit supplied by (agappe /France)¹¹

Statically analysis

All data have been presented as mean± standard deviation (independent-samples T-test) performed on each variable to compare the mean values from different groups differences were considered no significant at (**P>0.05**). All statistical analysis were performed at using spss .

Results and discussion

This study suggests that the liver might be damaged with radiation

dose series of changes, including injury to different organs, causing changes in the structure and function of cellular components, and resulting in tissue damage and death¹². The liver enzyme **GPT** rearranges the building blocks of proteins. The **GPT** concentration non-significant when compared between the two groups Figure (1)

The **GOT** concentration non-significant when compared between two groups Figure (2)

The **ALP** concentration non-significant when compared between two groups figure (3). **ALP** is processed in the liver and excreted into the digestive tract in the bile. A higher **ALP** levels than normal indicates liver problems¹³.

The serum **GPT** and **GOT** levels are common markers for hepatic toxicity; levels of these proteins were rapidly increased when the liver is damaged by any cause, including radiation, hepatitis or hepatic cirrhosis. Transaminases play an important role in protein and amino acid metabolism. They are found in the cells of almost all body tissues and when

diseases or injuries affected these tissues, they are released into blood stream¹³.

Some investigators have reported significant elevation in the activity of liver enzymes (**GPT** and **GOT**)¹⁴ But the results of present study not agreed with¹⁴. The reasons may be no direct exposure to radiation and there is a simple exposure treated by the liver. The commitment of the employees to the (**ALARA**) was good it mean we should employees

Time, distance and shielding to reduce our radiation dose typically that is the end of it and we move onto something else besides trying to ensure that occupational and public exposure to radiation is kept as low as reasonably achievable.

The present study **concludes** that regularly evaluates the exposed doses of each employee along with the necessary health assessments. Normal values of liver enzymes (**GOT, GPT, ALP**) and may ensure a good hepatic health of the radiation-exposed employees.

References

- [1]. Abbas, M. J.; Al-Mubarek, M. A.; Aboud, H. S.:
Underground Water Conditions Inside the Berm of Tuwaitha, Environmental Research Directorate, Siting Section, Internal Report No. EN-SI-RN129-2002, IAEC, 2002
- [2] Chesser Ronald K., Brenda E. Rodgers, Mikhail Bondarkov, Esmail Shubber And Carleton J. Phillips Piecing together Iraq's nuclear legacy," Bulletin of the Atomic Scientists. 2009 ; vol. 65, no. 3, pp.19–33.
- [3]-Bleise A., Danesi P.R. and Burkart W., "Properties, use and health effects of depleted uranium (DU): A general overview", J Environ Radioact 2003; 64(2-3):93-112.
- [4]- Hiatt JR, Gabbay J, Busuttil RW. Surgical anatomy of the hepatic arteries in 1000 cases. Ann Surg 1994; 220:50–52.
- [5]-Nathanson, M.H., Boyer, J.L.: Mechanisms and regulation of bile secretion. Hepatology 1991; 14: 551_565.
- [6]-Krauss, R. M., Windmueller, H. G., Levy, R. I. and Frederickson, D. S. J. Lipid Res. 1973; 14, 286±295.
- [7]- Daniel SP, Marshall MK. Evaluation of the liver: laboratory Tests. *Schiff's diseases of the liver*, 8th edn. USA; JB Lippincott Publications, 1999; 205-239.
- [8]- Wilson, G.E., Davis, R.E.: Clinical chemistry of vitamin B6. Adv. Clin. Chem. 1983; 23: 1_68.
- [9]-G. Traversa, C. Bianchi, R. Da Cas, I. Abraha, F. Menniti-Ippolito, and M. Venegoni, "Cohort study of hepatotoxicity Associated with nimesulide and other non-steroidal anti-inflammatory Drugs," *British Medical Journal*, 2003; vol. 327, no. 7405, pp. 18–22.
- [10]- Sherlock S. Assessment of liver function Disease of liver and Biliary system: Sheila Sherlock, 10th edn, London; Blackwell Science ltd, 1997; 17-32. 4.
- [11]-. Daniel SP, Marshall MK. Evaluation of the liver: laboratory

Tests. *Schiff's diseases of the liver*, 8th edn. USA; JB Lippincott

Publications, 1999; 205-239.

[12]- Tanaka H, Hayashi S, Ohtakara K, Hoshi H. Hepatic dysfunction after radiotherapy for primary gastric lymphoma. *Journal of Radiation Research*. 2012; 52: 92–97.

[13]- Pratt DS, Kaplan MM. Evaluation of abnormal liver enzyme results in asymptomatic patients. *N Engl J Med* 2000; 342:1266–71. 5.

[14]- Makhoulouf R, Makhoulouf I. Evaluation of the effect of Spirulina against Gamma irradiation induced oxidative stress and tissue injury in rats. *Int. J. Appl. Sci. Eng. Res.* 2012; 1(2):152-164.

Table (1) shows means and standard deviation for both two groups

Parameters	GPT	GOT	ALP
Patients	16.70 ± 7.41	14.32 ± 7.28	107.08 ± 27.45
Controls	15.0 ± 6.0	15.73 ± 4.84	104.50 ± 28.37
P value	0.1	0.1	0.9

Table-2- shows mean and standard deviation of age and body weight for both two groups.

Parameters	Patients	Controls	P value
Age (years)	44.70 ± 5.41	43.72 ± 5.84	NS
Body weight (Kg)	79.96 ± 7.4	93.1 ± 11.48	0.05

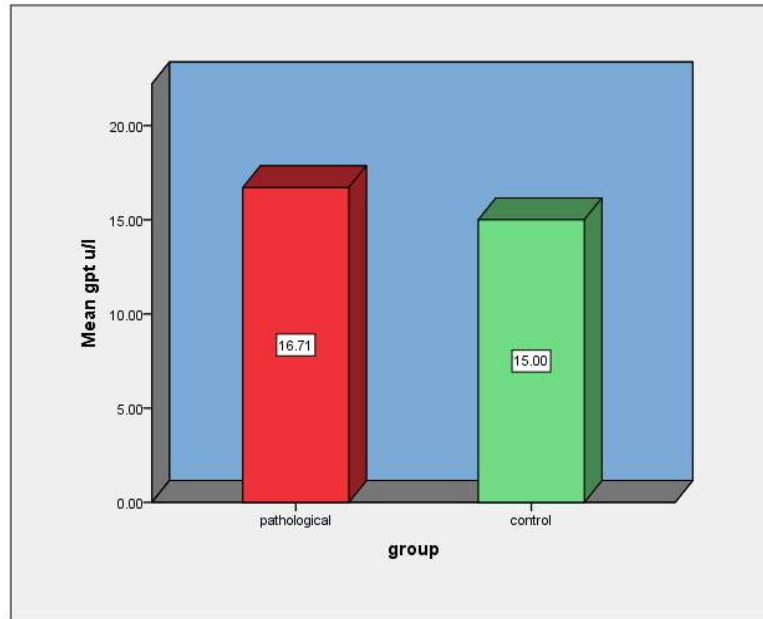


Figure (1) comparison of GPT between the two groups

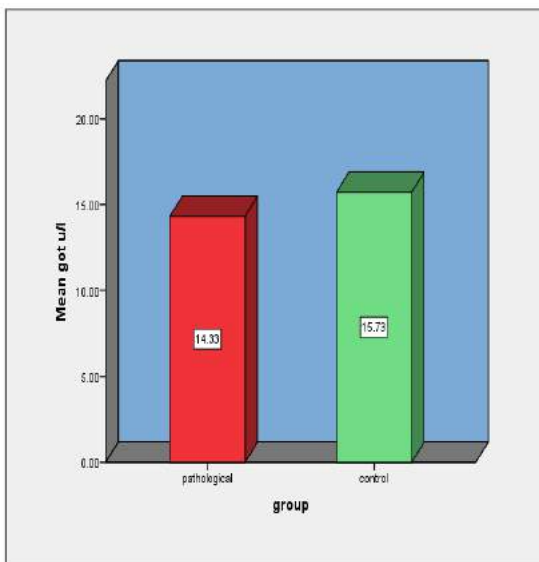


Figure (2) comparison of GOT between the two groups

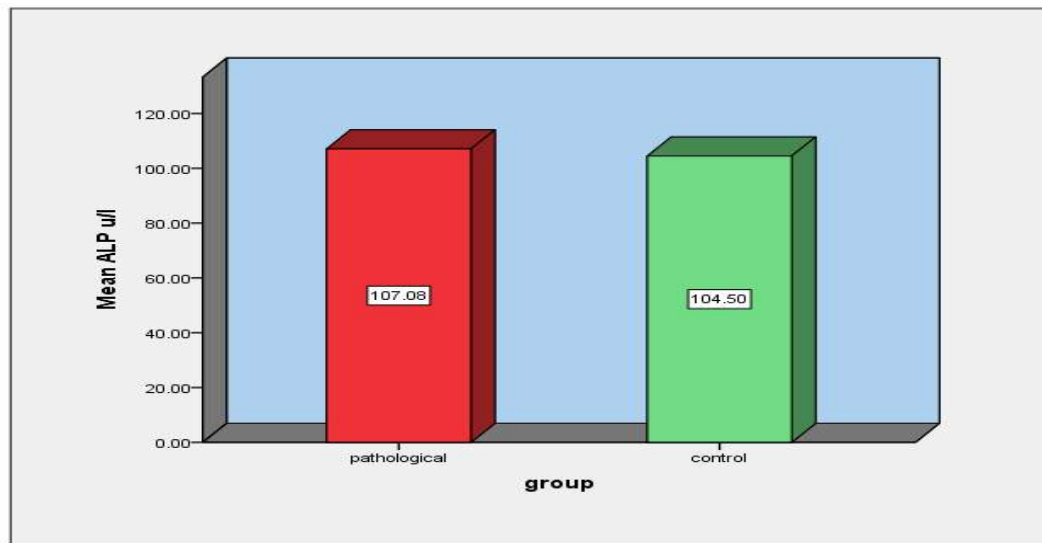


Figure (3) comparison of ALP between the two groups

Role of varicocelectomy in improving fertility in infertile male with varicocele

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Abstract

Introduction: Infertility is considered one of the major health problems. 40%–50% of infertility cases are associated with the male factor. There are several types of male infertility. From all types of male infertility, idiopathic infertility and varicocele are the major types. In general population, varicocele has an incidence of 4.4%-22.6%. The surgical treatment is varicocelectomy which can be performed through subinguinal, transinguinal, or suprainguinal incision. Varicocelectomy can be done either by open, laparoscopic, microscopic, or embolization unilaterally or bilaterally. The **aim** of the study is to assess effect of varicocelectomy in improving fertility in infertile male with varicocele. **Patients and methods:** The study was conducted between beginning of March to the end of October 2017. Twenty one (21), infertile male patients with varicocele were collected randomly. The diagnosis of varicocele was done clinically and by doppler ultrasonography. Clinical diagnosis was done by one surgeon and Doppler was conducted by one ultrasonographer. Seminal fluid analysis (SFA) and hormonal assay (Testosterone, FSH, LH and prolactin) were done for patient in initial diagnosis in the same laboratory using mini-vidas automated hormone analyzer. Scrotal subinguinal approach was used for performing varicocelectomy. Postoperatively, SFA was repeated monthly for assessment of patient improvement for 3 months. **Results:** 21 infertile men with varicocele included in this study and the mean of age of patients were 31.4 ± 9.7 years. Postoperatively, all parameters included in this study improved in a highly significant manner ($P < 0.001$). **Conclusion:** This study showed that varicocelectomy improves the fertility of infertile males with varicocele.

Key words: Kirkuk, male infertility, varicocele, subinguinal varicocelectomy, Seminal fluid analysis.

دور استئصال دوالي الخصية في تحسين الخصوبة لدى الذكور المصابين بالعقم مع دوالي الخصية

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الخلاصة

المقدمه: يعتبر العقم واحدة من القضايا الصحية العامة الرئيسية، ويشارك عامل الذكور في 40% - 50% من حالات العقم. النوع الأكثر شيوعاً من العقم عند الذكور هو العقم مجهول السبب، والذي يتميز بوجود واحد أو أكثر من المعلمات السائل المنوي غير طبيعية مع عدم وجود سبب محدد. وهناك سبب شائع آخر لعقم الذكور هو دوالي الخصية. في حين أن دوالي الخصية لديها نسبة 4.4% - 22.6% في عموم السكان، 21% - 41% من الرجال الذين يعانون من العقم الأولي و 75% - 81% من أولئك الذين يعانون من العقم الثانوي لديهم هذه الحالة. العلاج الجراحي هو استئصال الدوالي الذي ينطوي على ربط الأوردة الخصية. ويمكن الحصول على الوصول إلى الأوردة من خلال شق تحت المنطقة الاربية، أو من خلال المنطقة الاربية، أو من فوقها. ويمكن إجراء هذه العملية عن طريق الفتح، أو بالمنظار، أو بالميكروسكوب، أو الانصمام من جانب واحد أو الجانبين. والهدف من هذه الدراسة هو تقييم تأثير استئصال دوالي الخصية في تحسين الخصوبة في الذكور العقم مع دوالي الخصية. المرضى وطريقة العمل: أجريت الدراسة بين بداية مارس حتى نهاية أكتوبر 2017. تم جمع 21 من المرضى الذكور العقم مع دوالي الخصية عشوائياً. تم تشخيص دوالي الخصية سريريا و دوبلر بالموجات فوق الصوتية. تم إجراء التشخيص السريري من قبل جراح واحد، وأجريت دوبلر من قبل طبيب واحد. تم تحليل السائل المنوي والفحص الهرموني (تستستيرون، FSH، و LH و برولاكتين) للمريض في التشخيص الأولي في نفس المختبر باستخدام جهاز ميني فيداس (محلل الهرمون الألي). تم استخدام نهج الصفن تحت المنطقة الاربية لاستئصال دوالي الخصية. بعد العمل الجراحي، تم تكرار سفا شهريا لتقييم تحسين المريض لمدة 3 أشهر. النتائج: متوسط أعمارهم كانت 31.4 + 9.7 سنوات. بعد العمل الجراحي، تحسنت جميع المعلمات المدرجة في هذه الدراسة في مسألة ذات دلالة عالية. (P < 0.001) الاستنتاج: أظهرت هذه الدراسة أن فاريكوسلكتومي يحسن خصوبة الذكور العقم مع دوالي الخصية.

الكلمات المفتاحية: عقم الرجال، كركوك، دوالي الخصية، ازالة الدوالي، تحليل الحيامن.

Introduction

Infertility is considered one of the major health problems⁽¹⁾. 40%–50% of infertility cases are associated with the male

factor⁽²⁾. There are several types of male infertility. From all types of male infertility, idiopathic infertility and varicocele are the major types. In idiopathic infertility, all parameters of seminal fluid are normal

except one or two parameters without any cause identified⁽³⁾. In cases of varicocele, dilatation of testicular veins will be found with or without abnormal parameters of seminal fluid^(4,5). In general population, varicocele has an incidence of 4.4%-22.6% and this increases in males with primary (21%–41%) and secondary infertility (75%–81%)^(3,4,5). The surgical treatment is varicocelectomy (involves ligation of testicular veins) which can be performed through subinguinal, transinguinal, or suprainguinal incision. Varicocelectomy can be done either by open, laparoscopic, microscopic, or embolization unilaterally or bilaterally⁽⁶⁾. Earlier studies indicated a remarkable improvement in fertility profile after the use of varicocelectomy for the treatment of varicocele induced infertility. In addition, clinical trials concerning treatment effectiveness show conflicting results and varicocelectomy has been criticized especially under the light of evidence-based medicine (EBM)⁽⁷⁾. The introduction of intracytoplasmic sperm injection (ICSI) as an effective method of assisted reproduction in cases of male infertility has questioned the methods used until now⁽⁸⁾. Therefore, varicocele still remains one of the most controversial issues and further studies about effects of varicocelectomy on fertility are required^(7,8,9).

The aim of the study is to assess effect of varicocelectomy in improving semen parameters in infertile male with varicocele in Kirkuk.

Patients and methods

This study was conducted at the beginning of March to the end of October 2017. 21 infertile male patients with varicocele were collected randomly. The diagnosis of varicocele was done clinically and by doppler ultrasonography. Clinical diagnosis was done by one surgeon and Doppler was conducted by one ultrasonographer. Seminal fluid analysis (SFA) and hormonal assay (Testosterone, FSH, LH and prolactin) were done for patient in initial diagnosis in the same laboratory using mini-vidas automated hormone analyzer,⁽³⁾.

Scrotal subinguinal approach was used for performing varicocelectomy⁽¹⁰⁾. By using general or spinal anaesthesia, a transverse scrotal incision of 3-5 cm done. Covering fascias of the testes are incised in the same line of scrotal incision. Haemostasis should be secured. The affected testis should be delivered from the wound⁽¹¹⁾. Prophylactic Jaboulay's procedure should be performed to prevent postoperative hydrocele⁽¹²⁾. Then the spermatic cord above the testis should be examined well and then the covering internal and external spermatic fascias should be incised along the blood vessels. Contents of the cord should be examined well. Vas deferens and its vessels, cremasteric fibers and external spermatic vessels should be isolated and protected. Fine pulsations will usually point and reveal the location of the underlying internal spermatic artery (or arteries). Once located and identified, the artery is dissected and

freed from all surrounding veins. Care is taken to identify a number of lymphatic's (usually 2–5 channels). Then all internal spermatic veins are clamped with 2 artery forceps and in between excision of a segment of these vessels done. Both ends are ligated with Silk or Vicryl and approximated to each other. After securing hemostasis, the wound is closed in layers^(13,14,15).

Postoperatively, semen fluid analysis (SFA) was repeated monthly for assessment of patient improvement for 3 months. In this study, we measured the following parameters in SFA: sperm count, sperm concentration, normal sperm percentage and total motile sperm percentage. Normal values of these parameters have been obtained from WHO laboratory manual for the examination and processing of human semen⁽¹⁶⁾.

Comparison between means of variables done by using paired t test.

Results:

Twenty one patients with male infertile were studied. The mean and standard deviation of their ages were 31.4 ± 9.7 years. The study showed that sperm count improved significantly postoperatively, especially after 3 months of operation (Table 1).

Moreover, sperm count and normal sperm percentage improved gradually but significantly after operation, (Table 1). Also, the total motile sperm percentage

improved rapidly, dramatically and significantly postoperatively, (Table 1).

Discussion:

The present study showed that all parameters of seminal fluid analysis in infertile males with varicocele studied were improved postoperatively, either gradually or rapidly. The best results have been seen 3 months postoperatively.

Al-Huwaizi A., *et al.* concluded that there is an improvement of sperm parameters, the oxidant-antioxidant status and chromatin maturity percent following varicocelectomy⁽¹⁷⁾. Hammadi I., *et al.* mentioned that criteria of seminal fluid improved significantly in cases of clinical varicocele while in cases of subclinical varicocele, significant improvement seen in patients with low sperm count only⁽¹⁸⁾. Reddy S., *et al.* described that sperm motility, concentration, and testicular volume were improved after performing varicocelectomy⁽¹⁹⁾.

Vincenzo F., *et al.* mentioned that the criteria of seminal fluid significantly improves following varicocele repair⁽²⁰⁾.

Baazeem A., *et al.* mentioned that repair of varicocele will result in improvement of sperm count, motility (Both total and progressive motility) and ultramorphology. Also there will reduction of sperm DNA damage and seminal oxidative stress⁽²¹⁾.

Abdel-Meguid T., *et al.* concluded that varicocelectomy is superior to observation in infertile men with palpable varicocele and impaired semen quality⁽²²⁾. Also, Seo J., *et al.* described that varicocelectomy improves significantly both criteria of seminal fluid and chances of spontaneous pregnancy⁽²³⁾.

On other side, Cakiroglu B., *et al.* concluded that varicocelectomy may not cause statistically significant improvement in sperm morphology in cases of preoperative normospermia and teratozoospermia⁽²⁴⁾. Pena M., *et al.* concluded also, that varicocelectomy did not cause improvement in sperm parameters in general population⁽²⁵⁾. Okeke L., *et al.* concluded that patients with preoperative oligospermia will get benefit from repair of varicocele⁽²⁶⁾.

The present study conclude; that varicocelectomy did not cause improvement in sperm parameters in general population.

While the present study **recommend** that varicocelectomy should be done for all infertile males with varicocele. Also, the present study recommend that surgeons use scrotal subinguinal approach with prophylactic jableys procedure because of better results, less incidence of postoperative complications and better postoperative recovery of patients.

References

1. Bhasin S., De Kretser D., Baker H. Pathophysiology and natural history of male infertility. *Journal of Clinical Endocrinology and Metabolism*.1994;19(6):1525- 1529.
2. Speroff L., Glass R., Kase N. *Clinical gynecologic endocrinology and infertility*. 6th Edition. New York: Lippincott Williams & Wilkins; 1999.
3. Fourcroy J. The urologic evaluation of the infertile male. In: Centola G., Ginsburg K.(eds.) *Evaluation and treatment of the infertile male*. Cambridge,UK: Cambridge University Press;2004.p.215-234.
4. Lynch D., Brugh V. Urological interventions for the treatment of male infertility. In: Oehninger S., Kruger T.(eds.) *Male infertility diagnosis and treatment*.London,UK: Informa UK Ltd;2007.p.319-333.
5. Pasqualotto F., Borges E., Roth F., *et al.* Varicocele: To Fix or Not to Fix.In: Sabanegh E.(ed.) *Male infertility problems and solutions*. New York,USA: Springer Science+Business Media, LLC;2011.p.66-80.
6. Al-Kandari A., Shabaan H., Elshebiny Y., *et al.* Comparison of outcomes of different Varicocelectomy Techniques: Open Inguinal, laparoscopic, and subinguinal microscopic varicocelectomy: A randomized clinical trial. *Urology*. 2007;69(3): 417-420.

7. Reddy S., Shaik A., Sailaja S., *et al.* Outcome of varicocelectomy with different degrees of clinical varicocele in infertile male. *Advances in Andrology*.2015;2015:1-9.
8. Meniru G. *Cambridge guide to infertility management and assisted reproduction*. Cambridge: Cambridge University Press; 2004.
9. Carrell D. *The genetics of male infertility*. New Jersey: Humana Press Inc.,2007.
10. Almaramhy H., Aly M. Magnified and non magnified subinguinal varicocelectomy in infertile and/or symptomatic men: A comparative study of the outcome. *African Journal of Urology*. 2012; 18:161-166.
11. Williams D., Karpman E., Lipshultz L. Varicocele: Surgical techniques in 2005. *The Canadian Journal of urology*.2006; 13(1): 13-17.
12. Alkinany A., Alaaridhy H. Concomitant varicocelectomy and jabolay's operation. *Medical Journal of Babylon*. 2009; 6(2): 332-338.
13. Goldstein M., Gilbert B., Dicker A., *et al.* Microsurgical inguinal varicocelectomy with delivery of the testis: an artery and lymphatic sparing technique. *J Urol*.1992;148(6):1808-1811.
14. Mirilas P., Mentessidou A. Microsurgical subinguinal varicocelectomy in children, adolescents, and adults: surgical anatomy and anatomically justified technique. *J Androl*. 2012;33(3): 338-349.
15. Al-Said S., Al-Naimi A., Al-Ansari A., *et al.* Varicocelectomy for male infertility: a comparative study of open, laparoscopic and microsurgical approaches. *J Urol*. 2008; 180(1): 266-270.
16. World health organization. WHO laboratory manual for the examination and processing of human semen. Geneva: WHO;2010.
17. Al-Huwaizi A., Al-Hady F., Al-Murshedi S. Effect of varicocelectomy on sperm parameters, oxidative stress and Chromatin maturity in seminal fluid of infertile patients with varicocele. *Baghdad Science Journal*. 2016;13(2):305-311.
18. Hammadi I., Saeed G., Tawney R. Evaluation of the Effects of Surgical Varicocelectomy on the Seminal Fluid Parameters in Patients with Clinical and Subclinical Varicocele. *J Fac Med Baghdad*. 2015;57(1):40-44.
19. Reddy S., ShaikA., Sailaja S., *et al.* Outcome of varicocelectomy with different degrees of clinical varicocele in infertile male. *Advances in Andrology*. 2015;2015:9 pages.
20. Vincenzo F., Alessandro C., Giacomo N., *et al.* Varicocele repair for infertility: what is the evidence? *Current Opinion in Urology*. 2012; 22(6): 489-494.

21. Baazeem A., Belzile E., Ciampi A., *et al.* Varicocele and Male Factor Infertility Treatment: A New Meta-analysis and Review of the Role of Varicocele Repair. *European Urology*. 2011; 60(4):796-808.
22. Abdel-Meguid T., Al-Sayyad A., Tayib A., *et al.* Does varicocele repair improve male infertility? An evidence-based perspective from a randomized, controlled trial. *European urology*. 2011; 59:455-461.
23. Seo J., Kim K., Moon M., *et al.* The significance of microsurgical varicocelectomy in the treatment of subclinical varicocele. *Fertility and Sterility*. 2010; 93(6):1907-1910.
24. Cakiroglu B., Sinanoglu O., Gozukucuk R. The effect of varicocelectomy on sperm parameters in subfertile men with clinical varicoceles who have asthenozoospermia or teratozoospermia with normal sperm density. *ISRN Urology*. 2013; 3:19-27.
25. Peña M., Alescio L., Russell A., *et al.* Predictors of improved seminal parameters and fertility after varicocele repair in young adults. *Andrologia*. 2009; 41: 277–281.
26. Okeke L., Ikuerowo O., Chiekwe I., *et al.* Is varicocelectomy indicated in subfertile men with clinical varicoceles who have asthenospermia or teratospermia and normal sperm density?. *International Journal of Urology*. 2007; 14: 729–732.

Table (1) The mean and standard deviation of semen parameters preoperatively and postoperatively

Time of estimation Parameter (Mean ± SD)	Preoperatively	1 month postoperatively	2 months postoperatively	3 months postoperatively	P- value
Sperm count (million)	49 ± 21.1	52.9 ± 20.9	56.9 ± 21.4	63.8 ± 20	<0.001
Sperm concentration (million/ml)	14 ± 4.4	15.8 ± 4.5	17 ± 5.3	18.7 ± 5.8	<0.001
Normal sperm percentage (%)	51.4 ± 14.1	59.2 ± 13.8	65.3 ± 12	71.9 ± 10.4	<0.001
Total motile sperm percentage (%)	41.4 ± 13	51.1 ± 12.3	58.5 ± 13.5	70.7 ± 13.2	<0.001

Design and Implementation of Secure Management System for Electronic Library

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Abstract

Recently the digital libraries are created for diverse communities and in the different fields, in which large numbers of users that are distributed geographically can access the contents of large and diverse repositories of electronic objects such as, images, audio, video and files. Storage and copying of information are done either by downloading or by printing from a master file. In this work MySQL database and PHP language is used to design the web site of university (Madent Al-Ellem University College) and as a part of this web site is an electronic library that specified for the students of this university only.

Keywords: Database Systems, Electronic Library, website.

الخلاصة

تصميم وتنفيذ نظام إدارة أمن للمكتبة الإلكترونية

في الوقت الحاضر يتم إنشاء المكتبات الرقمية لمختلف المجتمعات وفي مختلف المجالات، حيث يتم توزيع أعداد كبيرة من المستخدمين جغرافيا لمحتويات مستودعات كبيرة ومتنوعة من الكائنات الإلكترونية مثل الصور والصوت والفيديو والملفات. يتم تخزين ونسخ المعلومات عن طريق التحميل أو عن طريق الطباعة من الملف الرئيسي. في هذا العمل يتم تصميم موقع على شبكة الإنترنت للجامعة (كلية مدينة العلم الجامعة) وكجزء من هذا الموقع هو مكتبة إلكترونية تحدد لطلاب هذه الجامعة فقط باستخدام قاعدة البيانات (MySQL) ولغة php.

الكلمات الرئيسية: أنظمة قاعدة البيانات، المكتبة الإلكترونية، موقع الكتروني

1. Introduction

A **website** is a combination of related web pages, including multimedia content, that identified with a common domain name. a website is published on at least one web server and it is accessible via a public Internet Protocol (IP) network by referencing a uniform resource locator (URL) that identifies it.

Web pages, which are the building blocks of websites, are documents, typically composed in plain text interspersed with formatting instructions of (Hypertext Markup Language(HTML, XHTML)) .

The Hypertext Transfer Protocol (HTTP) is used to accessed and transported the web pages , which may employ the (HTTP Secure, HTTPS) to provide the security and the privacy for the user [1].

Hyper linking between web pages transfer to the reader the site structure and guides the user of the site, which starts with a home page that containing a directory of the site web content. Some websites require user registration or subscription to access content [2].

A static website is the website that has web pages stored on the server in the way that is sent to a client web browser. It is primarily coded in (Hypertext Markup Language (HTML)). Cascading Style Sheets (CSS) are used to

control appearance beyond basic HTML [2].

Images are commonly used to effect the desired appearance and as part of the main content. video or Audio might be considered "static content" if it is generally non-interactive. The static website usually displays the same information to all visitors and it provide consistent, standard information for an extended period of time. Although the static website owner may make updates periodically [3].Dynamic websites can display dynamic or personalized content and it usually interact with data sources and web services [4]. Server-side dynamic pages are generated by computer code that produces the HTML (CSS are responsible for appearance and thus, are static files). There are a wide range of software systems that are available to generate dynamic web systems and sites(The software systems such as CGI, Java Servlets and Java Server Pages (JSP), Active Server Pages and ColdFusion (CFML)).[3]

2. Web Architecture

A web application includes four tiers as depicted in the figure(1).

- Web browsers on the client side for rendering data presentation coded in Hypertext Markup Language .
- Web server program that generates data presentation

- The application server program that computes business logic
- The database server program that provides data persistency.

These types of server programs may run on the same or different server machines [5].

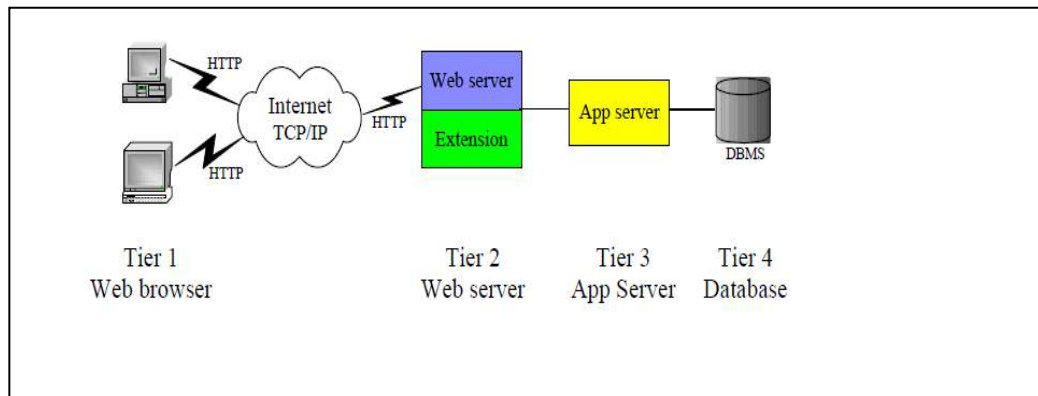


Figure (1) web architecture.

Web browsers can run with limited hardware or software requirement on the most operating systems, Web browsers are the graphic user interface for the clients to interact with web applications. IE and Firefox are popular web browsers and Apache, Tomcat and IIS are popular web server programs [5].

3. The Proposed Electronic Library of University

The design of **Electronic Library for the university** consists of many phases each phase have an algorithm for it design also there are many tools used to implement the design of web site and the **electronic library**.

3.1) Hardware and Software Requirements

To implement the design of E-library system, the following set of

hardware and software requirements are used:

1. Hardware requirements are divided into:
 - a. **Client:** is a machine used to access and use the designed smart of E-library system through a web interface.
 - b. **Server:** which is a machine used to host the proposed smart of E-library system database and website, To offer the services to clients The wamp server is installed on the server node as a database and web server and it is a windows web development environment. It allows the user to create web applications with (Apache2, PHP and a MySQL database)[6].

3.2) Software and Programming Languages Used

- a. Hypertext Mark-up Language (HTML) is the authoring language used to

create documents on the World Wide Web [7].

- b. JavaScript is a language that commonly used in web development, it used to add dynamic and interactive elements to websites.
- c. Hypertext Pre-processor (PHP) Language is a script language and interpreter that is freely available and used primarily on Linux Web servers. It derived from Personal Home Page Tools, now stands for PHP .
- d. MySQL Database is a relational database server that supports the (Structured Query Language) database language. Therefore, MySQL is named after the language that developers use to store, query, and later update data in a MySQL database and it can be accessed by most programming languages, it is often coupled with PHP because they work together with ease. Information stored in a MySQL database hosted on a web server can be accessed from anywhere in the world with a computer [7].

4. The security of system

To keeping that system secure. There are some tips concerned about the security of Apache server:

- **Enable ModSecurity:** ModSecurity is a free Web Application Firewall that works with Apache. It uses a flexible rule engine to perform simple and complex operations to prevent attacks like (SQL injection ,

cross-site scripting, trojans, bad user agents and much more).

By default, ModSecurity isn't installed[8]. To install ModSecurity, follow these steps.

- Open a terminal window on your Apache server.
- Issue the command `sudo apt-get install lib-apache2-modsecurity`.
- Rename the sample config file with the command `sudo mv /etc/modsecurity/modsecurity.conf-recommended .`
- Open the newly created file for editing with the command `sudo nano /etc/modsecurity/modsecurity.conf`.
- Add the line `SecRuleEngine On` in the rule engine initialization section.
- Restart Apache with the command `sudo service apache2 restart`.
- to edit the ModSecurity configuration file.
- Open that files with the command `sudo nano /etc/apache2/mods-enabled/security2.conf` and add the following lines:

IncludeOptional

"/usr/share/modsecurity-crs/*.conf"

IncludeOptional

"/usr/share/modsecurity-crs/base_rules/*.conf"

Save and close that file and restart Apache with the command `sudo service apache2 restart`.

- **Limit large requests by default,** Apache does not set a limit to the size of HTTP

requests it will accept; this can lead to an attacker sending a lot of data to take down the server. This is configured on a per-directory basis.

- **Restrict browsing to specific directories** the users to don't be able to browse outside of specific directories [9].

5. Design Phases

The design consist of two essential phases and many others sub-phases

1. The First Main Phase (The Administrator Side)

The administrator login page of the designed E-library website. It contains two fields the username and password. If the administrator enter correct information, the system will redirect the administrator to Admin home page, otherwise the shows a message that the username or password error. The administrator have many responsibilities to do such as check the user that want to register in the electronic library (checking algorithm) ,add, delete new book or thesis, Reports Page and Resource books Report page.

1-1 Checking (Authentication) Algorithm

Input: The request of registration

Output: Approve / or Disapprove the request of registration

Step 1: Begin

Step 2: the administrator take the information of user that entered in the registration form (name of user, date of birthday and his department in the university)

Step 3: the administrator search the Central Data Base about the information of the user to assurance the authorization (the registration department in the university control and continue update the central data base that have the names of all student and members of university)

Step 4:

4.1 if the information of user found in the Central Database then

4.1.1 The administrator search the Users Database (the users database control and update by the administrator of the system) about the username and the password of the user to avoid the confliction and also to avoid register the same user with more than user name ,**if** the information not found in users data base **Then**

* The administrator approve the registration request

* Add the user name and the password and the registration information to the users database. **Otherwise**

4.2 The administrator disapprove the registration request

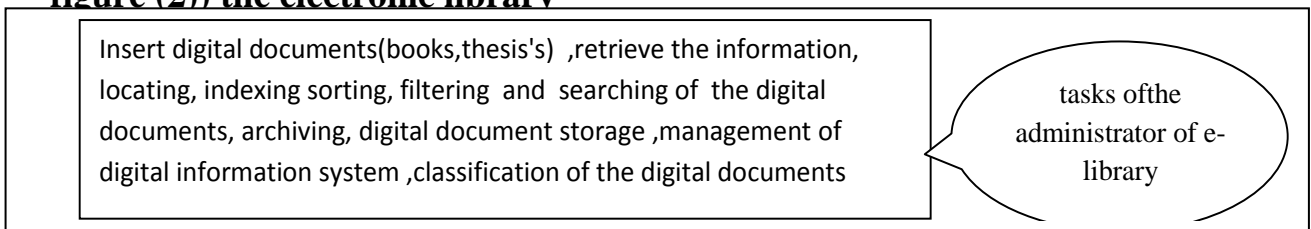
4.2.1 The administrator sends a declaration message to the user about reasons of disapproving the registration request.

Step 5: End.

1-2 The Administrator Responsibilities

The administrator have many responsibilities (as shown in the figure (2)) to do for manage the electronic library, These responsibilities are begin after the administrator login to page of the designed E-library website. It contains two fields the username and password.

figure (2)) the electronic library



administrator to Admin home page, otherwise the shows a message to user that the username or password error, the administrator responsibilities are:

a. Add New (Book, thesis)

The Add books, **thesis's** page of the e-library website allows the administrator of to add information

and digital copy of the book to the system as shown in figure (3), the information are (Book Title, Library Class, Book Class, Book Author, Edition Number, The Publisher, Number Of Copies, Resource Of Textbox, ISBN, Date Of Insertion, The type of file of book, The Chosen Department).

Figure (3) Add New Book Page.

b. Delete Books page

The edit books page of the designed e-library website allows the administrator of the website to edit information or make a digital copy of the required books, also It allows the administrator to delete books. To delete any book or thesis, the administrator must enter the book title and author to search the database of e-books and find it, then all the information about the book will appear .The administrator may delete the book and its information, the same process will execute when

the administrator want to delete any thesis.

c. Reports Page

The reports page of the administrator phase of E-library website contains the reports about books like resource books report, books specialty report and textbox report as shown in figure (4). It also contains report for thesis like thesis title reports and Supervisor report for example (**Resource books Report page:** It presents report contains book name, author, number of book copies and publish date).

Id	Student Name	Book Name	Download Date
1	محمد محمد	Mathematics	0000-00-00
2	محمد محمد	Mathematics	2017-04-25
3	محمد محمد	Mathematics	2017-04-25

Figure (4) Resource books report page.

2. The Second Main Phase (The User(Student) Side)

The Users of the E-library can be accessed at anytime and anywhere through the designed GUI interfaces

using the internet browser . The E-library website can be accessed using various types of client devices such desktop, laptop or mobile devices as shown in the Figure (5).

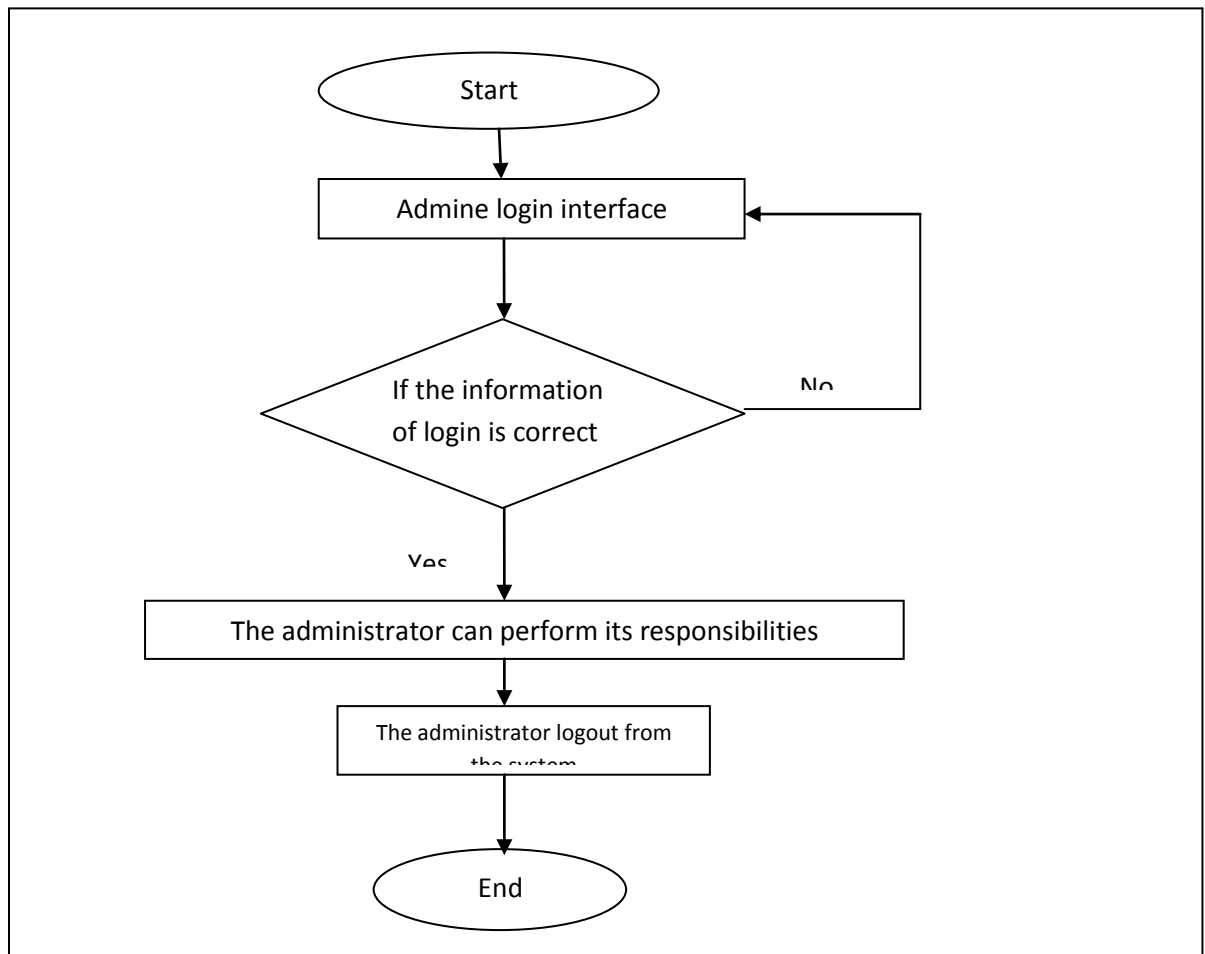


Figure (5) The administrator login and logout

Then if the user it the first time he visit the website he must be registrations otherwise he must be login to the system, The main function that the user can perform can be divided into three parts: user registration, user login and user logout of website .

2-1 Algorithms Of User Side

To assure the authentication of the user of the online e-library, the user must perform some actions such as the registration in the website, login and after he visits the website, he

must logout of e-library. Figure (6) illustrate the user side.

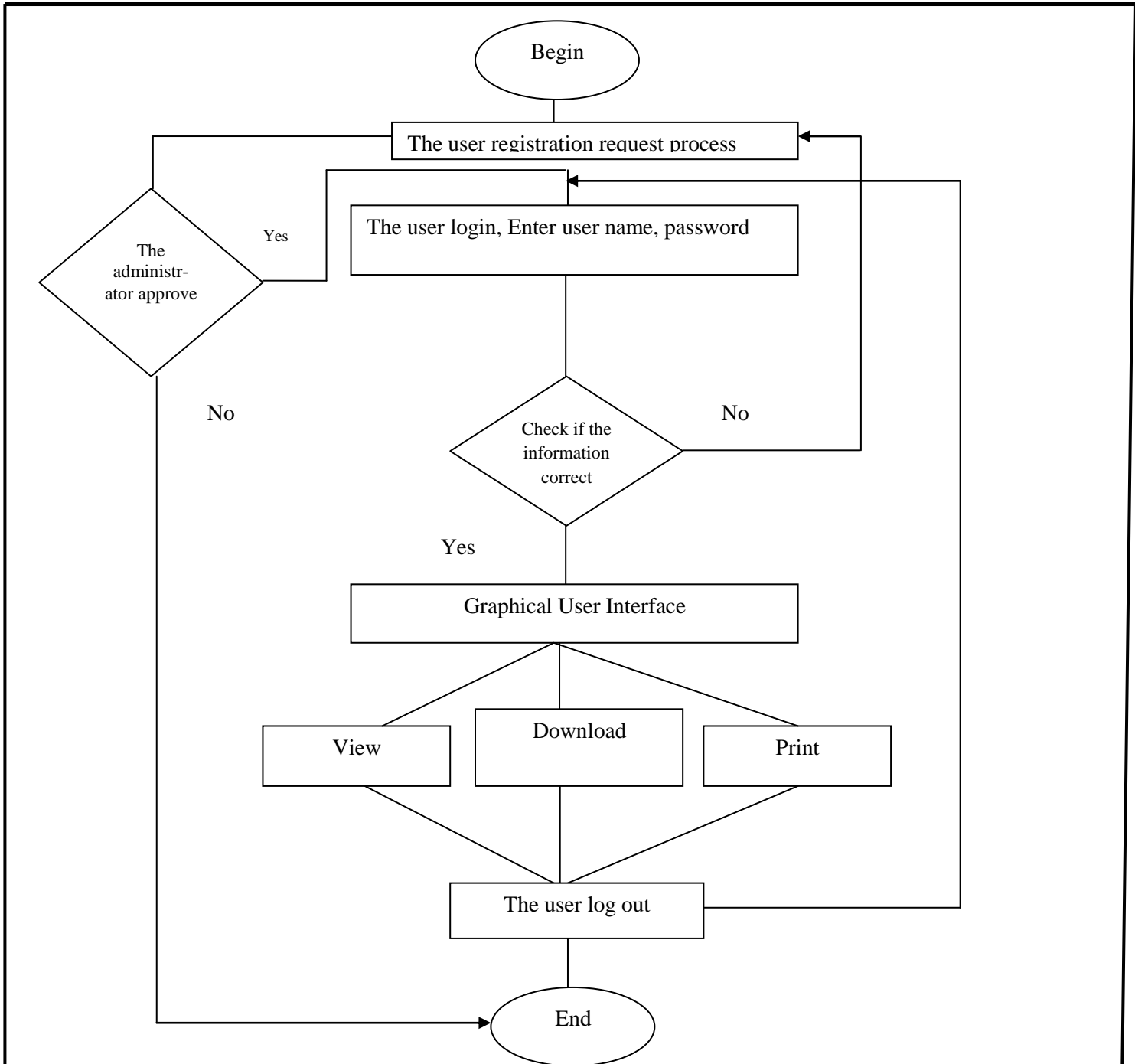


Figure (6) The user side

2-1-1 Login Algorithm

Input: The username and password

Output: Redirect the user to user's home page.

Step 1: Begin

Step 2: If the user enter correct information, the system will redirect the user to user's home page (this mean the user was registered in the website previously) and he can perform the operation that specified to him (**user operations algorithm**)

Step 3: otherwise the shows a message to user that the username or password error.(**this mean the user wasn't registered in the website previously**)) the user must first complete the Registration process (**Registration Algorithm**) before login to the system

Step 4: End.

2-1-2 Registration Algorithm (Figure (7))

Input: The user information

Output: Complete the user registration process

Step 1: Begin.

Step 2: The user fills the registration field: name, e-mail, password, date of birthday, department.

Step 3:the user click register button

Step4: After that the registration request is displayed for the administrator.

- **If** the administrators approve student registration (Administration Algorithm), then the student can access to e-library via username and password.

- **Else** message is displayed to the student that this username and password is not registered

Step5: End.



Figure (7) Student registration page.

2-1-3 User Operations Algorithm

Input: The user login to the website.

Output: The user view or download the books or thesis .

Step 1: Begin

Step 2: The user login to website by enter the correct user name and password in user management Interface

Step 3: If the user selects the books page of the e-library website. It views the books archived in e-library with basic information like book name, author, ISBN and publish year this page allows the students to **view** and **download** books and also search for books using book title and author.

Else if the user selects thesis page, it views the thesis archived in e-library with basic information like thesis title, researcher name and supervisor. This page allows the students to **view** and **download** thesis and also search for thesis using thesis title, researcher of supervisor.

Step 4: The user must logout from the website after he finish his work

Step 5: End.

Conclusion

With the development of science and technology, The E-library plays an important role in education sector these days. Its success depends upon the sharing of useful information and documentation of it. The Electronic libraries can provide a vehicle for extending collaboration, which is at the heart of the academy, with the aim of more effective education. The Digital Libraries basically store materials in electronic format and the administrator can use an E-library management system to add,

modify or delete the objects from the database by using online control that is protected with a username and password and e-mail for more authentication also The e-library system facilitates of different departments in the same universities to access, search and download the required books and thesis's.

References

- 1] Cailliau, Robert. "A Little History of the World Wide Web", 2007.
- 2] G. sreedhar," Web Data Mining and the Development of Knowledge-Based Decision Support Systems", deemed university,india,2017
- 3] Hillar Petersen, "From Static and Dynamic Websites to Static Site Generators", university of TARTU, Institute of Computer Science, 2016.
- 4] Amazon Web Services, "Hosting Static Websites on AWS", 2017.
- 5] lixin tao, "Introduction To Web Technologies", pace university,
- 6] Rohan Vibhandik," Online and Offline eBook Management System using W-CMS", San Jose State University, 2011.
- 7] Gary shelly, Denise woods, Html: complete concepts and techniques,2009
- 8] Jason pubal , web application firewalls,2015.
- 9] Argiro Birba , "Modsecurity Evaluation Command Injections", 2016.

Design and Analysis the Performance of UWB Transceiver using BPSK Modulation

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Abstract

UWB communications attracted significant attention as a strong candidate solution for short-range high data-rate applications. UWB is a modulation and data transmission method which has potential to change the wireless picture entirely in future. The non-orthogonal collaboration in limited band wireless networks regularly requires sending disseminated space-time codes with joint encoding of a few symbols at the source and transfers; furthermore, it requires joint disentangling of these images at the goal. In any case, the proposed non-orthogonal collaboration conspire acknowledged inside one image span. This implies the proposed methodology is adjusted to the structure of the Continuous Wave that constitutes the most well-known tweak conspire related with UWB transmissions. This system additionally proposes a basic and effective power portion technique that further lifts the execution of the proposed participation methodology.

Keywords: Ultra-wideband, UWB, CW, BPSK

تصميم وتحليل أداء جهاز الإرسال والاستقبال النطاق الترددي فائق العرض باستخدام تعديل الإزاحة الزاوي

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الجامعة التقنية الوسطى- بغداد-العراق

الخلاصة

جذبت اتصالات النطاق الترددي فائق العرض اهتماما كبيرا كحل مرشح قوي لتطبيقات معدل البيانات العالية قصيرة المدى. النطاق الترددي فائق العرض هو أسلوب تشكيل ونقل البيانات التي لديها القدرة على تغيير الصورة اللاسلكية تماما في المستقبل. ويتطلب التعاون غير المتعامد في الشبكات اللاسلكية المحدودة النطاق بانتظام إرسال شفرات موزعة للفضاء مع تشفير مشترك لعدد قليل من الرموز عند المصدر والتحويلات؛ وعلاوة على ذلك، فإنه يتطلب تفكيك مشترك من هذه الصور عند الاستلام. وعلى أية حال، التقنية المقترحة داخل نطاق صورة واحدة. وهذا يعني أن المنهجية المقترحة يتم تعديلها وفقا لهيكل الموجة المستمرة التي تشكل أكثر التعديلات المعروفة والمعروفة والمتزامنة مع إرسالات النطاق الترددي فائق العرض ويقترح هذا النظام بالإضافة إلى ذلك تقنية أساسية وفعالة حيث أنه يستخدم نبذبات من الطاقة والتي تنشر طاقة التردد الخاصة بالإرسال وبذلك تزيد من رفع تنفيذ منهجية استخداما لنطاق الترددي فائق العرض

Introduction

The universe of ultra-wideband (UWB) has changed significantly in exceptionally late history. A considerable change happened in February 2002, when the FCC (2002a, b) issued a decision that UWB could be utilized for information correspondences and in addition for radar and security applications. UWB is not really altogether new in either the idea or the flag handling methods utilized, we trust the current (and for years to come) accentuation on low power, low obstruction and low control makes the utilization of UWB an alluring alternative for present and future remote applications [1]. The capacity to move between the high information rate - short connection separate and the low information rate - longer connection remove applications is one of the tremendous possibilities of UWB [2]. The low transmit control accessible constantly implies low vitality, numerous, UWB beats must be consolidated to convey 1 bit of data. This basically implies, exchanging information rate for connection separation can be as basic as expanding the quantity of heartbeats used to convey one piece. The more heartbeats per bit, bring down the information rate, and

more noteworthy the achievable transmission remove. Truly, UWB radar frameworks were produced essentially as a military instrument since they could "see through" trees and underneath ground surfaces.[3] Be that as it may, as of late, UWB innovation has been centered around customer gadgets and correspondences. Perfect focuses for UWB frameworks are minimal effort, low power, high information rates, exact situating capacity and amazingly low obstruction. UWB innovation separates from regular narrowband remote transmission innovation – as opposed to broadcasting on independent frequencies; UWB spreads motions over an extensive variety of frequencies [4]. The ordinary sinusoidal radio wave is supplanted via trains of heartbeats at countless heartbeats/every second. The low power and wide data transfer capacity makes UWB transmissions show up as foundation commotion[5]. This is basically based on Ultra Wide band system and their characteristics and generation of the UWB in monocycle and Doublet. In this report we are introducing the benefits of the UWB and comparison of the spectral allocation for different wireless radio system, survey of

UWB waveforms, division of different modulation methods for UWB communication and types of Receiver used for UWB, Comparison of performance of UWB with the others as in it gives the way to do what has not been conceivable some time recently, be that the utilization of high information rates, littler, bring down fueled gadgets, ground infiltration radars, through-divider radar imaging or, without a doubt, some other new application [6]. In any case, UWB is, fairly, another designing innovation in that no new physical properties have been found. Be that as it may, the overwhelming technique for remote correspondence today depends on sinusoidal waves [7]. The sinusoidal electromagnetic waves are so widespread in radio correspondences that many individuals don't know that the principal correspondence frameworks were in truth beat based [8-14]. This is an outlook change for now's architects from sinusoids to heartbeats that require the most moves in core interest.

1. System Model

The following SIMULINK model was used for simulating the UWB transmitter as shown in the figure below. Utilizes arbitrary information which BPSK regulates a transporter to develop a BPSK UWB transmitter. The recipient demodulates the BPSK UWB flag (expecting flawless match up) and the separated information is recuperated. Give values, for example, $f_{carr} = 4.0\text{GHz}$, $N = 1.3\text{GHz}$ et cetera. The numbers appeared here, when up scaled, imply beat widths of ~ 750 pico seconds ($1/1.3\text{GHz}$). At the end of the day, what a framework that can work in the 3.1-10.6 GHz UWB band (at information rates up to 1.3 Gbps) by changing $f_{carrier}$ and the transfer speed can be changed by shifting the season of the information rate or N . It is pleasant to do this continuously with each of the comparing squares utilized is talked about in detail as far as parameter settings and piece functionalities

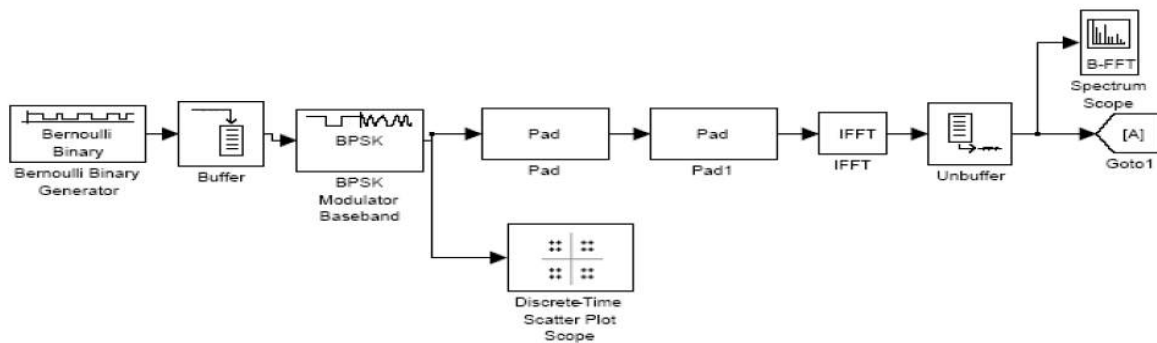


Figure 1 UWB Transmitter Design block in MATLAB

The Bernoulli Binary Generator square produces arbitrary double numbers utilizing a Bernoulli conveyance. The Bernoulli circulation with parameter p produces zero with likelihood p and one with likelihood $1-p$. The Bernoulli conveyance has mean esteem $1-p$ and difference $p(1-p)$. The Probability of a zero parameter determines p , and can be any genuine number in the vicinity of zero and one [9]. This block was used to generate the binary data by adjusting the output attributes of the sample time field to 1.0ns. This is in accordance with UWB criterion that the pulses should be of short duration in the order of nanoseconds, in addition to fulfilling of the project's objective of 100MHz bandwidth. The Buffer block redistributes the input samples to a new frame size. Buffering to a bigger edge estimate yields a yield with a slower outline rate than the information. The square

facilitates the yield outline size and casing rate of non-covering supports with the end goal that the example time of the flag is the same at both the info and yield. This square backings activated subsystems when the piece's information and yield rates are the same. The buffer's functionality is to create an area or limit within which the UWB signal will work within and this set as 96 in the output buffer size (per channel) field in the parameter settings. It acts as a guard to restrict the UWB signal into the desired frequency band. The BPSK Modulator Baseband square tweaks utilizing parallel stage move keying strategy. The yield is a baseband portrayal of the adjusted flag. The info must be a discrete-time parallel esteemed flag. In the event that the info bit is 0 or 1, separately, then the adjusted symbol. The block is used in its default parameter settings. The reason with respect

to why this piece is utilized is that UWB radio, not at all like exemplary interchanges, does not utilize a regulated sinusoidal transporter to pass on data. Rather, the transmitted flag is a progression of baseband heartbeats created by the BPSK piece. The Pad piece broadens or edits the measurements of the contribution by cushioning or truncating along its sections, lines, segments and pushes, or any dimension(s) you determine. Truncation happens when you indicate yield measurements that are shorter than the comparing input measurements. On the off chance that the info and yield lengths are the same, the square is a go through. The pad block is used to append the signal for proper inverse fast fourier transformation. This is so because the IFFT block cannot perform the inversion without appending or truncation. The parameters were modified as pad signal field was placed at the beginning and the padding being done along the columns with specified output rows at a value of one. The IFFT piece registers the opposite Fast Fourier Transform (IFFT) of each channel of a P-by-N or length-P input, u. At the point when the Inherit FFT length from info measurements check box is chosen, the information length P must be a

whole number energy of two and the FFT length M is equivalent to P. At the point when the check box is not chosen, P can be any length, and the estimation of the FFT length parameter must be a positive whole number energy of two. For client determined FFT lengths, when M is not equivalent to P, zero cushioning or modulo-M information wrapping occurs before the IFFT operation. IFFT is a form of digital signal processing (dsp) and is relevant to allow for easy transmission of the generated signals across the channel to the receiver end of the transceiver. The Unbuffer square unbuffers a Mi-by-N outline based contribution to a 1-by-N test based yield. That is, information sources are unbuffered push astute so that every lattice push turns into a free time-test in the yield. The rate at which the piece gets information sources is by and large not as much as the rate at which the square creates yields. The Un buffer block's seeks to integrate the IFFT output from the frame based aspect to the waveform (sample based) display on the spectrum scope. The following SIMULINK model as shown in figure was used to simulate the UWB receiver in accordance with the project objectives. The receiver is similar in design to the transmitter model but in this case,

each of the blocks performing the reverse operations as compared to the transmitter block.

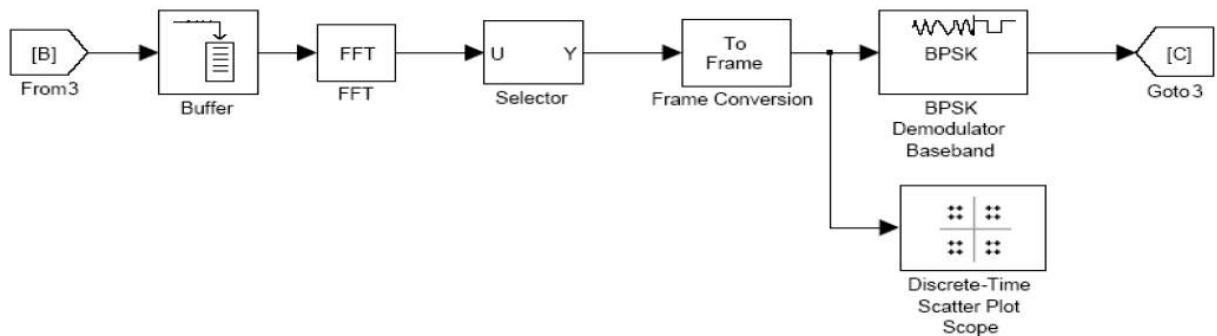


Figure 2 UWB Receiver design Block in MATLAB

The FFT block computes the fast Fourier transform (FFT) of each channel of a P-by-N or length-P input, u. When the Inherit FFT length from input dimensions check box is selected, the input length P must be an integer power of two and the FFT length M is equal to P. When the check box is not selected, P can be any length, and the value of the FFT length parameter must be a positive integer power of two. For user-specified FFT lengths, when M is not equal to P, zero padding or modulo-M data wrapping happens before the FFT operation. The parameter settings were set at table lookup in the twiddle factor computation field and speed in the optimize table field. Its functionality is to get the fast Fourier transform of the received signal for proper

demodulation of the signal .The Selector piece produces as yield chose or reordered components of an info vector, lattice, or multidimensional flag. A Selector piece acknowledges vector, grid, or multidimensional flags as info. The parameter discourse box and the piece's appearance change to mirror the quantity of measurements of the information. The Input type parameter was set to the type of signal “Matrix”. The parameter dialog box and the block's appearance changed to reflect the type of input that was selected. The Frame Conversion square goes the contribution through to the yield and sets the yield examining mode to the estimation of the Sampling method of yield flag parameter, which can be either Frame-based or Sample-

based. The yield inspecting mode can likewise be acquired from the flag at the Ref (reference) input port, which you make noticeable by choosing the Inherit yield examining mode from <Ref> input port check box. The Frame Conversion square does not roll out any improvements to the information flag other than the examining mode. Specifically, the square does not rebuked or resize 2-D inputs. Since 1-D vectors can't be casing based, when the information is a length-M 1-D vector and the square is in Frame-based mode, the yield is a casing based M-by-1 framework — that is, a solitary channel [9]. The piece was utilized as a part of the default settings without any progressions being influenced. The BPSK Demodulator Baseband square demodulates a flag that was regulated utilizing the double stage move keying strategy. The info is a baseband portrayal of the tweaked flag. The information can be either a scalar or an edge based segment vector. The square acknowledges the

information sorts twofold, single, and marked settled point. The information must be a discrete-time complex flag. The square maps the point's $\exp(j\theta)$ and $-\exp(j\theta)$ to 0 and 1, individually, where θ is the Phase balance parameter. The UWB signal demodulation was as required and displayed on the discrete scatter plot. The BPSK Demodulator parameter output type was set at bit and the constellation ordering was set to gray code.

2. Results and Analysis

The transceiver design is as implemented herein. It is from the simulation results of the spectrum scope at the transmitter and receiver side that they showed the actual functioning of the transceiver. The waveform from the transmitter is the one actually received at the receiver side plus an AWGN, as theory dictated. The simulated and theoretical discussions agree, thus the project being a success shown in figures below

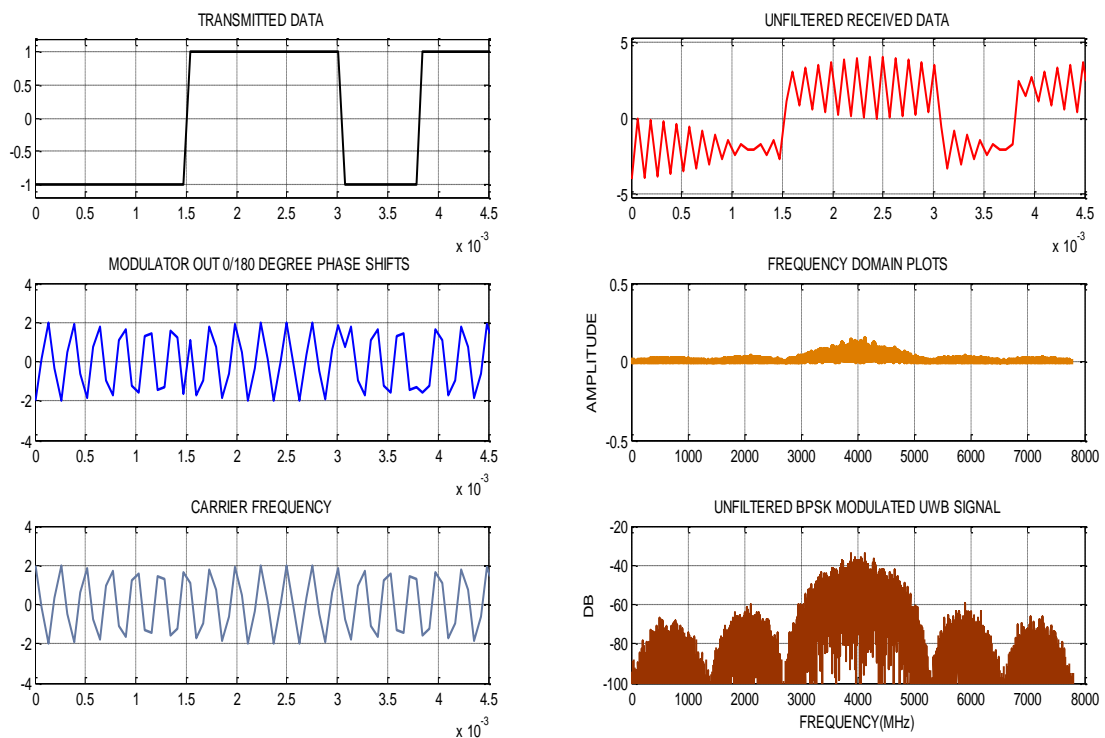


Figure 3 Simulations Results of UWB Transceiver design in MATLAB

Conclusion

This work explores the wide range of applications that can exploit the unique properties of UWB systems. It also reviews some of the first commercial UWB products and applications. For both high and low data rate applications, with expanding interest for range distribution to oblige new ad remote administrations, UWB has demonstrated to

offer a win-win development that makes accessible effective utilize and re-use for basic range. Adaptability as far as balance plans and collector topologies, and a technique that can join multipath vitality in thick situations. Another advantage of this usage is the capacity to update execution of framework attributes with a product change as opposed to building another equipment

setup, making the framework perfect for a UWB test recreation. Each of these focal points was shown in this venture, alongside framework check through recreation in MATLAB. All through the plan displayed in this work, recommendations have been made to make upgrades to the outline. As examined already, since UWB framework was intended to be adaptable, a significant number of the correspondence framework and collector calculation plans can be additionally actualized.

References

- [1] Ropot. c. s. r. r. "First report and order and F. ultra-wideband transmission systems, Washington, DC, ET Docket 98-153, 2002.
- [2]. Rogerson, GRA. "Ultra-wideband Wireless Systems," Spectrum policy task force report," FCC, Washington, DC, ET Docket 02-135, 2002. 3.
- [3] Yushkov, Y., Badulin, N.N. A nanosecond pulse-compression microwave radar., "A nanosecond pulse-compression microwave radar.," *Electromagnetic Waves & Electronic Systems (Russian)* 2, 26-30, 1997.
- [4] Changhui Hu, RK., Jay Nejedlo, Kangmin Hu, Huaping Liu, and Patrick Y. Chiang,, "A 90nm-CMOS, 500 Mbps, 3–5 GHz fully-integrated IR-UWB transceiver with multipath equalization using pulse injection-locking for receiver phase synchronization," " *IEEE J. SolidState Circuits*, vol. 46, no. 5, pp. 1076–1088, May 2011
- [5] Choliz, AH., A. Sierra, and P. Cluzeaud, "," "Coexistence of MB-OFDM UWB with Impulse Radio UWB and other radio systems," *IEEE International Conference on Ultra-Wideband*, 2011, pp. 410-414.
- [6]. Mallipeddy, IO, and R. S. Kshetrimayum, "Impact of UWB interference on IEEE S02.11a WLAN system,," " *National Conference on Communications (NCC)*, Jan. 2010, pp.1-5., 2010,.
- [7] Karam, PH, Shamim, A and J. Rogers, *Symp. Dig.*, Jun. 2007, pp. 101–104., "A 6.3 GHz BFSK transmitter with on-chip antenna for self-powered medical sensor applications,"" in *Radio Frequency Integrated Circuits (RFIC) 2007*.
- [8] Wentzloff, D and A. P. Chandrakasan, " "A 47 pJ/pulse 3.1-to-5 GHz all-digital UWB transmitter in 90 nm CMOS," in *IEEE Int. Solid-State Circuits Conf. Dig. Tech. Papers*, Feb. 2007, pp. 118, 591.
- [9] Zhang, AJF., R. Gharpurey, and P. Kinget, "," "An Agile, Ultra-Wideband Pulse Radio Transceiver With Discrete-Time Wideband-IF," *IEEE J. Solid-State Circuits*, vol. 44, no. 5, pp. 1336–1351, MAY. 2009.
- [10] Chen, PX., and S. Kiaei, " "Pulse generation scheme for low-power low

complexity impulse ultrawide band," IEE Electron. Lett., Jan. 2007.

[11] Yu, Do, MA., L. Jia, J.-G. Ma, and K. S. Yeo, "Design of a low power wideband high resolution programmable frequency divider," IEEE Trans. Very Large Scale Integr. Syst., vol. 13, pp. 1098–1103, Sep. 2005.

[12] Tak, SH., T. Kang, B. Choi, and S. Park, "A 6.3-9-GHz CMOS fast settling PLL for MB-OFDM

UWB applications," IEEE J. Solid-State Circuits, vol. 40, no. 8, pp.1671–1679.

[13] Zheng and H. C. Luong, vol. 42, no. 6, pp. 1250–1260, Jun., "A 1.5 V 3.1 GHz - 8 GHz CMOS synthesizer for 9-band MBOFDM UWB transceivers," IEEE J. Solid-State Circuits, 2007.

[14] Dal Toso, AB., M. Tiebout, S. Marsili, C. Sandner, A. Gerosa, and A. Neviani, "UWB fast-hopping frequency generation based on sub-harmonic injection locking," IEEE J. Solid-State Circuits, vol. 43, no. 12, pp. 2844–2852, Dec. 2008.

Effectiveness of an Instructional program concerning Medication adherence on Knowledge of Hypertensive Patients at AL-Razi Center in Al-Basra Governorate

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Abstract

Objective: the study aims to find out the effectiveness of an instructional program on patients adherence for medication of hypertension, and their knowledge.

Methodology: A quasi-experimental design study is conducted at AL-Razi center in AL-Basra governorate. The study was started at 1st of December 2018 to end June 2019. A probability sample of (50) hypertensive patients who attending AL-Razi center. Data were collected throughout the utilization of the adopted questionnaire and interview technique. The questionnaire is composed of (44) items related to patient's adherence and knowledge toward importance of medication compliance. The reliability of instrument was 0.74 by using cronbachs alpha, the data analysis done by uses the statistical methods which as (descriptive, and inferential statistics)

Results: the findings revealed that there were improve in patient's knowledge and their adherence toward hypertensive medication at post test of program which of 75.3% of them was compliance for medication uses, and the patients not compliance was reduced to 24.7%.

Conclusions: The instructional program had positive effect on this group of patients and this study demonstrated significant changes in their knowledge scores comparing the pre and the post knowledge, knowledge was changed from moderate grade level in pre-test to high grade level in post-test.

The study **recommend** to establish specific department in each treating center of hypertension to provide the patients the information needed about the important of compliance and follow up when patients need to change their drugs

Key words: Effectiveness, Instructional program, Medication adherence ,Knowledge, hypertensive patients. AL-Razi center

فاعلية البرنامج التعليمي المتعلق بالالتزام بالعلاج على معارف مرضى فرط ضغط الدم في مركز الرازي في محافظة البصرة

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المستخلص

الهدف: تهدف الدراسة لمعرفة فاعلية البرنامج التعليمي في معارف المريض التزامه بعلاج ارتفاع ضغط الدم **المنهجية:** دراسة شبه تجريبية في مركز الرازي في محافظة البصرة. اجريت بتاريخ الاول من كانون الاول 2018 حتى نهاية حزيران 2019. تم اختيار (50) مريض مشخص بارتفاع ضغط الدم الذين يراجعون مركز الرازي. وتم جمع البيانات باستعمال الاستبيان المعد لهذا الغرض. حيث تكون من (44) فقرة تتعلق بالتزام المرضى ومعارفهم حول اهمية الالتزام بأدوية ضغط الدم. وتم قياس صدق الاستبانة باستخدام مقياس مروان باخ والمساوي 0.74. وتم تحليل البيانات باستخدام التحليل الوصفي والاستدلالي

النتائج: اظهرت نتائج الدراسة تحسناً واضحاً في معارف المريض والتزامه بأدوية ارتفاع ضغط الدم في الاختبار البعدي للبرنامج وبنسبة 75.3% ، وانخفض مستوى عدم التزام المرضى إلى 24.7%.

الاستنتاجات: طبقاً للنتائج تبين ان للبرنامج التعليمي تأثير إيجابي على معارف المرضى من خلال زيادة نسبة الالتزام بأخذ علاج ارتفاع الضغط

التوصيات: توصي الدراسة بإنشاء قسم مخصص في كل مركز علاجي لفرط ضغط الدم لتزويد المرضى بالمعلومات حول أهمية الامتثال والمتابعة عندما يحتاج المرضى إلى تغيير العلاج.

كلمات البحث: فاعلية ، برنامج تعليمي ، الالتزام بالعلاج ، المعرفة ، مرضى ارتفاع ضغط الدم. مركز الرازي

Introduction:

Hypertension, or high blood pressure (BP), is the most common health problem among persons and can cause complication like stroke, myocardial infarction, renal failure, and death if not treated early and effectively, patients with specific risk factors for developing hypertension should be treated at any age.⁽¹⁾

Approximately 1 in every 3 American adults has hypertension and only about half have their blood pressure controlled. In addition to therapeutic lifestyle modifications as a first intervention for blood pressure control among those with hypertension, adherence to prescribed antihypertensive medication regimens is also necessary. Good adherence to medication has been associated with greater odds of blood pressure control⁽²⁾.

Globally, it is also one of the major causes of premature death, and 7.1 million of people die from hypertension related diseases annually and the problem is still increasing globally. More than 25% of the adult people worldwide have been diagnosed as having hypertension, and the prevalence of hypertension increases with age⁽³⁾.

Currently, hypertension is also responsible for at least 45% of deaths due to heart disease and 51% of deaths due to stroke. In Ethiopia, 3.5% of all deaths are due to HTN, making it

the seventh leading cause of death in the country (4).

Hypertension may not cause symptoms for a long time and its significant side effects may occur after years there for is called "silent killer". In the absence of symptoms, the treatment by the patient is difficult to accept. Antihypertensive drug therapy is the key method for long-term control of blood pressure.⁽⁵⁾

Despite the effectiveness of antihypertensive therapies, the proportion of patients regularly taking their medication is decrease, even in the context of secondary prevention. It is estimated that about half of the patients being prescribed antihypertensive drugs stop taking treatment within the first year. A similar level of adherence is observed among patients with uncontrolled and/or resistant hypertension^(6,7).

The effectiveness of medications to treat hypertension must be achieved by optimal medication adherence. Medication adherence is defined as the process by which patients take their medication as their prescribed. Optimal antihypertensive drug adherence has significantly positive association with blood pressure control^(8,9).

World health organization classified those multidimensional factors into patient, social/economic, condition, therapy, and health care team-related factors. Community management is the main factor that effects to

treatment and control of blood pressure in patients with hypertension ⁽⁸⁾.

Patients with low medication adherence have a high risk in terms of uncontrolled blood pressure and adverse outcomes that may increase. It has been proven that involvement of patients in decision making, and taking disease and treatment seriously by the patients affects the medication adherence positively ⁽⁷⁾.

Low adherence to antihypertensive medications is interference in the management of hypertension resulting in high rate of hospitalization and death it undermines the efforts of health facilities, health professionals, and policy makers for the modification and improvement of the health of patients. low adherence will be the main source of psychological and medical complications and has an impact on patient's quality of life, wasting health care resources and reducing individual's believe towards the health care system ⁽⁹⁾.

MATERIAL AND METHODS:

Design of the Study:

A quasi-experimental design study was achieved through the pre and post-tests for present sample to evaluate effectiveness of instruction program concerning medication adherence on knowledge of hypertensive patients at AL-Razi center in AL-Basra

governorate. The study was started at 1st of December 2018 to end of June 2019.

Setting of the Study:

The study was conducted in AL-Razi center which treat the hypertensive patients and diabetic that located in AL-Basra government.

Sample of the Study

A probability sample consists of (50) patients for both male and female (28 years and above) patients chosen randomly which received the instructional program.

Study Instrument

A constructional checklist was conducted to evaluate the effectiveness of an instructional program on patient's knowledge through data collection which contains five parts.

First part: It is concerned with the patient's demographic data that include (gender, age, and level of education, marital status, level of income, living, and occupation).

Second part: it concerned with patient's behavior that include (Physical activity, smoking, alcohol drinking, your food contain a small amount of salt, and drink water in sufficient quantity at least 3 liters per day).

Third part: it concerned with medical history of the patient that include (diseases associated with hypertension ,have family history of hypertension ,frequency of physician's follow up , change medication without order ,alternative practices methods are used to reduce the high blood pressure, date of

medically diagnosed with high blood pressure ,date taking medication ,does the medication reduce blood pressure ,highest reading of pressure ,type of medication used ,do you take your medication regularly ,body mass index).

Fourth part: it contains (30) items which are rated according to know (3), not sure (2), Not know (1) score, related to the patient's knowledge about hypertension and the most important treatments and their uses and methods of giving and alternative methods used to reduce high blood pressure.

Fifth part: it concerned with scale of the patient's adherence to medications that contain from (14) items which are rated according to choice yes or no, correct answer take (2) incorrect (1) score.

Validity: the checklist and had been achieved by 10 experts from different scientific branches having at least 10 years' experience .in their field of work

Reliability of the checklist Items: The reliability had been evaluated through

applying Cronbach's Alpha for (44) items, the results was (0. 74)

Statistical Methods: Statistical programs such as SPSS (Statistical Package for Social Science) version 23 and Excel application were used to analyze the data through descriptive data analysis that included frequencies, percentages, in addition to inferential data analysis.

Results

Table (1): shows that the high percent (70%) of the study sample are males more than females, and 62% of them are at age group (48 and above) years old, the mean and standard deviation of patients was(50±8.7) and 26% of them illiterate , all of them was married (100%) , and 54% of their monthly income were barely sufficient,70% of them living urban area, and 28% of them were free-business, and 30% of them were housewives.

Table (1): Distribution of the Study Sample by Socio-demographic Characteristics No=50

Variables	Classification	F.	%
Gender	Males	35	70.0
	Females	15	30.0
Age group	28-37 year	5	10.0
	38-47 year	14	28.0
	48 and above	31	62.0
	Mean ± SD	50 ± 8.7	
Level of Education	Don't Read and Write	13	26.0
	Read and write	12	24.0
	Primary school	8	16.0
	Secondary school	12	24.0
	Institute	1	2.0
	College	3	6.0
	Postgraduate	1	2.0
Marital Status	Married	50	100.0
Monthly Income	Sufficient	8	16.0
	Barely sufficient	27	54.0
	Insufficient	15	30.0
Residency	Rural	9	18.0
	Urban	35	70.0
	Suburban	6	12.0
Occupation	Employee	7	14.0
	Free business	14	28.0
	Retired	9	18.0
	Housewife	15	30.0
	Student	1	2.0
	Un employed	4	8.0

While, Table (2) shows that 86% of subject are physically in active and the remaining 14% are physically active , (18%) of the smoking patients in a present study was still smoking, all of

them (100%) do not drink alcohol, 66% of the study sample eating food with small amount of salt, and half of them (50%) drinks' water in sufficient quantity at least 3 liters per day.

Table (2): Distribution of the Study Sample by Health Behaviors
No=50

Variables	Classification	F.	%
Physical activity	do exercise for 30 minutes per day or higher	1	2.0
	do some exercise lower than 30 minutes per day	6	12.0
	can't do exercise	43	86.0
Smoking	Still smoking	9	18.0
	Ex-smoker	13	26.0
	Never smoking	28	56.0
Alcohol Drinking	Yes	0	0.0
	No	50	100.0
Does your food contain a small amount of salt?	Yes	33	66.0
	No	17	34.0
Do you drink water in sufficient quantity at least 3 liters per day?	Yes	25	50.0
	No	25	50.0

However, Table (3): represent that **46%** of the study sample was medically diagnosed as hypertension since (1-5) years, most of their high blood pressure was associated with heart's disease which of **40%**, **72%** of the study sample have a family history of hypertension, according to patients physician's follow up the result represent that **66%** of them not doing follow up, **92%** of the study sample was change the treatment by consult a doctor, **38%** of them used lemonade as an assistant methods to reduce

the high blood pressure, **54%** of them was have medication since (1-5) years, **98%** of the study sample who used medication for decrease level of blood pressure was effectives on reducing the high level of reading, **76%** of the study sample their blood pressure reading reached to (140-180 mm/Hg) as a systolic and from (100-120 mm/Hg) as diastolic, **38%** of them used capoten to maintain the blood pressure, and **42%** of them was a normal weight.

Table (3): Distribution of the Study Sample by Medical History No=50

No	Variables	Classification	Freq.	%
1	Duration of medically diagnosis of hypertension?	1-5 years	23	46.0
		6-11 years	13	26.0
		12-17 years	11	22.0
		18-23 years	1	2.0
		24-29 years	2	4.0
2	High blood pressure associated with disease	Diabetic mellitus	16	32.0
		Herat disease	20	40.0
		No	14	28.0
3	Have family history of hypertension	Yes	36	72.0
		No	14	28.0
4	Frequency of physician's follow up	No visit	33	66.0
		One time every six months	0.0	0.0
		One time every three months	4	8.0
		One time every month	10	20.0
		One or more times every two weeks	3	6.0
5	How to change treatment	By self	4	8.0
		Consult a doctor	46	92.0
6	What are the alternative behaviors methods are used to reduce the high blood pressure	Lemonade	19	38.0
		Bananas	5	10.0
		Ginger	5	10.0
		Nothing	21	42.0
7	How long have you been taking treatment?	1-5 years	27	54.0
		6-11 years	12	24.0
		12-17 years	7	14.0
		18-23 years	2	4.0
		24-29 years	2	4.0
8	Does the medication of blood pressure effective?	Yes	49	98.0
		No	1	2.0
9	Highest reading of pressure?	140-180/100-120 mm/Hg	38	76.0
		185-215/ 125-145 mm/Hg	12	24.0
10	Type of medication used	Capoten	19	38.0
		Amlodipine	12	24.0
		Atenolol	4	8.0
		Losartan	5	10.0
		Atacand	4	8.0
		Lisinopril	6	12.0
11	Body mass index (BMI)	Underweight = <18.5	0.0	0.0
		Normal weight = 18.5–24.9	21	42.0
		Overweight = 25–29.9	20	40.0
		Obesity = BMI of 30 or greater	9	18.0

Also, Table (4): shows the patients adherence for medication of hypertension at pre-test which of 58.7% of them was not adherence to medication and 41.3% of them adherence to medication

Table (4): Patients Adherence for Medication of Hypertension at pretest

No.	Items of adherence	Not Adherence		adherence	
		F	%	F	%
1	Do you forget to take your medication when you are busy	45	90.0	5	10.0
2	Do you forget to take your medication if you are invited to lunch or dinner?	40	80.0	10	20.0
3	Do you forget to take your medication?	45	90.0	5	10.0
4	Do you get late when it comes to buying your medication	33	66.0	17	34.0
5	Do you stop taking your medication if it forbids you from eating certain food that you love because of possible food-medication interaction?	34	68.0	16	32.0
6	Will you stop taking your medication, without your doctor's consultation, if your neighbor/relative took a prescription like yours for a long term and it caused them side effects?	2	4.0	48	96.0
7	Do you stop taking your medication without consulting your doctor if the laboratory tests show improvement during treatment period?	29	58.0	21	42.0
8	Do you stop taking your medication without consulting your doctor if you do not feel better during treatment period?	15	30.0	35	70.0
9	Do you stop taking your medication without consulting your doctor if you feel better during treatment period?	33	66.0	17	34.0
10	Do you decide to stop some of your medications without consulting your doctor if you noticed that you are taking too many medications every day?	1	2.0	48	96.0
11	Do you stop your chronic treatment if you get bored of it?	32	64.0	18	36.0
12	Do you stop taking your medication in case of side effects?	40	80.0	10	20.0
13	Do you stop taking your medication if your insurance does not cover it?	18	36.0	32	64.0
14	Will you stop buying your medication packs if you considered them expensive?	17	34.0	33	66.0
	Total		58.7		41.3

The result of table (5) revealed that the patient's knowledge toward importance of adherence for medication of hypertension at pre-test was moderate level according to total mean which of (1.1%).

Table (5): Patients Knowledge toward importance of adherence for medication of Hypertension at pre-test

No.	Patients knowledge	M.	S.D.	Ass.
1	Hypertension is a major cause of gastrointestinal diseases	1.12	0.32	M
2	Primary blood pressure develops over time	1.12	0.32	M
3	High salt content in the body leads to high blood pressure	1.12	0.32	M
4	Blood pressure is more than 130 \ 90 mm / Hg is normal	1.12	0.32	M
5	Adult patients with diabetes are not at risk for high blood pressure	1.14	0.35	M
6	Age and diabetes mellitus are an unchangeable risk factor for hypertension	1.14	0.35	M
7	Reducing weight, organizing meals, exercising, reducing smoking and drinking alcohol are a risk factor for high blood pressure	1.02	0.14	L
8	there is no obvious cause for Primary hypertension	1.02	0.14	L
9	Renal failure is one of the causes of secondary hypertension	1.04	0.19	L
10	Signs of hypertension are headaches, dizziness, nausea and facial redness	1.02	0.14	L
11	Cholesterol, blood, urine analysis and ECG are essential for the diagnosis of hypertension	1.20	0.40	M
12	Lifestyle change is not considered a therapeutic intervention for hypertension	1.02	0.14	L
13	Garlic can damage the liver and cause bleeding in some patients with hypertension	1.02	0.14	L
14	Exercise, relaxation techniques and reduced fatigue play to reducing hypertension	1.02	0.14	L
15	The patient with hypertension should not change the diet to become better	1.02	0.14	L
16	A patient with high blood pressure should reduce fat, salt, sweets,	1.02	0.14	L
17	Stress is an important factor for treating high blood pressure	1.20	0.40	M
18	Behavioral interference, breathing techniques, relaxation and meditation are important tools to reduce fatigue or stress	1.20	0.40	M
19	Use garlic, omega-3 capsules and natural fiber such as wheat bran to treat many health problems including high blood pressure	1.12	0.32	M
20	Atenolol contributes to reducing the pressure on the heart	1.04	0.19	L
21	Atenolol is used to lower blood pressure	1.04	0.19	L
22	Atenolol is given intravenously only	1.20	0.40	M
23	Capoten is given an hour or two after the meal to absorb the entire treatment	1.24	0.43	M
24	Capoten causes headache, cough, insomnia, dizziness, constant fatigue	1.20	0.40	M
25	Amlodipine is used to treat hypotension and diabetes	1.20	0.40	M
26	The frequent side effects of lisinopril are headache, dizziness, orthostatic hypotension	1.06	0.23	L
27	Lisinopril is used to treat stress in adults and children 6 years of age and above and also to treat left ventricular dysfunction following myocardial infarction	1.06	0.23	L
28	One of the contraindications of Losartan is the hypersensitivity to Losartan	1.02	0.14	L
29	Candesartan is initially given to adults 32 mg once a day.	1.20	0.40	M
30	Patients who are adherence to medications are exposed to damage the organs	1.20	0.40	M
	Total	1.1		M

Low= 1; Middle= 1.1- 1.5; High= 1.6-2

Table (6): Patients Adherences for Medication of Hypertension at Post test

No.	Items of adherence	Not Adherence		adherence	
		F	%	F	%
1	Do you forget to take your medication when you are busy	22	44.0	28	56.0
2	Do you forget to take your medication if you are invited to lunch or dinner?	16	32.0	34	68.0
3	Do you forget to take your medication?	24	48.0	26	52.0
4	Do you get late when it comes to buying your medication	5	10.0	45	90.0
5	Do you stop taking your medication if it forbids you from eating certain food that you love because of possible food-medication interaction?	17	34.0	33	66.0
6	Will you stop taking your medication, without your doctor's consultation, if your neighbor/relative took a prescription like yours for a long term and it caused them side effects?	2	4.0	48	96.0
7	Do you stop taking your medication without consulting your doctor if the laboratory tests show improvement during treatment period?	3	6.0	47	94.0
8	Do you stop taking your medication without consulting your doctor if you do not feel better during treatment period?	2	4.0	48	96.0
9	Do you stop taking your medication without consulting your doctor if you feel better during treatment period?	4	8.0	46	92.0
10	Do you decide to stop some of your medications without consulting your doctor if you noticed that you are taking too many medications every day?	4	8.0	46	92.0
11	Do you stop your chronic treatment if you get bored of it?	23	46.0	27	54.0
12	Do you stop taking your medication in case of side effects?	28	56.0	22	44.0
13	Do you stop taking your medication if your insurance does not cover it?	13	26.0	37	74.0
14	Will you stop buying your medication packs if you considered them expensive?	10	20.0	40	80.0
	Total		24.7%		75.3%

Table (6): represent the patients adherence for medication of hypertension was improved at post instruction program which

as 75.3% of them was compliance for medication uses, and the patients not compliance was reduced to 24.7%.

Table (7): Patients Knowledge toward importance of patient's adherence for medication of Hypertension at post-test

No.	Patients knowledge	M.	S.D.	Ass.
1	Hypertension is a major cause of gastrointestinal diseases	1.90	0.30	H
2	Primary blood pressure develops over time	1.50	0.50	M
3	High salt content in the body leads to high blood pressure	2.00	0.00	H
4	Blood pressure is more than 130 \ 90 mm / Hg is normal	1.96	0.19	H
5	Adult patients with diabetes are not at risk for high blood pressure	1.94	0.23	H
6	Age and diabetes mellitus are an unchangeable risk factor for hypertension	1.58	0.49	M
7	Reducing weight, organizing meals, exercising, reducing smoking and drinking alcohol are a risk factor for high blood pressure	1.98	0.14	H
8	there is no obvious cause for Primary hypertension	1.30	0.46	M
9	Renal failure is one of the causes of secondary hypertension	1.66	0.47	H
10	Signs of hypertension are headaches, dizziness, nausea and facial redness	2.00	0.00	H
11	Cholesterol, blood, urine analysis and ECG are essential for the diagnosis of hypertension	1.92	0.27	H
12	Lifestyle change is not considered a therapeutic intervention for hypertension	1.90	0.30	H
13	Garlic can damage the liver and cause bleeding in some patients with hypertension	1.86	0.35	H
14	Exercise, relaxation techniques and reduced fatigue play in reducing hypertension	2.00	0.00	H
15	The patient with hypertension should not change the diet to become better	1.98	0.14	H
16	A patient with high blood pressure should reduce fat, salt, sweets, and red meat	2.00	0.00	H
17	Stress is an important factor for treating high blood pressure	1.94	0.23	H
18	Breathing techniques, relaxation and meditation are important t to reduce fatigue or stress	1.68	0.47	H
19	Use garlic, omega-3 capsules and natural fiber such as wheat bran to treat many health problems including high blood pressure	1.68	0.47	H
20	Atenolol contributes to reducing the pressure on the heart	1.06	0.23	L
21	Atenolol is used to lower blood pressure	1.08	0.27	L
22	Atenolol is given intravenously only	1.94	0.23	H
23	Capoten is given an hour or two after the meal to absorb the entire treatment	1.36	0.48	M
24	Capoten causes headache, cough, insomnia, dizziness, constant fatigue	1.94	0.23	H
25	Amlodipine is used to treat hypotension and diabetes	1.98	0.14	H
26	The frequent side effects of lisinopril are headache, dizziness, orthostatic hypotension	1.18	0.38	M
27	Lisinopril is used to treat stress in adults and children 6 years of age and above and also to treat left ventricular dysfunction following myocardial infarction	1.10	0.30	M
28	One of the contraindications of Losartan is the hypersensitivity to Losartan	1.14	0.35	M
29	Candesartan is initially given to adults 32 mg once a day.	1.98	0.14	H
30	Patients who are adherence to medications are exposed to damage the key organs such as kidneys or hear	1.98	0.14	H
	Total means	1.71		H

Low= 1; Middle= 1.1- 1.5; High= 1.6-2

Table (7): shows the patient’s knowledge toward importance of patient's adherence for medication of hypertension at post-test was improved their knowledge according to total mean of their responses toward the items of instruction program which of (1.71) (high level).

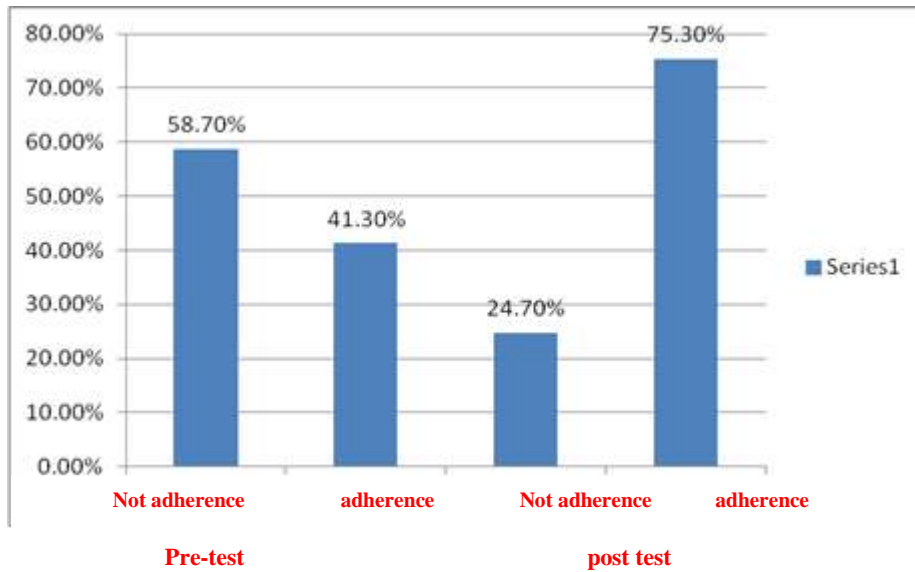


Figure (1): Pre and Post patients Adherence for Medication of Hypertension

Figure (1): present the improvement of patient’s adherence for medication of hypertension between pre and post instruction program

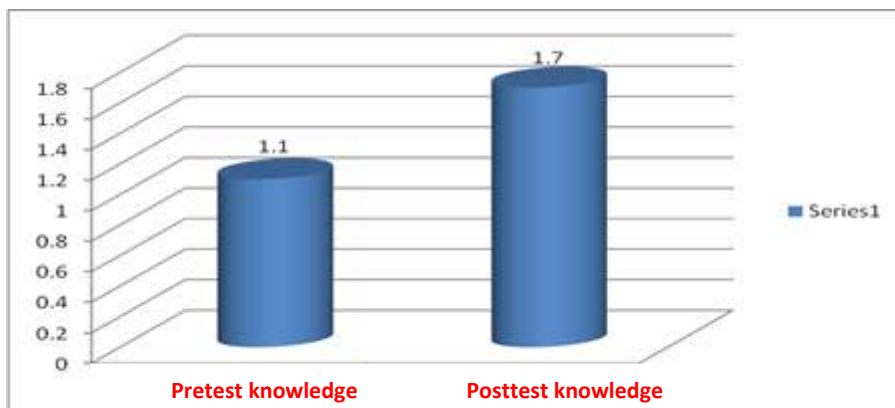


Figure (2): Pre and Post patients knowledge toward important of adherence for Hypertension Medication

Figure (2): present the improvement of patient’s knowledge toward important of their adherence for medication of hypertension between pre and post instruction program.

Table (8): Relationship between the Patients Adherence after Instruction Program and their age, level of education, income, and Residency

Variables		Patients adherence	Age group	Level of education	Income	Residency
Patients adherence	Pearson Correlation	1	.048	.130	-.255	.395**
	Sig. (2-tailed)		.742	.369	.074	.005 H.S.
	N	50	50	50	50	50
Age group	Pearson Correlation	.048	1	-.313*	-.100	.085
	Sig. (2-tailed)	.742		.027 S.	.489	.555
	N	50	50	50	50	50
Level of education	Pearson Correlation	.130	-.313*	1	-.385**	.079
	Sig. (2-tailed)	.369	.027		.006	.585
	N	50	50	50	50	50
Income	Pearson Correlation	-.255	-.100	-.385**	1	-.258
	Sig. (2-tailed)	.074	.489	.006 H.S.		.071
	N	50	50	50	50	50
Residency	Pearson Correlation	.395**	.085	.079	-.258	1
	Sig. (2-tailed)	.005	.555	.585	.071	
	N	50	50	50	50	50

Table (8) presented that there were highly significant relationship between patient's adherence after instruction program and their residency, and there were no significant relationship between patient's adherence and their level of education, age, and income at $p \leq 0.01$ level.

Table 9: Relationship between Patients Adherence and duration of hypertension, other disease, family history, follow up, and type of their drug

Variables		Patients adherence	Duration of hypertension	Other disease	Family history	Follow up	Type of drug
Patients adherence	Pearson Correlation	1	-.010	-.023	.134	.245	.192
	Sig. (2-tailed)		.943	.875	.354	.086	.181
	N	50	50	50	50	50	50
Duration of hypertension	Pearson Correlation	-.010	1	-.350*	-.132	-.135	-.011
	Sig. (2-tailed)	.943		.013 H.S.	.361	.351	.941
	N	50	50	50	50	50	50
Other disease	Pearson Correlation	-.023	-.350*	1	.082	.056	-.024
	Sig. (2-tailed)	.875	.013		.573	.700	.866
	N	50	50	50	50	50	50
Family history	Pearson Correlation	.134	-.132	.082	1	.067	-.207
	Sig. (2-tailed)	.354	.361	.573		.646	.149
	N	50	50	50	50	50	50
Follow up	Pearson Correlation	.245	-.135	.056	.067	1	.048
	Sig. (2-tailed)	.086	.351	.700	.646		.739
	N	50	50	50	50	50	50
Type of drug	Pearson Correlation	.192	-.011	-.024	-.207	.048	1
	Sig. (2-tailed)	.181	.941	.866	.149	.739	
	N	50	50	50	50	50	50

Table (9) presented that there were no significant relationship between patient's adherence and duration of hypertension, other disease, family history, follow up, and type of their drug at $p \leq 0.01$ level, while there were significant relationship between duration of hypertension and other disease at $p \leq 0.01$ level.

Discussion

The socio-demographic characteristics of participate in present study were (70%) of them were males, high percent (62%) of the sample at age group (48 and above) years, the level of education included in the present study was (26%) illiterate, the monthly income barely sufficient (54%), 70% of them

lives in urban area (table 1) **Mekonnen , et al.,(2017)** stated in a cross sectional study to assess the drug adherence among 409 participants from three referral hospitals in Northwest Ethiopia were the mean age of respondents was 54.5 years ,More than three-fourth (78.2%) of the respondents were urban area. two hundred sixty one (63.8%) reported as married, and 105 (25.7%) were government employees⁽¹⁰⁾ .

The present study revealed that (table2) the physical activity that (86%) can't do exercise, lowest percentage of them (18%) still smoking and (26%) ex-smoker smoke, all of the hypertensive patients (100%) not alcohol drinking, (66%) of this group were food contain a small amount of salt. **Serhal , et al.,(2018)** stated in study a cross-sectional

study, including 405 patients, was performed in outpatient cardiology clinics of three hospitals in Beirut. Blood pressure was measured, a questionnaire filled, and sodium intake estimated by a urine test. Logistic regression defined predictors of hypertension control and adherence, showed (71.1%) of patients don't any physical activity, the lowest percentage of them (18%) still smoking and (26%) stopped smoke, (63.4) have low sodium diet⁽¹¹⁾.

The present study revealed that high percent (46%) date of medically diagnosis of hypertension at the (1-5) years, hypertensive patients have another diseases associated with hypertension, most of this diseases in this study were heart diseases that represent (40%) in this sample, (72%) of sample has family history of hypertension, Frequency of physician's follows up in this study (66%) no routine consultation and 92% of this sample change treatment by consult a doctor, the alternative practices methods are used to reduce the high blood pressure in this study (38%) used Lemonade to reduce high blood pressure, while (42%) not use anything, duration since starting treatment (54%) of patients start to take medication range at (1-5) years after disease started and high percentage of this sample 98% were the medications reduce blood pressure for them, (76%) of them represent the highest reading of blood pressure were the diastolic pressure range from 100-120 mm/Hg and systolic pressure range from 140-180 mm/Hg, Type of medication used in this study represent capotien (38%) the highest using, Body mass index was normal weight (18.5-24.9) in the most sample of study (42%) of them(table 3). **Boratas and Kilic**, (2018) explained in their cross-sectional which included 147 hypertensive patients who were admitted to Akdogan Health Center to evaluate

medication adherence in hypertensive patients and to identify the influential factors that duration of hypertension range between (2-6) years (38.1), and visit for hypertension (70.7%) once a month, 72.8 of them not uses any alternative methods to reduce high blood pressure⁽⁴⁾.

The patients adherence for medication of hypertension at pre-test which of (58.7%) of them was not adherence to medication and (41.3%) of them was adherence to medication, while the patients adherence for medication of hypertension was improved at post instruction program which as 75.3% of them was compliance for medication uses, and the patients not compliance was reduced to 24.7%. **Teshome, et al.**,(2017) shows in their study in a cross-sectional study was conducted on 346 participants to assess the adherence to antihypertensive medications and identify associated factors at Debre Tabor General Hospital, northwest Ethiopia, they concluded that (75.1%) of the participants were found to be adherent to their medication therapy⁽⁵⁾.

The results of present study revealed that the patient's knowledge toward importance of adherence for medication of hypertension at pre-test was moderate level, and at post test was high level which of (1.71) **Pirasath, et al.**, (2017) stated in comparative study was carried out at Teaching Hospital Jaffna, from January 2017 to April 2017 to assess the patient's knowledge and awareness about hypertension and adherence to antihypertensive medication among hypertensive patients in a tertiary care center of northern Sri Lanka that 69.9% of patients from 303 patients had adequate knowledge about hypertension⁽¹²⁾.

There were highly significant relationship between patient's adherence after instruction program and their residency, and there were no significant relationship between patient's adherence and their level of education, age, and income at $p \leq 0.01$ level (table 8). **Saleem, et al.**, (2013) assess 385 hypertensive patients who visited outpatient departments in two public hospitals in Quetta City, Pakistan, patient's knowledge of hypertension management and medication adherence that out of 385 patients, 236 (61.3 %) of them had average knowledge about hypertension while 249 (64.7 %) were categorized as poor adherent. No patient was considered as good adherent in the study. Correlation coefficient between total score of knowledge and total adherence was -0.170 ($p < 0.001$), indicating an inverse association between knowledge scores and adherence level ⁽¹³⁾.

The study results find that there were highly significant relationship between the effectiveness of instruction program and patients level of education, and there were no significant relationship between effectiveness of instruction program and their patient's residency, duration of hypertension, family history, and follow up at $p \leq 0.01$ level (table 10). **Saleem, et al.**, (2011) explain in their study a non-clinical randomized control trial was conducted whereby participants received an educational intervention through hospital pharmacists. Hypertension knowledge, medication adherence and health-related quality of life were measured by means of self-administered questionnaires that three hundred and eighty-five hypertensive patients were randomly assigned 192 in the control group and 193 in the intervention group) they presented that there were . no significant differences were observed in either group for age, gender, income, locality, education, occupation or duration of disease. And they

found, that increase in the participants' levels of knowledge about hypertension and medication adherence among the interventional group after completing the intervention. Significantly lower systolic and diastolic blood pressure levels were also observed among the interventional group after completion of the intervention. The interventional group, however, reported decreased yet significant health-related quality of life at the end of the interventional program ⁽¹⁵⁾.

The present study concluded:

- 1-The instructional program had positive effect on patient's knowledge.
- 2- Patients in the study demonstrated significant changes in their adherence for medication between pre and the post test

The study recommends the followings;

- 1-To enhance medication adherence, the clinicians should prescribe the minimal doses but best combinations and government should ensure availability of antihypertensive medications in all government health facilities.
- 2-Health care providers should reinforce their activities to help to improve patients' knowledge level, through focusing on identifying risk factors to hypertension, regular medication intake, good nutrition, physical activity, and changing and informing lifestyles of patients with hypertension.
- 3- Establish specific department in each treating center of hypertension to provide the patients the information about the important of compliance and follow up when patients need to change their drugs.

References

- 1-Ignatavicius ,D.; Workman ,M.; Blair ,M.; Rebar ,C.; and Winkelman ,C.: Medical-Surgical Nursing Patient-Centered Collaborative Care, Elsevier, 8th Edition,(2016),P:2040.
- 2-Chang ,T.; Ritchey ,M.; Ayala ,C.; Durthaler ,J.; and Loustalot ,F.: Use Of Strategies To Improve Antihypertensive Medication Adherence Within United States Outpatient Health Care Practices, Docstyles 2015-2016,Wiley,vol(20),(2018),P:225.
- 3-Tibebu ,A.; Mengistu ,D; and Bulto,L.: Adherence To Prescribed Antihypertensive Medications And Associated Factors For Hypertensive Patients Attending Chronic Follow-Up Units Of Selected Public Hospitals In Addis Ababa, Ethiopia, International Journal Of Health Sciences, 2017, ,Vol(11),P:47.
- 4-Boratas ,S.;and Kilic ,H.: Evaluation Of Medication Adherence In Hypertensive Patients And Influential Factors, Pak J Med Sci,Vol(34),No(4),2018,P:959.
- 5-Teshome ,D.; Bekele ,K.; Habitu ,Y.;and Gelagay ,A.: Medication Adherence And Its Associated Factors Among Hypertensive Patients Attending The Debre Tabor General Hospital, Northwest Ethiopia, Dove Press Journal,Vol(10),2017,P:2.
- 6-Pan ,J.; Lei ,T.; Hu ,B.;and Li ,Q.: Post-Discharge Evaluation Of Medication Adherence And Knowledge Of Hypertension Among Hypertensive Stroke Patients In Northwestern China, Dove Press Journal,Vol(11),2017,P:1916.
- 7-Zhang ,Y.;Li ,X.;Mao ,L.;Zhang ,M.;Li ,K.;Zheng ,Y.;Cui ,W.;and et. al.: Factors Affecting Medication Adherence In Community-Managed Patients With Hypertension Based On The Principal Component Analysis: Evidence From Xinjiang, China, Dove Press Journal,Vol(12),2018,P:804.
- 8-Wu ,J.; Cummings ,D.;Li ,Q.; Hinderliter ,A.; Bosworth ,H.; Tillman ,J., and et. al.: The Effect Of A Practice-Based Multicomponent Intervention That Includes Health Coaching On Medication Adherence And Blood Pressure Control In Rural Primary Care, Wiley,Vol(20),2018,P:758.
- 9-Serhal,R.; Salameh,P.; Wakim,N.; Issa,C.; Kassem,B.; Abou Jaoude,L.; And Saleh,N.: A New Lebanese Medication Adherence Scale: Validation In Lebanese Hypertensive Adults, International Journal Of Hypertension, Vol. 2018,P:4-6.
- 10-Pirasath,S.; Kumanan,T.; And Guruparan,M.: A Study On Knowledge, Awareness, And Medication Adherence In Patients With Hypertension From A Tertiary Care Centre From Northern Sri Lanka, International Journal Of Hypertension, Vol. 2017,P:3-5
- 11-Saleem,F.; Hassali,M.; Shafie,A.; Farooqui,M.; Aljadhay,H.: And Ahmad,F.: Pharmacist Intervention In Improving Hypertension related Knowledge, Treatment Medication Adherence And Health-Related Quality Of Life: A Non-Clinical Randomized Controlled Trial, John Wiley & Sons Ltd ,Vol(18),2013,P:125
- 12-Saleem,F.; Hassali,M.; Shafie,A.; Awad,A.;And Bashir,S.; Association Between Knowledge And Drug Adherence In Patients With Hypertension In Quetta, Pakistan, Tropical Journal Of Pharmaceutical Research,Vol(10),2011,P:1270.

Characteristics of Brillouin Fiber Laser Under Two Different Techniques

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Abstract:

The effect of recycling transmitted Brillouin power (RTBP) ratio on the threshold of the single wavelength Brillouin fiber laser (SWBFL) utilizing a recycling technique (R-Technique) is investigated. Different single mode fiber (SMF) lengths are used as a gain medium for the proposed laser. The RTBP ratio is increased from 20 % to 100 % a steps of 20 % and compared within the conventional technique (C-Technique) for each gain medium length. The laser threshold within R-Technique is enhanced by 48.4 % for gain medium length of 5 km and by 28.29 % for gain medium length of 30 km as compared within the C-Technique. This reduction in the threshold ratio is attributed to the fact that at long SMF (>10 km) the effective gain medium length tends to be approximately constant.

Keywords: single wavelength Brillouin fiber laser, conventional technique, recycling technique

خصائص ليزر بريلوين الليفي تحت تقنيتين مختلفتين

أخلاصة

تم التحقق من تأثير نسبة قدرة بريلوين المدورة على القيمة الحرجة لليزر بريلوين الليفي احادي الطول الموجي باستخدام تقنية التدوير. تم استخدام الياف بصرية احادية النمط باطوال مختلفة كوسط ربحي لليزر المقترح. اخذت نسبة قدرة بريلوين المتكررة المرسله من 20% الى 100% ، بمقدار ثابت 20% ، وقورنت مع التقنية التقليدية لكل طول وسط ربحي. ان القيمة الحرجة لهذا الليزر مع تقنية التدوير تحسنت بقيمة 48.4% لوسط ربحي بطول 5كم و بقيمة 28.29% لوسط ربحي بطول 30كم بالمقارنة مع التقنية التقليدية. بالاضافة الى ذلك، وسط الربح المؤثر يميل للثبات للاطوال اكبر من 10كم. كنتيجة ذلك، لاطوال وسط ربحي اكبر من 10كم، تأثير نسبة قدرة بريلوين المدورة تنخفض و يحدث اشباع في تحسين حد العتبة.

الكلمات المفتاحية: ليزر بريلوين احادي الطول الموجي، التقنية التقليدية، تقنية التدوي

Introduction

The main types of nonlinear scattering within optical fibers are stimulated Brillouin scattering (SBS) and stimulated Raman scattering (SRS) [1]. In optical fiber, the threshold power level for the SBS is quite lower than the SRS. It appears over the generation of a red shift backward Stokes signal that carries the most of pump power, once the input power reached the SBS threshold power level. As a result, the SBS determines the input power level in optical communication systems [1]. In contrast, this phenomenon can be used in numerous optoelectronics applications such as, optical sensors [2,3], optical amplifiers [4,5], single wavelength and multi wavelength laser sources [6–10].

In this context, achieving a lower threshold level is of utmost importance in most applications. Several approaches are proposed to obtain low SBS threshold. For instance, threshold reduction of SBS by Stokes seeds utilizing acousto-optic effect [11], core microstructuration in multifilament core fibers [12] and the bidirectional pumping methods have also been considered, in order to quicken the SBS establishment time [13]. In addition, both of

recycling and laser techniques are proposed to reduce the SBS threshold to 48% [14] and 75% [15], respectively. Furthermore, modeling of SBS has been considered in order to predict the SBS Stokes and pump power along the fiber in conventional [16], recycling [17] and laser [18] technique.

In this paper, the performance of SWBFL within R-Technique is investigated under different RTBP ratios, namely, (20%, 40%, 60%, 80% and 100%) utilizing OptiSystem 10. The simulation results show that, the SBS threshold level depends strongly on RTBP ratio. In addition, the effective gain medium tends to be approximately constant for long SMF (>10 km). As a result, for longer gain medium length both of the RTBP ratio effect is reduced and threshold improvement is saturated.

Simulation Setup

The simulation setup of the SWBFL utilizing both of the conventional and recycling technique is illustrated in Fig.1 A and B, respectively. The Brillouin pump power (BPP) is obtained from a laser source (LS) with a line width of 10 MHz, wavelength of 1550 nm and maximum power of 24 mW. In this setup, the BPP is injected through port 1 of the optical circulator (OC1) then

propagated through a 3-dB coupler before inserting into the gain medium, and the laser

architecture operates as an SWBFL with C-Technique.

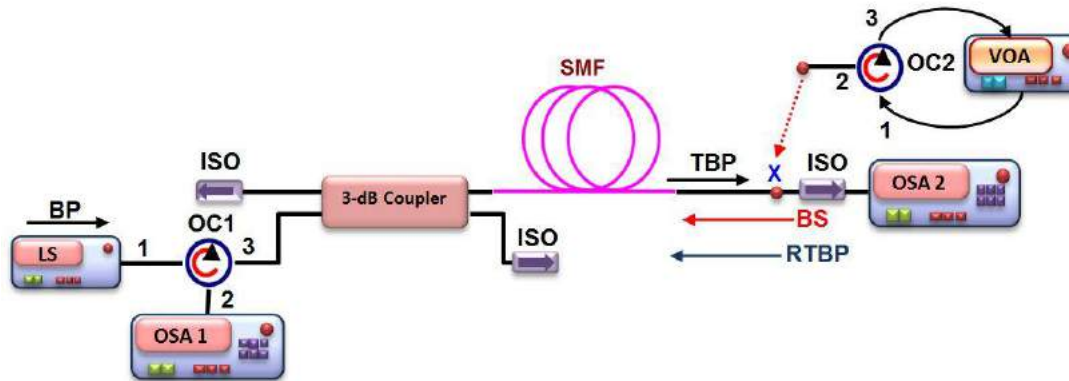


Figure 1: Simulation setup of SWBFL (configuration A) conventional technique; and (configuration B) recycling technique, with optical circulator and VOA connected to point X.

In order to reinsert the TBP inside the gain medium, another optical circulator (OC2) is connected to point X through port 2. In addition, a variable optical attenuator (VOA) is connected between port 3 and port 1 in order to control the ratio of the RTBP as depicted in Fig.1 B. The laser output power (Stokes signal) is measured through port 3 of the (OC1) via an optical spectrum analyzer OSA1 for both configurations, while the RTBP and TBP are measured via OSA1 and OSA2, respectively.

Results and Discussion

The behavior of both the Stokes power and TBP versus the BPP utilizing C-Technique are depicted in Fig.2 (a) and (b) for gain

medium length 5 km and 30 km, respectively. In general, for both gain medium lengths, the increment in the pump power led to increase the TBP linearly, while the Stokes power is still close to zero. Then after a certain pump power (SBS threshold) the behavior of both the Stokes power and TBP are changed, the Stokes power is increased rapidly while the TBP is closed to saturate. This can be attributed as follow; at first the pump power was lower than the SBS threshold and the optical system work within the spontaneous Brillouin scattering. While the laser (Stokes signal) is appeared when the pump power is becoming greater than the SBS threshold as well as those caused the saturation in the TBP. In addition, when the gain medium

length is increased from 5 km to 30 km, the laser threshold power is decreased from 18.76 mW to 6.19 mW, respectively. While the laser output power has increased from 4.4 mW for SMF of 5 km to 17,12 mW for SMF of 30 km at pump power of 24 mW.

The effect of the RTBP ratio on the proposed laser performance is investigated for different gain medium length. The R-Technique are compared with the C-Technique results on the same gain medium length. The results of 5 km and 30 km are illustrated in Figure (a) and (b), respectively. According to the results in Figure (a), the laser threshold within RTBP ratio of 0 % C-Technique and 100 % R-Technique is about 18.76 mW and 9.681 mW, respectively. This represents a 48.4 % improvement in the laser threshold, as well as shows good agreement with the results in [14][15], which confirm

the validity of our model. For gain medium length of 30 km as depicted in Figure b), the laser threshold level is enhanced from 6.19 mW within C-Technique to 4.43 mW within the R-Technique, which represents a 28.29 % improvement in the laser threshold.

In order to clarify the effect of the RTBP ratio on the laser threshold for different gain medium length, the threshold power as a function of the RTBP ratio is depicted in Figure(4). The results show that the improvement in the threshold level of the shorter gain medium length is higher than it in the longer gain medium length as well as this improvement is saturates at gain medium length (>10 km). This can be attributed to the fact that, the effective gain medium length tends to be constant (approximately $1/\alpha$), as well as this improvement boundary shows good agreement with the results in [14,15].

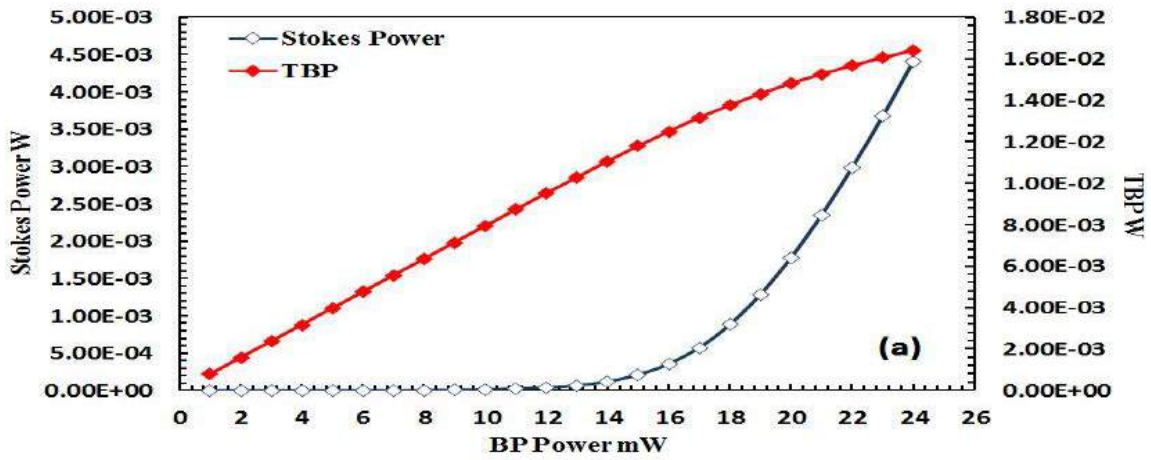


Figure 2-a: Stokes Power and TBP versus BPP for gain medium length: (a) 5 km, (b) 30 km.

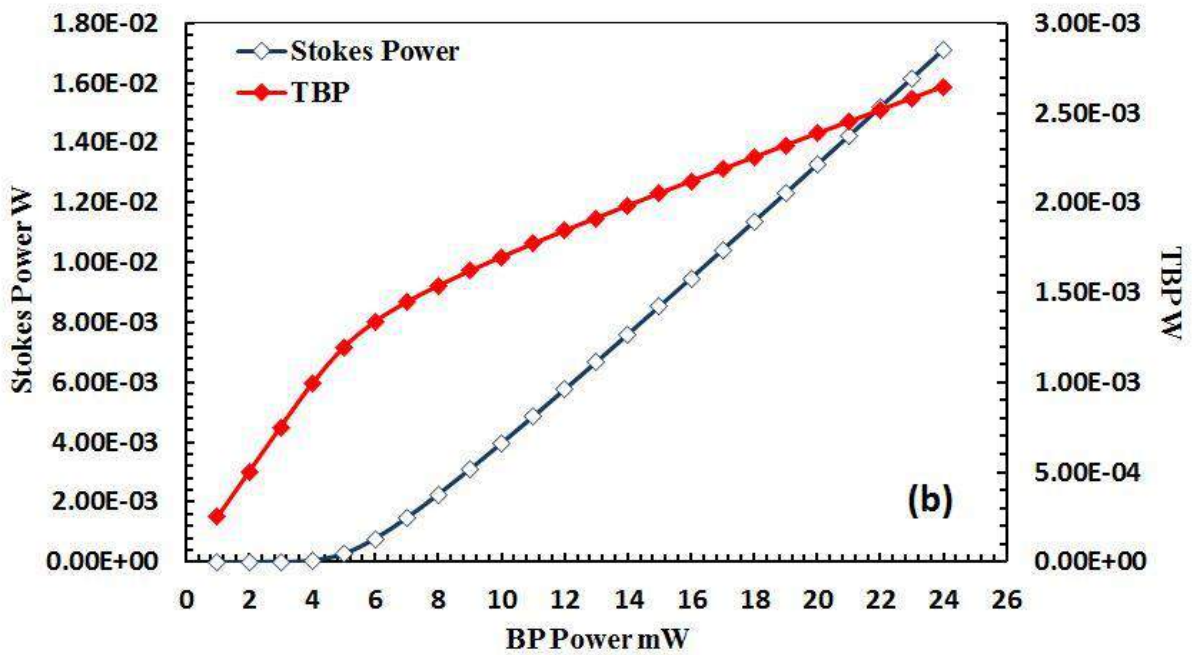


Figure 3-b: Stokes Power and TBP versus BPP for gain medium length: (a) 5 km, (b) 30 km.

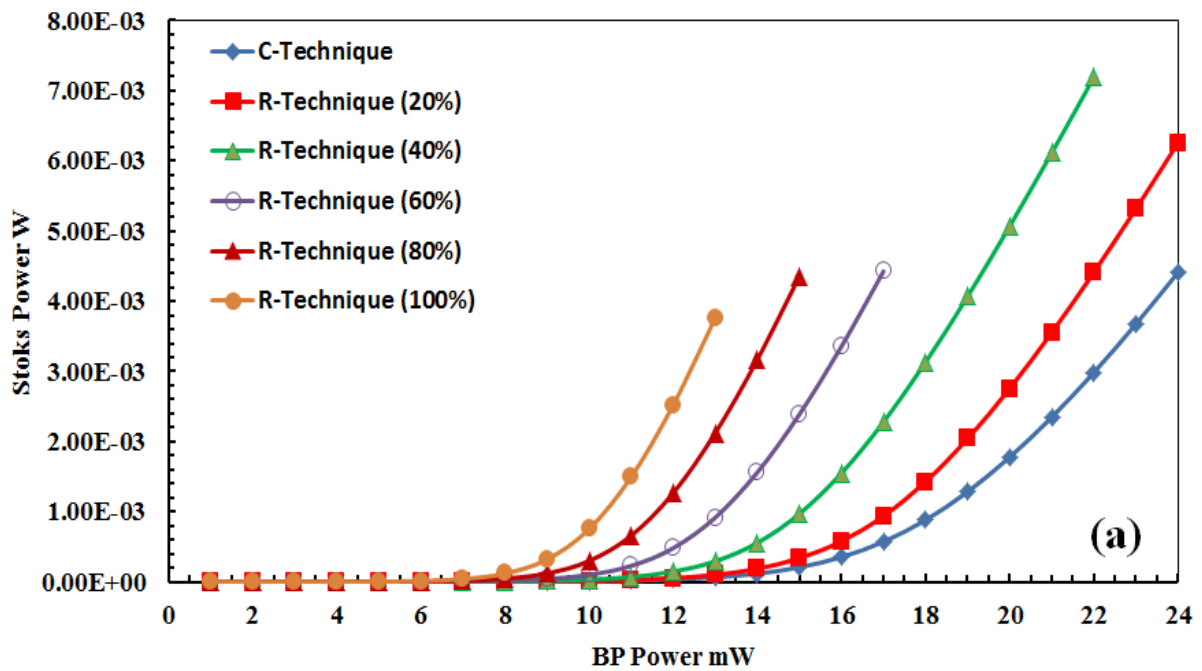


Figure 3-a: Stokes power versus BP power for gain medium length: (a) 5 km SMF, (b) 30 km

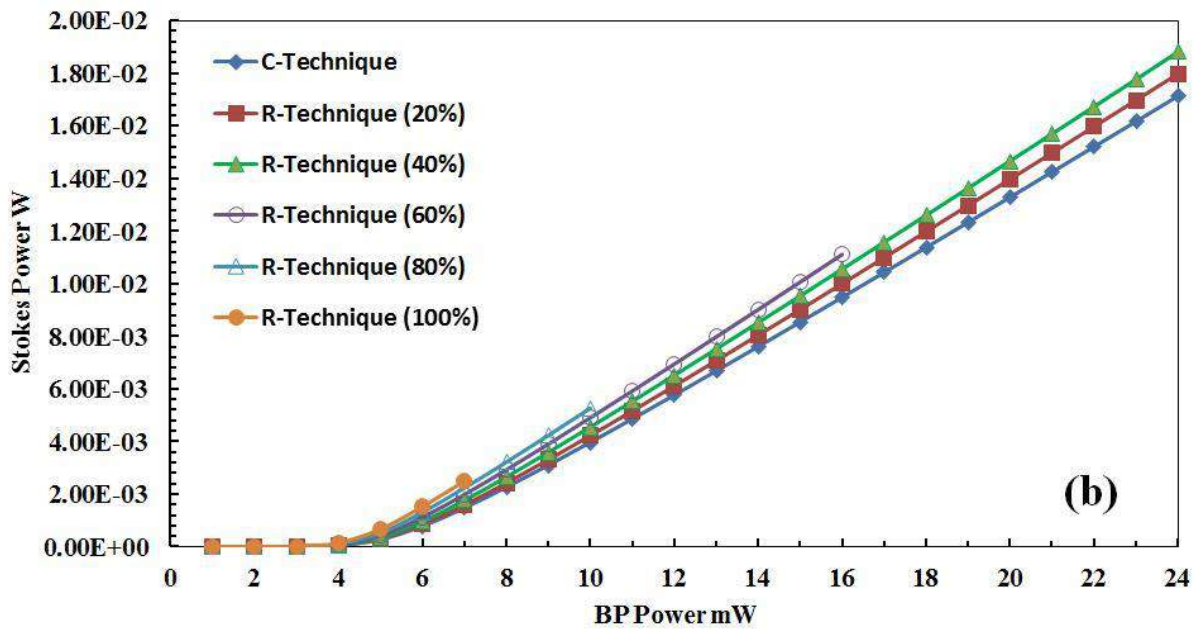


Figure 3-b: Stokes power versus BP power for gain medium length: (a) 5 km SMF, (b) 30 km SMF.

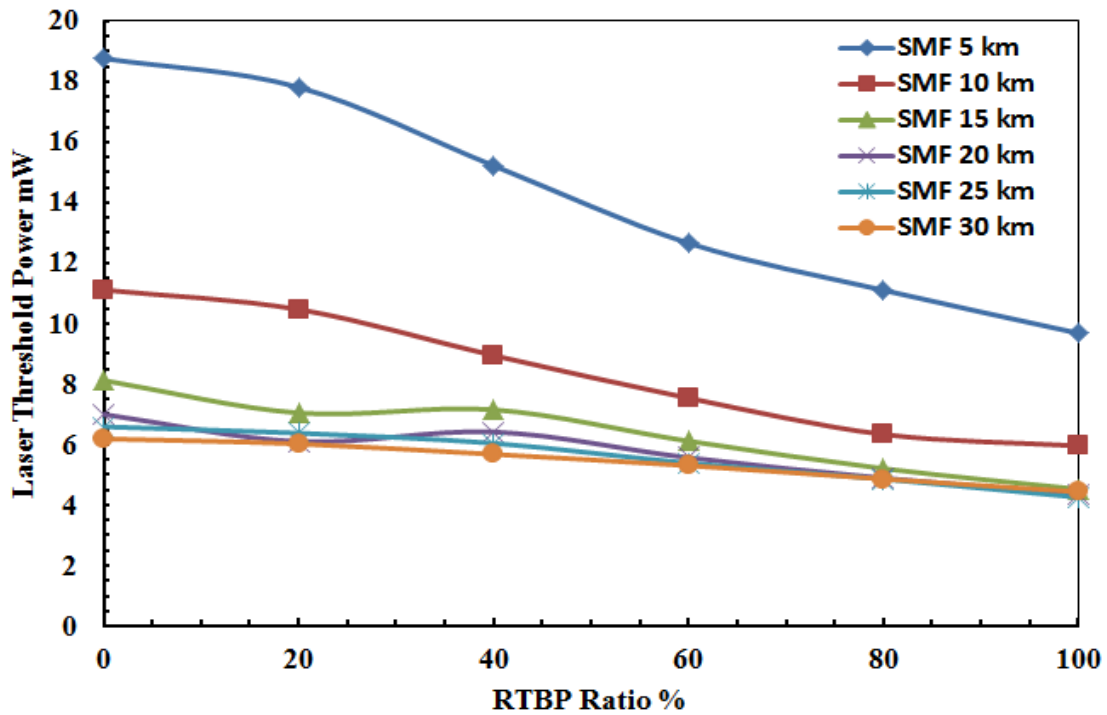


Figure 4: Laser threshold power versus the RTBP ratio %.

Conclusions

We theoretically investigated the effect of the RTBP ratio on the threshold of SWBFL via recycling technique. The laser threshold depends strongly on the RTBP ratio, and improved as the RTBP ratio is increased. The effect of the RTBP ratio on the laser threshold is reduced as the gain medium is increased, as well as the threshold improvement is saturated for long gain medium length (>10 km).

References

- [1] R. G. Smith, "Optical power handling capacity of low loss optical fibers as determined by stimulated Raman and Brillouin scattering," *Appl. Opt.*, vol. 11, no. 11, pp. 2489–94, 1972.
- [2] F. Ravet, X. Bao, Y. Li, Q. Yu, A. Yale, V. P. Kalosha, and L. Chen, "Signal processing technique for distributed Brillouin sensing at centimeter spatial resolution," *J. Light. Technol.*, vol. 25, no. 11, pp. 3610–3618, 2007.
- [3] A. Minardo, R. Bernini, and L. Zeni, "Stimulated Brillouin scattering

- modeling for high-resolution, time-domain distributed sensing,” *Opt. Express*, vol. 15, no. 16, pp. 10397–10407, 2007.
- [4] S. J. Strutz, K. J. Williams, and R. D. Esman, “Polarization-Maintaining Hybrid Erbium – Brillouin Amplifier for High-Power Low-Noise Sources,” *IEEE Photonics Technol. Lett.*, vol. 13, no. 9, pp. 936–938, 2001.
- [5] L. Xing, L. Zhan, S. Luo, and Y. Xia, “High-Power Low-Noise Fiber Brillouin Amplifier for Tunable Slow-Light Delay Buffer,” *IEEE J. Quantum Electron.*, vol. 44, no. 12, pp. 1133–1138, 2008.
- [6] M. S. A. Hurera, N. A. M. A. Hambali, N. Roshidah, M. S. Zainudin, A. Z. Malek, M. H. A. Wahid, S. S. M. Isa, and G. C. Seong, “L-band single-wavelength Brillouin fiber laser utilizing ring cavity,” in *2nd International Conference on Electronic Design, ICED*, 2014, pp. 297–300.
- [7] T. F. Al-Mashhadani, M. H. Al-Mansoori, M. Z. Jamaludin, F. Abdullah, A. K. Abass, and N. I. M. Rawi, “Tunable multiwavelength L-band Brillouin-Erbium fiber laser utilizing passive EDF absorber section,” *Opt. Fiber Technol.*, vol. 19, no. 6, pp. 593–597, Dec. 2013.
- [8] T. F. Al-Mashhadani, M. Z. Jamaludin, M. H. A.- Mansoori, F. Abdullah, and A. K. Abass, “Impact of Booster Section Length on the Performance of Linear Cavity Brillouin-Erbium Fiber Laser,” *J. Opt. Soc. Korea*, vol. 18, no. 2, pp. 162–166, Apr. 2014.
- [9] A. K. Abass, M. H. Al-Mansoori, M. Z. Jamaludin, F. Abdullah, and T. F. Al-Mashhadani, “Characteristics of multiwavelength L-band Brillouin-Raman fiber laser under forward and backward pumped environment,” *Appl. Opt.*, vol. 52, no. 16, pp. 3764–3769, Jun. 2013.
- [10] A. K. Abass, M. H. Al-Mansoori, M. Z. Jamaludin, F. Abdullah, T. F. Al-Mashhadani, and M. H. Ali, “Enhancing performance of multiwavelength Brillouin–Raman fiber laser by capturing residual pump power,” *Appl. Opt.*, vol. 53, no. 23, pp. 5187–5192, Aug. 2014.
- [11] Y. Zhu, Q. Lu, S. Guo, X. Xu, and X. Cheng, “Threshold reduction of stimulated Brillouin scattering by Stokes seeds via acousto-optic effect,” *Opt. Commun.*, vol. 281, no. 17, pp. 4523–4525, Sep. 2008.
- [12] G. Canat, S. Jetschke, L. Lombard, S. Unger, P. Bourdon, J. Kirchhof, V. Jolivet, and O. Vasseur, “Stimulated Brillouin threshold reduction by core microstructuration in multifilament core fibers,” in *Lasers and Electro-Optics and the European Quantum Electronics Conference. CLEO Europe - EQEC*, 2009, pp. 1–1.
- [13] K. Inoue, “Brillouin threshold in an optical fiber with bidirectional pump lights,” *Opt. Commun.*, vol. 120, no. 1–2, pp. 34–38, 1995.
- [14] M. Ajiya, M. A. Mahdi, M. H. Al-Mansoori, Y. G. Shee, S. Hitam, and M. Mokhtar, “Reduction of stimulated Brillouin scattering threshold through pump recycling technique,” *Laser Phys. Lett.*, vol. 6, no. 7, pp. 535–538, Jul. 2009.
- [15] T. F. Al-Mashhadani, M. H. Al-Mansoori, M. Z. Jamaludin, F. Abdullah, and A. K. Abass, “Influence of a bidirectional recycling residual pump on the Stokes signal characteristics of a linear cavity Brillouin fiber laser,” *Laser Phys.*,

- vol. 23, no. 8, p. 085111, 2013.
- [16] Z. Ou, J. Li, L. Zhang, Z. Dai, and Y. Liu, "An approximate analytic solution of the steady state Brillouin scattering in single mode optical fiber without neglecting the attenuation coefficient," *Opt. Commun.*, vol. 282, no. 18, pp. 3812–3816, Sep. 2009.
- [17] H. A. Al-Asadi, M. H. Al-Mansoori, M. Ajiya, S. Hitam, M. I. Saripan, and M. A. Mahdi, "Effects of pump recycling technique on stimulated Brillouin scattering threshold: a theoretical model," *Opt. Express*, vol. 18, no. 21, pp. 22339–47, Oct. 2010.
- [18] T. F. Al-Mashhadani, M. Z. Jamaludin, M. H. Al-Mansoori, F. Abdullah, and A. K. Abass, "Modeling of Multi-Wavelength Brillouin Fiber Laser Based on Analytical Solutions in a Linear Cavity," *Fiber Integr. Opt.*, vol. 31, no. 6, pp. 383–396, 2012.

Simulation of Single Phase SPWM Full Bridge Inverter Using Different Control Techniques

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Abstract— this paper presents two control algorithms using two different feedback controls for a SPWM single phase inverter to obtain pure 50 Hz output sinusoidal voltage, the plan is to employ each controller with its particular features for controlling the SPWM single phase inverter. The first technique is done with a traditional Proportional-Integral (PI) controller and the second technique is done with the Fuzzy Logic Control (FLC), the efficiency of the offered scheme is tested under various operating conditions. The offered scheme has shown good performance regarding output voltage distortion, very good voltage chasing even under load inconstancy. This system is used with grid-solar energy systems; induction heating and uninterruptible power supplies (UPS).

Keyword- : Membership functions M.F, Fuzzy Logic Controller (FLC), Sinusoidal Pulse Width Modulation (SPWM), inverters, Total Harmonic Distortion (THD).

محاكاة عاكس القنطرة المتكاملة ذي الطور الواحد باستخدام تقنيات تحكم مختلفة

احكام كامل ناجي

قسم هندسة تقنيات القدرة الكهربائية -الكلية التقنية الهندسية الكهربائية

الجامعة التقنية الوسطى

الخلاصة:

في هذا البحث تم استخدام تقنيتين للتحكم بعرض النبضة الجيبية للعاكس ذو الطور الواحد للحصول على فولتية خرج ذات موجه جيبية بتردد 50 هيرتز، التقنيه الأولى هي عباره عن تقنيه تقليديه حيث تم استخدام طريقة تحكم (PI) و أما في التقنيه الثانيه فقد تم استخدام نظام التحكم المضرب (FLC) , حيث تم استخدام كل تقنيه على حده للتحكم بنفس دائرة العاكس ومراقبة سلوك الدائره والموجات الخارجه منها من ناحية التشوهات في موجة الفولتية الخارجه واستجابة الدائره للتغير المفاجئ للحمل وتعقب المنظومه لأشارة المرجع وبالتالي معرفة أذا كانت المنظومه تستجيب الى الأوامر التي يتم أداخلها لتعقب أشارات المرجع. تستخدم دائرة العاكس في العديد من التطبيقات مثل تطبيقات الطاقه المتجدده, مزود الطاقه اللامنقطعة (UPS) , و التسخين بالتيارات الحثيه.

I. Introduction

Inverters convert DC power to AC power by switching the input DC voltage in a pre-determined succession to produce AC output voltage. There are a wide range of power inverters available, though power handling capability is still a constraint for many applications [1]. A voltage source inverter (VSI) is a device which has fixed DC voltage supply. VSI inverters are easy to control than that of current source inverter [2]. VSI are mostly used in, uninterruptible power supplies (UPSs), adjustable speed drives (ASDs), static VAR compensators, voltage compensators, flexible AC transmission systems (FACTSs) and other industrial applications [3]. For economic and good performance purposes, VSI's are predominantly preferred over current source inverter (CSI). The transistors used in the bridge circuit of the inverter such as IGBTs, MOSFETs etc should have freewheeling diode built in as a part of entire integrated device convenient for voltage source inverter. For sinusoidal AC voltage, the phase, magnitude and frequency should be controllable. VSIs are at the heart of applications that demand to produce AC output voltage from a DC source voltage. So, it is important that VSI design should be efficient and robust, as inverter failure may cause damage in many production processes [4].

II. PI Controller

Proportional integral (PI) controllers have been exceedingly applied in industrial applications because of their ease of design, simplicity, efficiency, and low cost. There is a several of various method to apply a PI controller. Since various control systems that depend on the PI controller as the closed loop strategy, it has shown a good performance so the PI controllers are still used in industrial applications.

The mathematical equation of PI controller is:

$$u(t) = K_p e(t) + K_i \int_0^t e(\tau) d\tau \dots \dots (1)$$

Where the error signal is symbolized by e ($e = r - y$), and the proportional and integral signals are symbolized by K_p and K_i respectively, control signal is symbolized by u , the reference signal (the set point) is symbolized by r , So considering the summation of the two parts, the proportional part and the integral part, where the proportional part is only proportionate with error signal and the integral part which is proportionate with integral of the error signal, the proportional part K_p will drive any variation in the output signal that proportionate to the present error, The integral part K_i proportionates with both the magnitude of the error signal and the interval of the error signal. If added with the first part (proportional part), then it will accelerate the motion of the process across the set point and particularly minimizes or remove the residual of steady-state error that may appear with the proportional controller only [5]. Figure 1 shows the block diagram of PI controller.

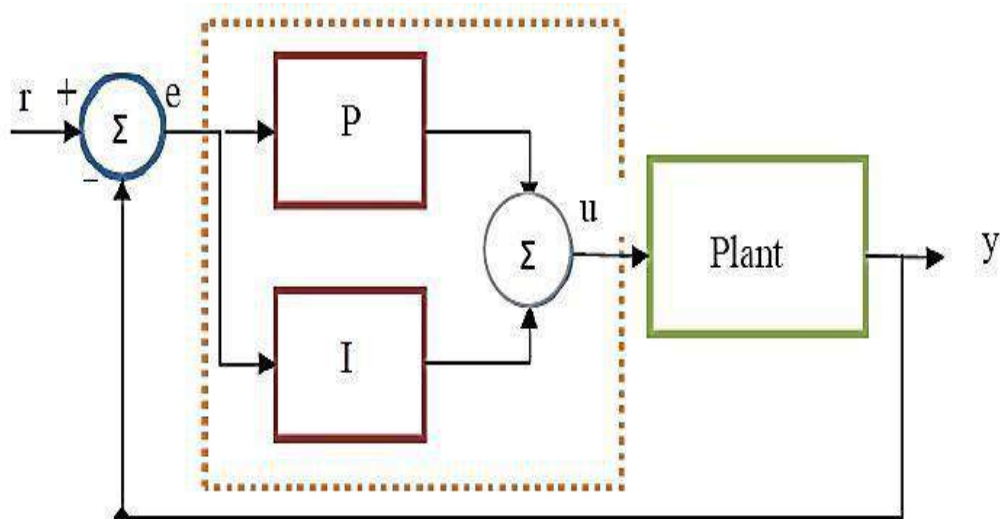


Fig.1 PI controller block diagram

The PI controller is designed by properly choosing K_i and K_p , The result suppose to have a a small overshoot, small rise time, a zero steady-state error and a small settling time. Such a response is surely almost typical. The difficulty in attaining such a response is the tuning (or selection) of the appropriate K_p and K_i , for any specific system under control. choosing the suitable K_p and K_i , depending on the experience of the design engineer, the suitable values of the parameters K_p and K_i of the PI controller may be chosen via trial and error.

III. The Fuzzy Logic Controller (FLC):

The fuzzy logic concept was introduced for the first time in 1965 and was discover by Lofti A. Zadeh. When the complexity of any system increases, it may become difficult to describe the behavior of the system, eventually coming to a complexity side where, as known the fuzzy logic technique has born in humans and this technique was the only technique so that a human could understand various problems. Theoretically, the fuzzy logic depends on the creation functions of

membership. Dr. Zadeh, offered the notion of membership set to make appropriate resolve if the unbelieved occurs [6].

Control field is the master field of application in FLC, fuzzy logic control include complex aircraft machine, fans, train guidance, generator control, etc. The fundamental concept of FLC is to employ the experience and knowledge of the expert engineer for designing a system that controls a particular application process whose relevance between input and output is given by table of fuzzy control rules that utilize linguistic variables as an alternative of a dynamic model that possibly advanced. Fuzzy control rules are basically in the sort of "if- then" statment. In control system that uses fuzzy rules because of its linguistic variables which best employed for controller designing. The main parts of fuzzy controller are: fuzzification, fuzzy knowledge base, an inference components, the fuzzy rule base and a defuzzification. It includes of membership functions that assign the input variables to the fuzzy rule base as well as the output variable of the plant under control. The inference engine is considered as the head of the

FLC system, and it has the capability to mimic the human resolution by implementing sacrificial

reasoning to get a desirable strategy for controlling [6].

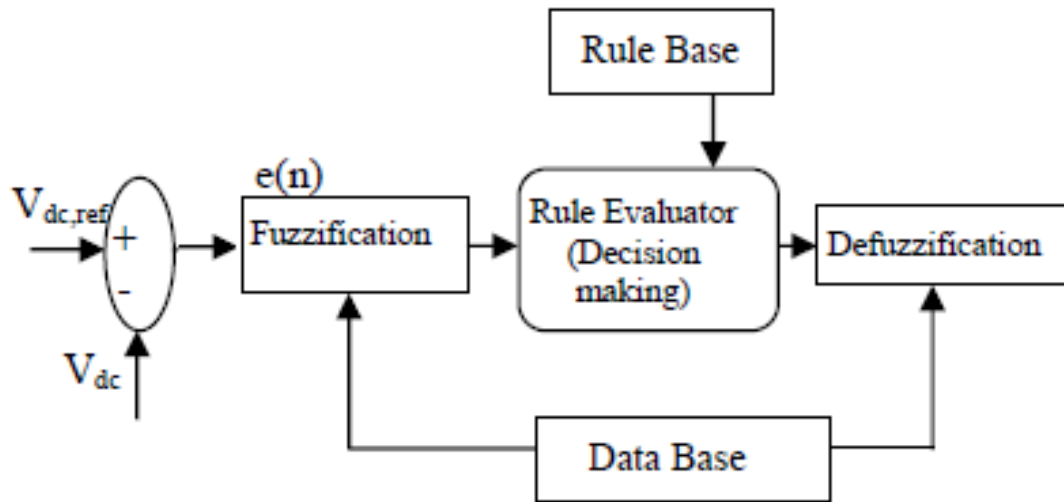


Fig.2 FLC system structure.

FLC is a set of several processes and procedures that are shown in Figure 2, It means a FLC involves several processes which are elaborate below.

1. The Fuzzification:

Fuzzy logic employs linguistic variables as an alternative of numeral variables. In control applications, the error that measured between the reference signal and the actual output signal could take one of the following linguistic variables "Positive Big (PB), Positive Medium (PM), Positive Small (PS), Zero (ZE), Negative Small (NS), Negative Medium (NM), Negative Big (NB)". a triangular membership functions are utilized in fuzzification procedure.

2. The Rule Elevator:

Basic controllers such as PI or PID controllers have a gain of control that are expressed in crisp values (numerical values). Fuzzy logic method does not used crisp values but uses linguistic variables instead. The linguistic variables for the error signal is represented as error input signal e_n

and the fuzzy output is symbolize in the form of membership functions with a correction degree. The basic fuzzy set operations which are necessary for rules evaluation are AND (\cap), OR (\cup) and NOT ($-$).

3. The defuzzification:

The fuzzy logic produces the desired output in the form of a linguistic variable, according to the real world demands, linguistic variables must be transformed to crisp value. Therefore, the options of defuzzification are plentiful.

4. The data base:

The action of database is to store the definition of the membership function that related to both the defuzzifier and the fuzzifier. Storage arrangement is an arrangement between the available memory and the microprocessor step of the digital controller chip [7].

IV. FLC using SPWM single phase Inverter.

The fuzzy logic controller has been designed using the Matlab software utilizing the fuzzy logic toolbox [8]. This package will enable the designer to create the input membership functions, output membership functions and fuzzy control rules. There are two inputs will be applied to the fuzzy logic controller (FLC). The first one is an error signal (V_e) and the second is the change of error signal (V_{ce}), these two inputs will be multiplexed and then fed to the fuzzy controller which produce a signal with a degree of correction. This degree of correctness will then be compared with one of the output variables which have the following linguistic variables Negative Big (NB), Negative

Medium (NM), Negative Small (NS), Zero (Z), Positive Small (PS), Positive Medium (PM), Positive Big (PB). Then the fuzzy logic controller (FLC) output is multiplied with modulation signal with a certain amplitude and then compared with triangular signal to produce the gating pulses to the inverter bridge. Seven membership functions in fuzzy logic controller (FLC) have been assigned for both input and output. A triangular membership functions are utilized to illustrate the variable related to the input and output. There will be 49 input linguistic variables because there is two input variables and each input variable have seven linguistic variables.

The rules table will link every of the 49 of the input pairs to the output respective label that is given in Table1.

$V_e \backslash V_{ce}$	NB	NM	NS	Z	PS	PM	PB
NB	NB	NB	NB	NB	NM	NS	Z
NM	NB	NB	NB	NM	NS	Z	PS
NS	NB	NB	NM	NS	Z	PS	PM
Z	NB	NM	NS	Z	PS	PM	PB
PS	NM	NS	Z	PS	PM	PB	PB
PM	NS	Z	PS	PM	PB	PB	PB
PB	Z	PS	PM	PB	PB	PB	PB

Table 1: Membership Rules

V. Simulation of PI Controller Single Phase Inverter:

Figure 3 shows the simulation circuit using MATLAB/SIMULINK of single phase full bridge inverter which consists of 220V DC source, four IGBT transistors, LC filter of 25 mH and 0.25 μ F respectively, resistive load of 400 ohm and PI controller with parameters of $K_p=35$ and $K_i=70$. The gains of PI controller are tuned so that the the bridge of the inverter.

output voltage of the inverter is obtained with fast dynamic response. The root mean square block is added after the output sinusoidal voltage signal to obtain RMS voltage value and then scaled down and compared with the reference signal to obtain the error signal which is fed to the PI controller to which produce the correction signal. This correction signal will be multiplied with reference signal and then compared with triangular signal of 10 KHz to produce the gating signals that is fed to

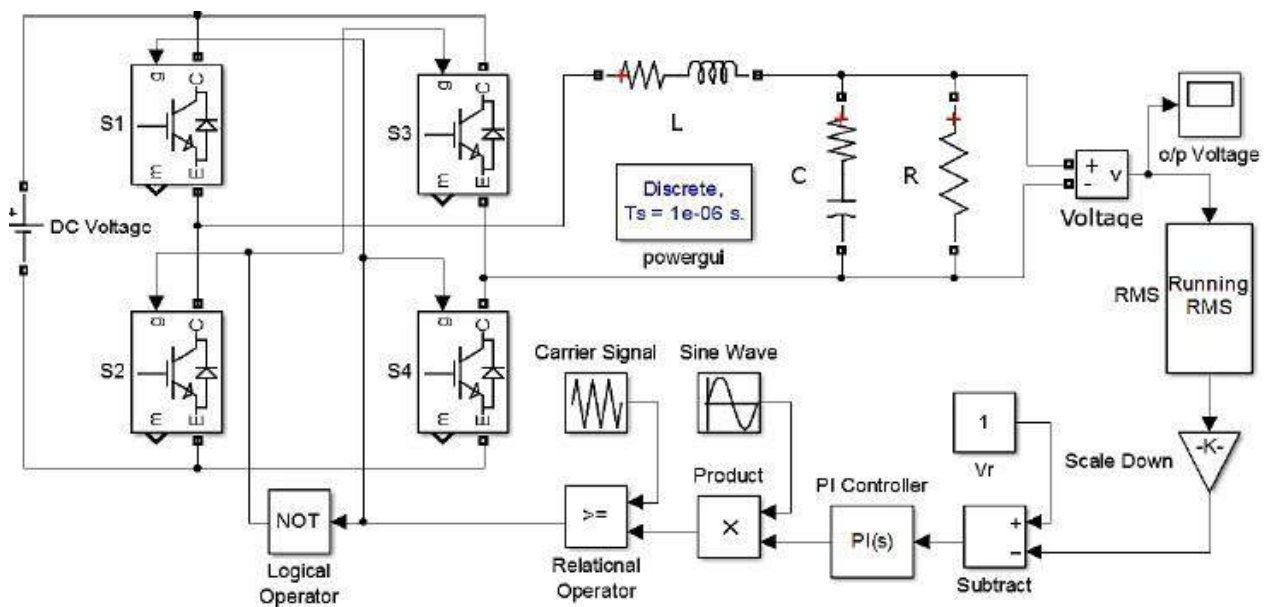


Fig.3 SPWM single phase inverter circuit using PI controller.

VI. Simulation Results of PI controller.

After creating the simulation model of single phase inverter using PI controller, now it's time to test the circuit under different operating conditions as well as test the circuit robustness and effectiveness in terms of tracking

performance and output voltage respond to load variations and voltage and current THD values.

1-Gating Signals.

Figure 4 shows the gating signals fed to the bridge circuit that consisting of four IGBT transistors.

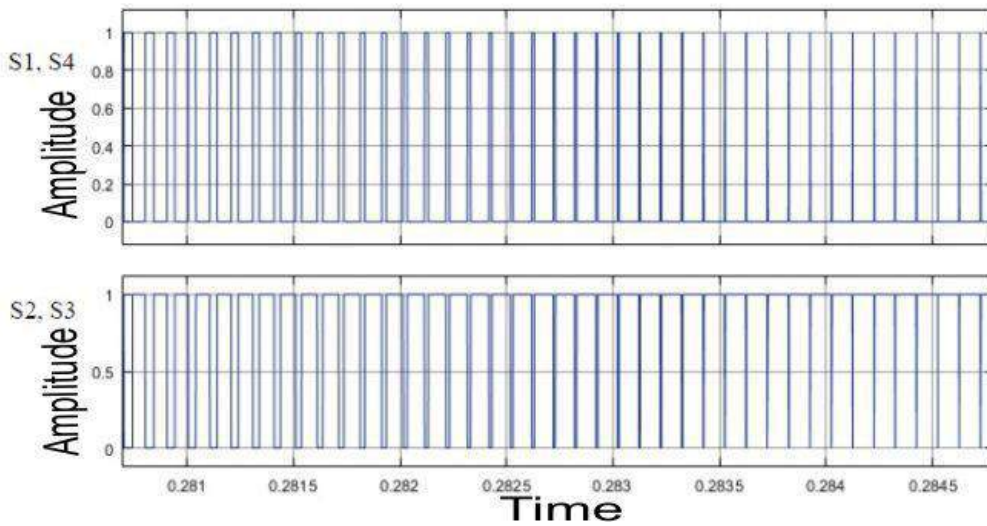


Fig.4 Gating signals fed to (S1,S4) and (S2,S3).

2-Output Voltage.

Figure 5 shows the inverter output voltage, the output waveform signal shows that the controller works efficiently and the controller keeps constant voltage amplitude.

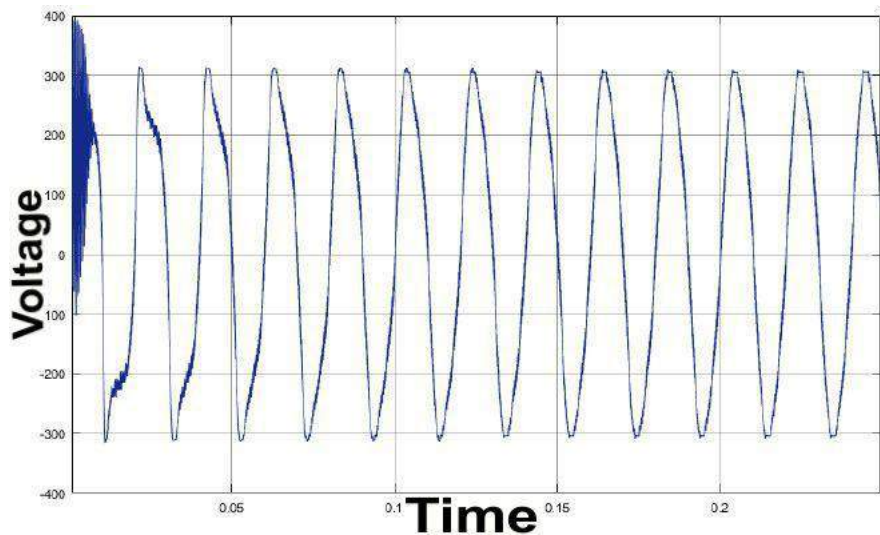


Fig.5 The output waveform of PI controller single phase inverter.

3-Total Harmonic Distortion of the Output Voltage.

Figure 6 shows the total harmonic distortion (THD) of the output voltage signal, the THD value is 4.26%, the inverter DC voltage is 220V with 400Ω resistive load, LC filter also used to block all higher order harmonics.

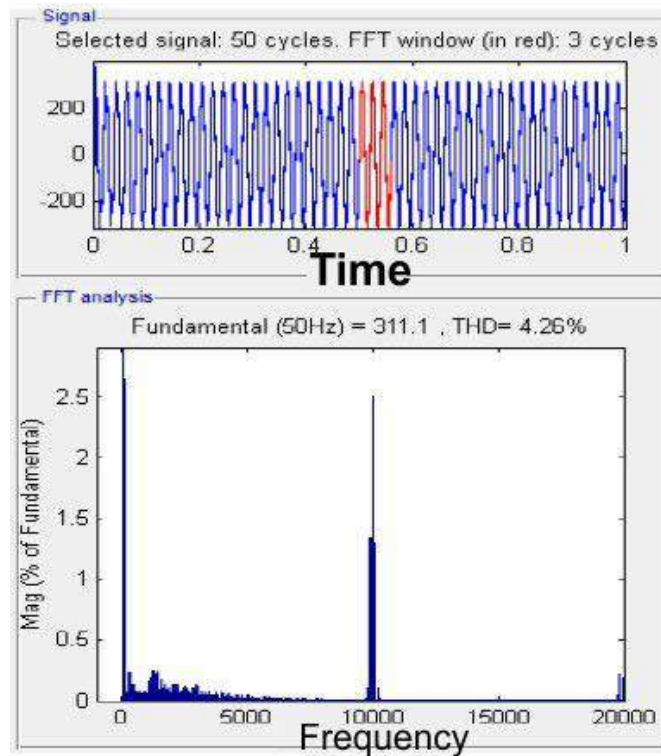


Fig.6 THD of single phase inverter using PI controller

4-Reference Signal Tracking.

Figure 7 shows the system response to a step change in reference signal, the initial value of the reference signal is 150V, at $t=0.2\text{sec}$ a step change in reference signal is applied with amplitude of 230V, the system shows good tracking voltage performance with some overshoot noticed after $t=0.2\text{sec}$.

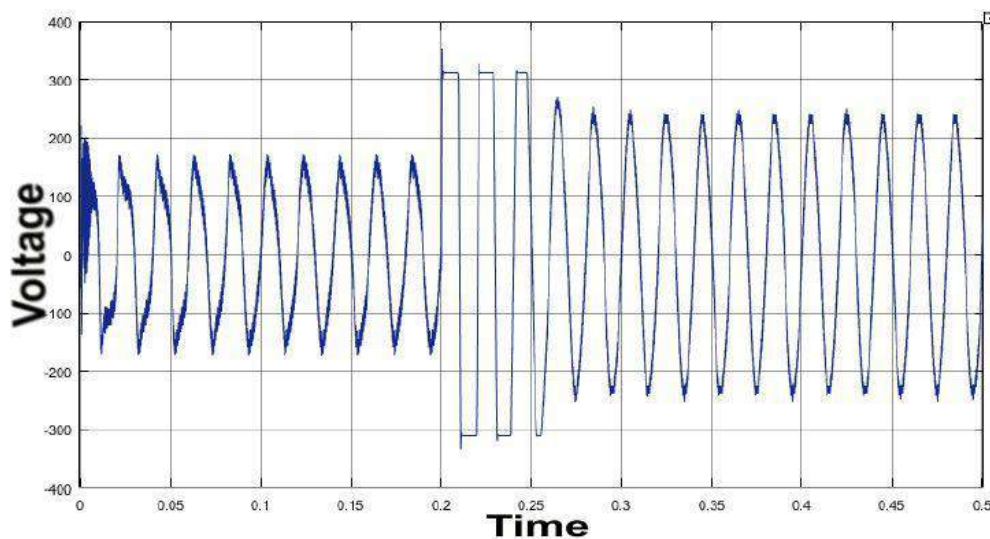


Fig.7 inverter output voltage waveform response after step change in reference signal is applied.

RMS voltage is also shown in figure 8 which shows good tracking performance when step change in reference signal is applied.

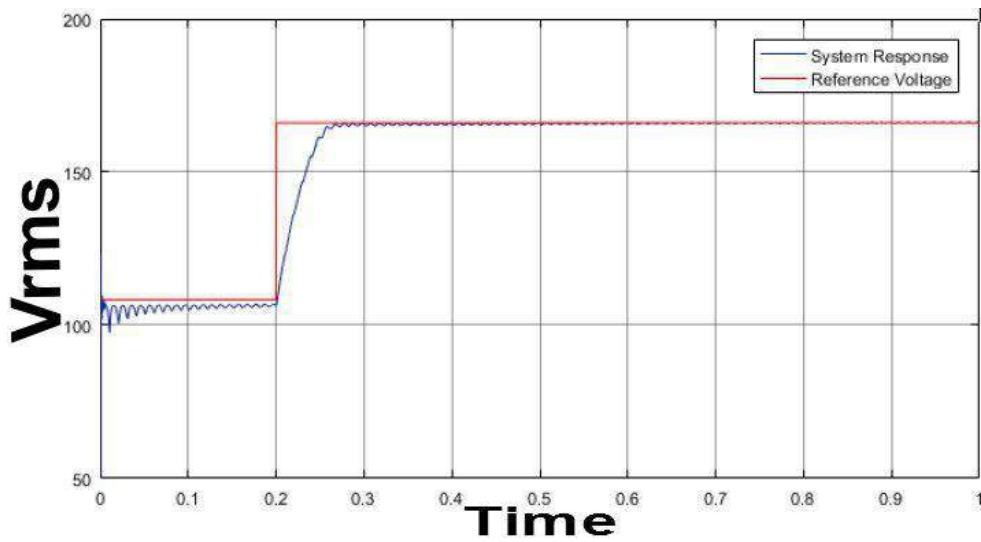


Fig.8 RMS voltage respond after step change is applied.

5- Load Current Response after Sudden Load Change is Applied.

Figure 9 and 10 show load current and output voltage signal response respectively after a sudden

change in the load current which is applied at time $t=0.2$ sec, the initial value of the load is 200Ω , at $t=0.2$ sec a step change of 400Ω load is applied.

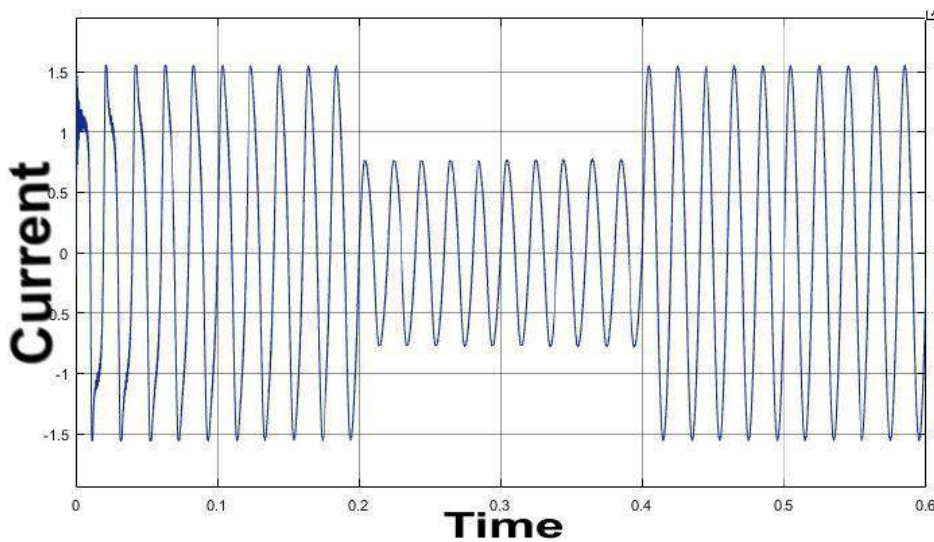


Fig.9 load current respond when sudden change is applied (200Ω to 400Ω).

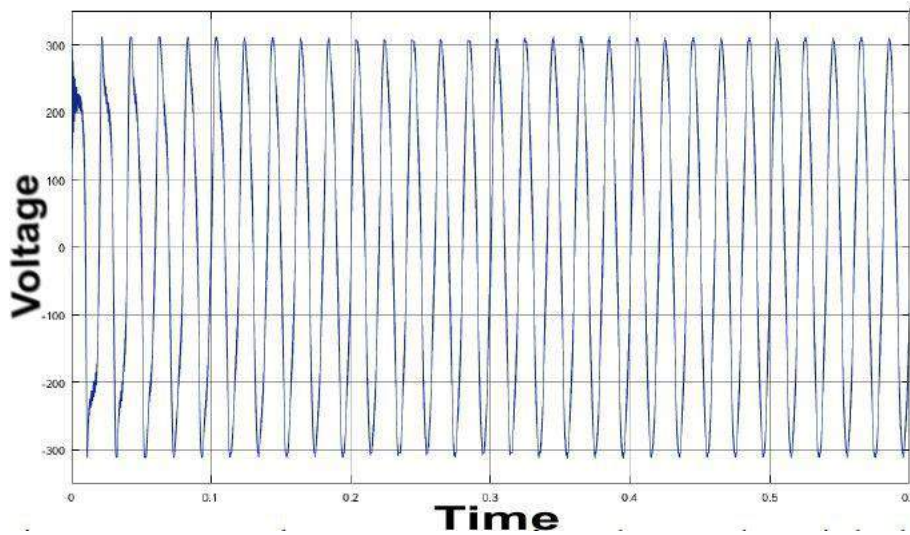


Fig.10 output voltage signal when step change in load current is applied.

VII. Simulation of single phase inverter using FLC.

As mentioned earlier the fuzzy logic controller has two inputs (the error signal V_e and change of error signal V_{ce}), the change of error signal is obtained using two blocks, the memory block which generates the last error value and the subtractor block which produces the change of error signal from the error signal and the signal

obtained from the memory block. Both signals are multiplexed and fed to the controller which contains input and output membership function and rules to decide how much of the signal needs to be corrected, the output signal from the controller will then be multiplied by sinusoidal signal as and then compared to triangular signal to generate the gating signals of the inverter bridge, figure 11 shows the simulation circuit which contains all the mentioned elements and blocks

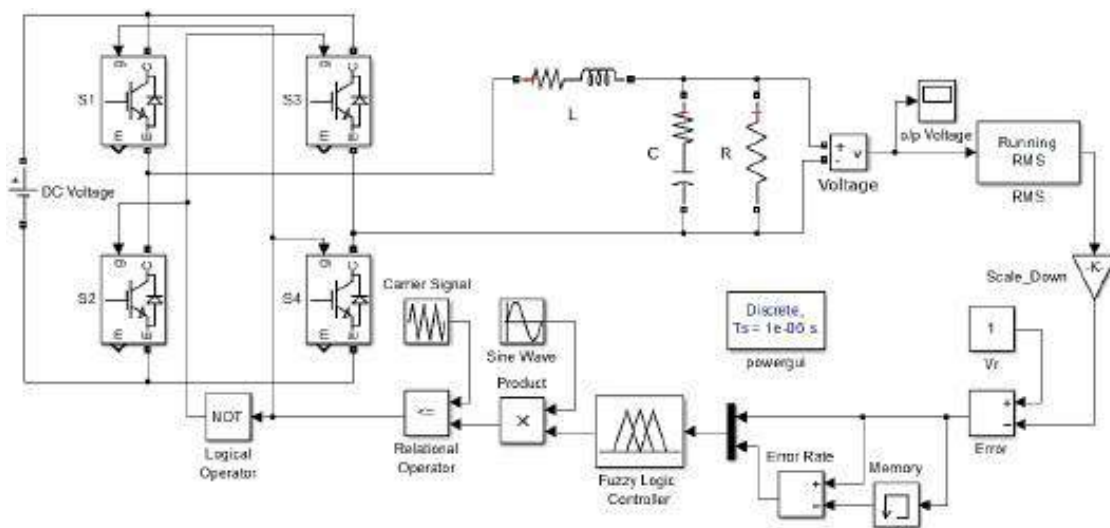


Fig.11 Simulation circuit of single phase inverter using fuzzy logic controller (FLC)

The harmonic distortion fuzzy model scheme is performed using the simulation software

MATLAB/SIMULINK which contains the fuzzy logic toolbox. This tool enables the setting of both

input/output membership functions as well as fuzzy control rules [9]. Fig.12 shows window of the FIS editor where the input/output membership function are formed as well as fuzzy rules that also can be formed using fuzzy logic toolbox, Fig.13 and 14 shows the signals of error and change of error which represent the error and

change of error signals, Fig.15 shows the output membership function, In this paper, the fuzzification process have been applied using the Mamdani method, defuzzification process have been applied using centroid method, and all the used membership functions are triangular.

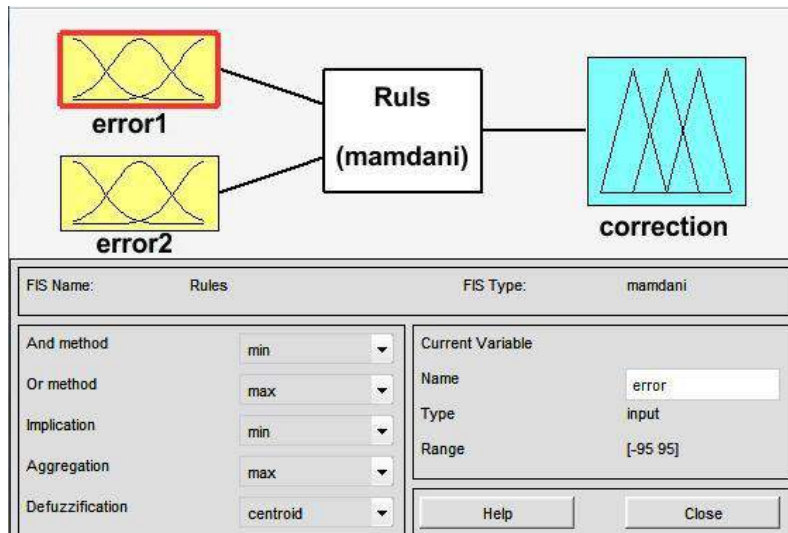


Fig.12 FIS editor window.

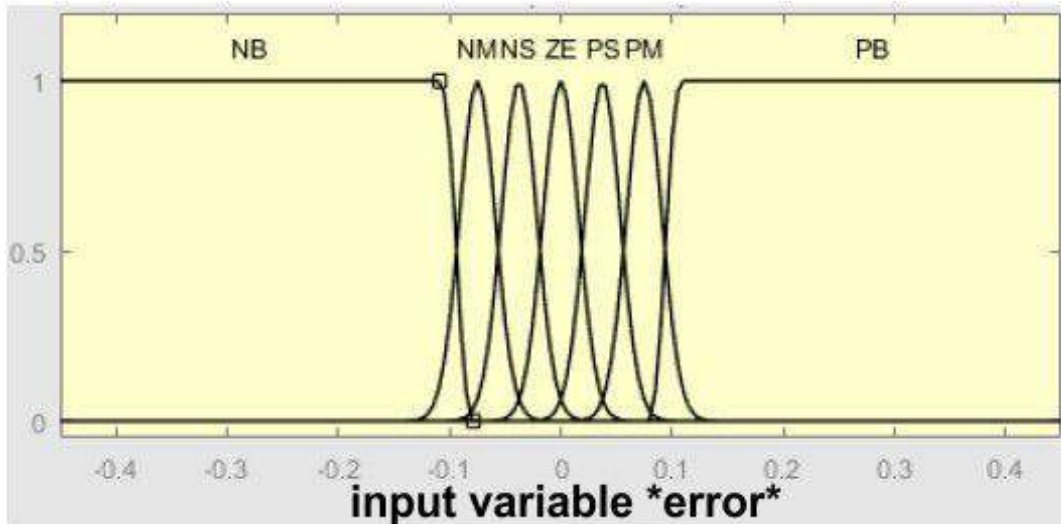


Fig.13 First input M.F (error).

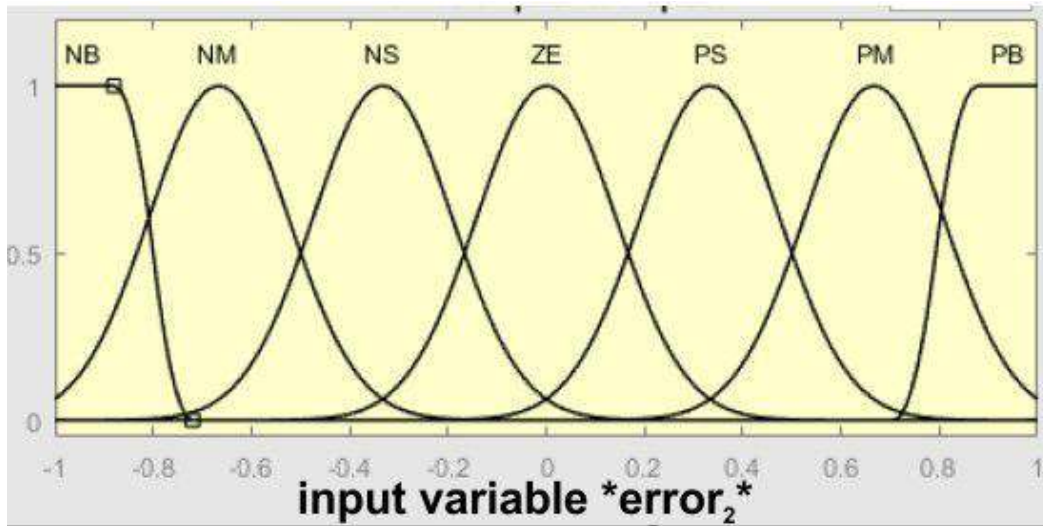


Fig.14 Second input M.F (change of error).

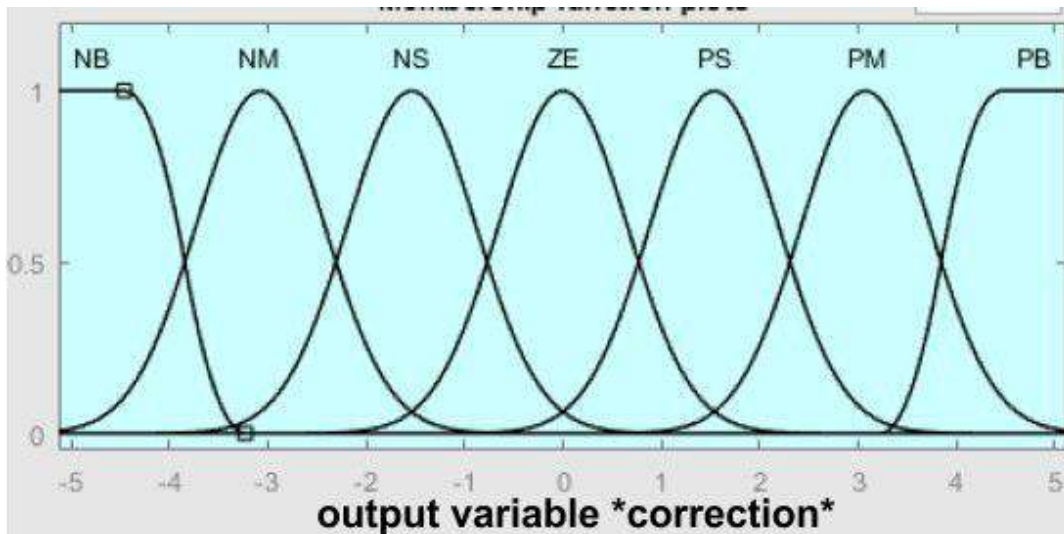


Fig.15 Output Membership Function.

I. The Results of Single phase inverter using FLC:

After finishing the simulation circuit of single phase inverter using fuzzy logic controller, it's time to test the circuit and obtain the waveforms and THD results, the same testing conditions will be applied on this circuit as done on the PI controller simulation circuit, at the end of the results, a THD comparison will be done on the

output voltage under variation of the set point and load values.

1-Gating Signals.

Figure 16 shows the gating signals fed to the bridge circuit, the upper gating signals is sent to

(S1 and S4) and the lower gating signal is sent to (S2 and S3).

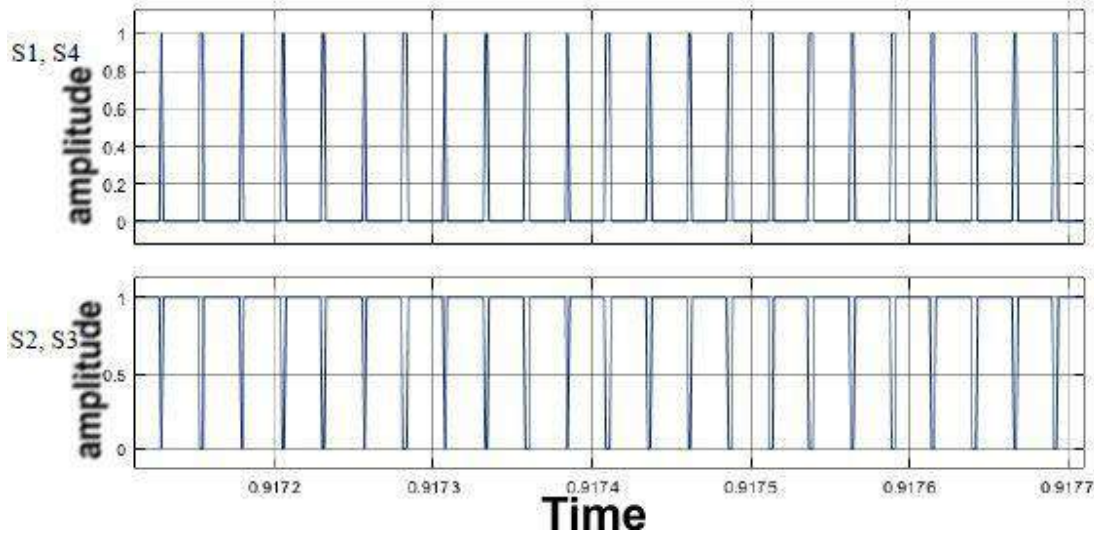


Fig.16 Gating signals fed to (S1, S4) and (S2,S3).

2-Output Voltage.

Figure 17 shows the output voltage waveform of single phase inverter using fuzzy logic controller (FLC), it is obvious that the waveform has some

overshoots but the fuzzy controller acts efficiently and eliminates the overshoots and finally produce voltage waveform with reduced total harmonic distortion (THD).

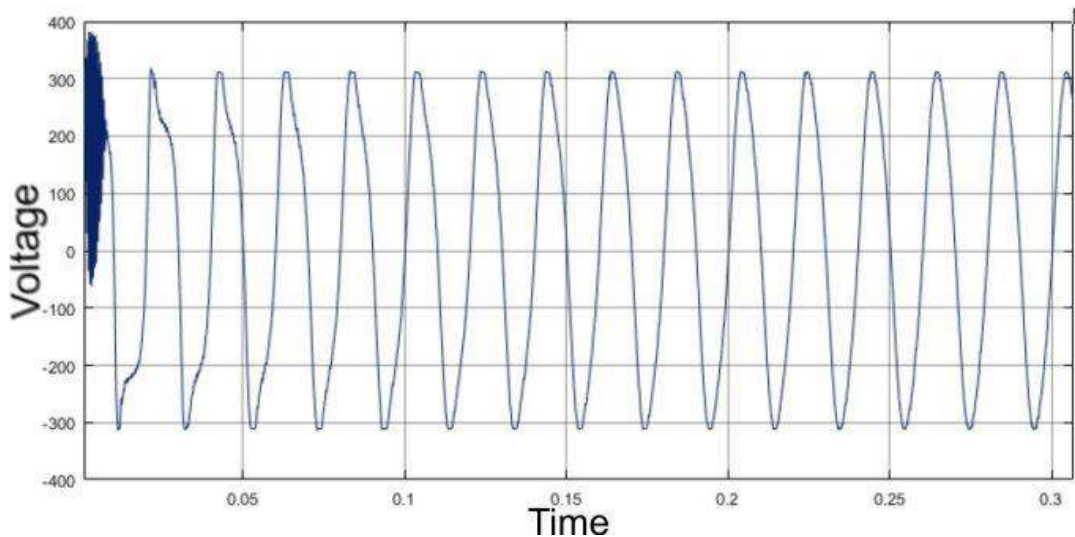


Fig.17 The output waveform of the inverter single phase with FLC controller

3- The Total Harmonic Distortion (THD):

Figure bellow shows the THD of the output voltage using FLC where the DC source voltage was 220V with load 400Ω.

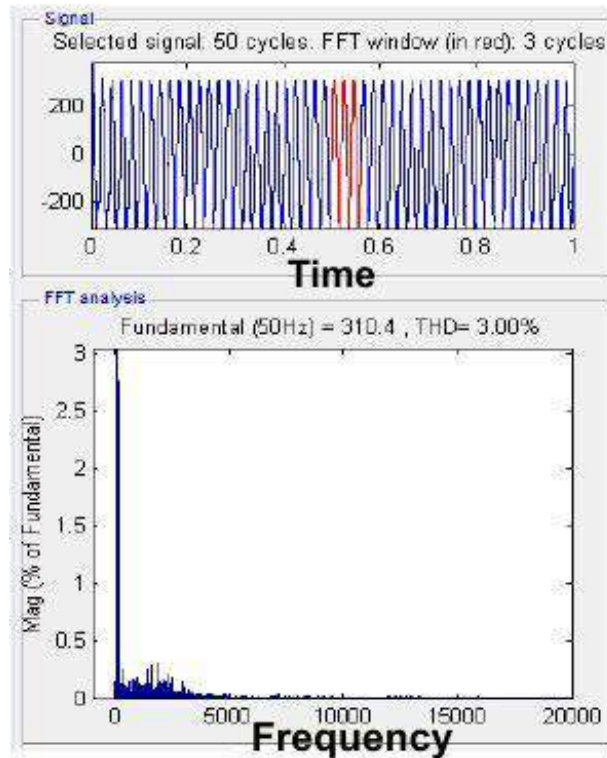


Fig.18 THD of single phase inverter using FLC controller

From the THD results seen previously, it can be seen that the output voltage controller using fuzzy logic controller (FLC) has less THD percentage, the PI controller has THD percentage of 4.26%, but fuzzy logic controller outperformed this value with a THD percentage of 3% only.

4- Reference signal Tracking.

Figure 19 shows the voltage signal when step change in reference signal is applied, the initial value of the set point was 150V, at time $t=0.2\text{sec}$ a step change of 230V in the reference signal is applied.

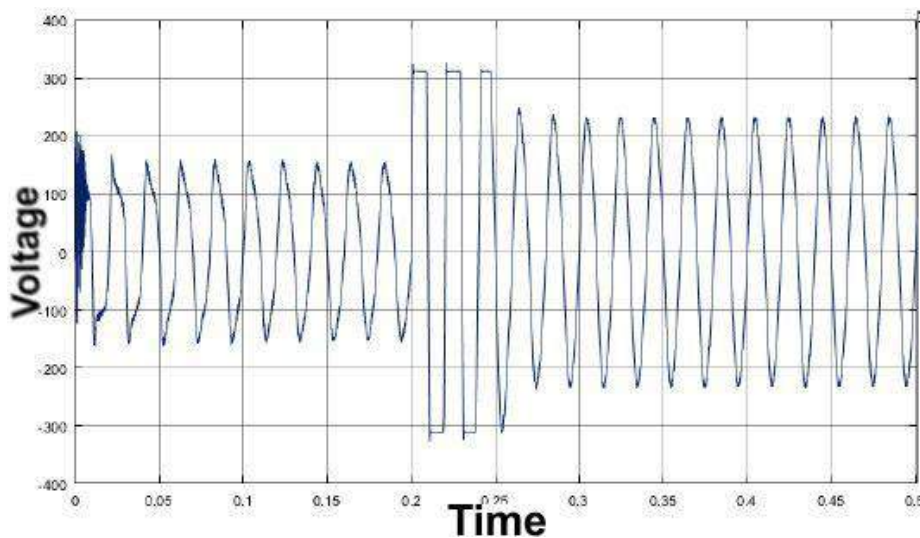


Fig.19 inverter output voltage waveform response after step change in reference signal is applied. **figure 20** show the RMS value acts when applying the step change in reference signal.

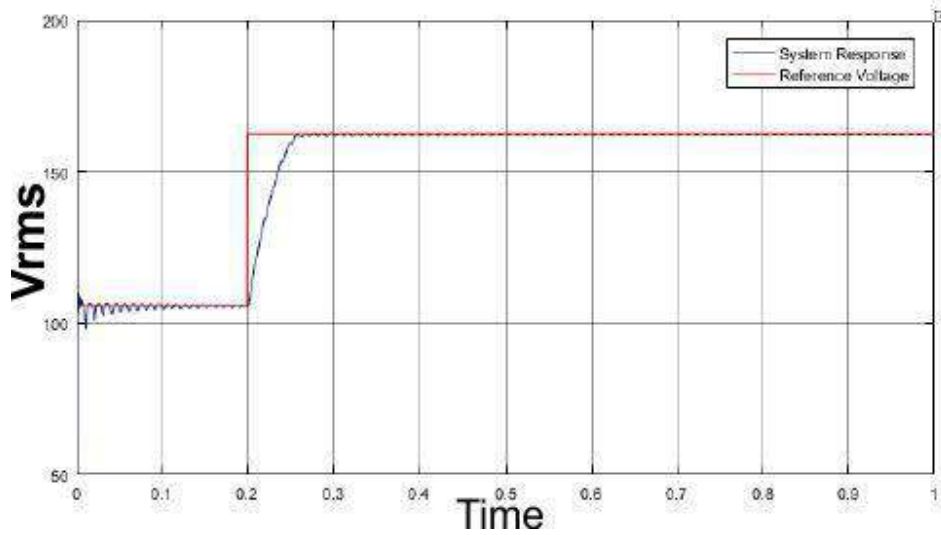


Fig.20 RMS voltage response versus step change signal.

From the simulation results, fuzzy logic controller shows better performance regarding set point tracking. In comparison with PI controller, the fuzzy logic controller has outperformed the rise time, overshoot and steady state error.

5- Load Current Response after Sudden Load Change is Applied.

Figures 21 and 22 shows the load current signal and output voltage signal when a step change in the load is applied (200Ω to 400Ω).

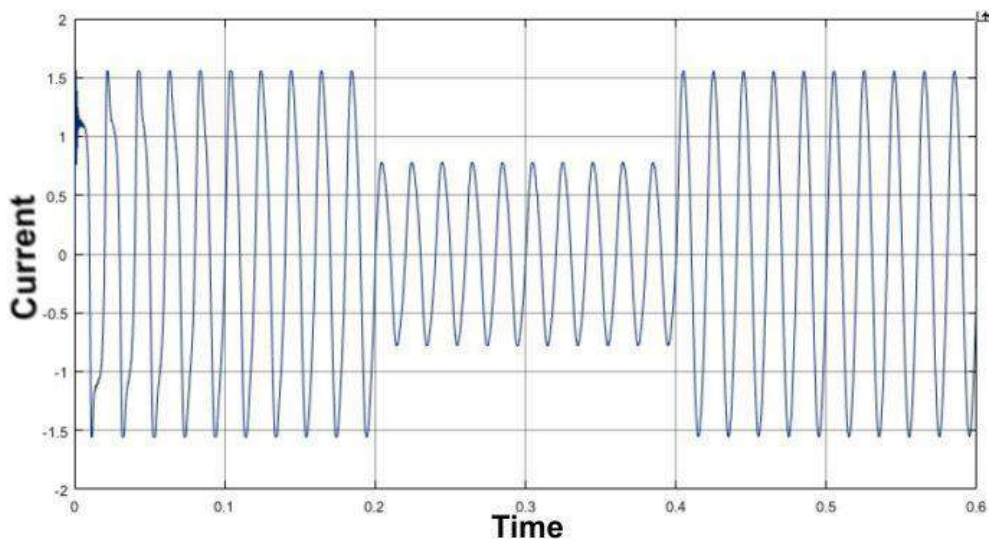


Fig.21 load current respond when sudden change is applied (200Ω to 400Ω)

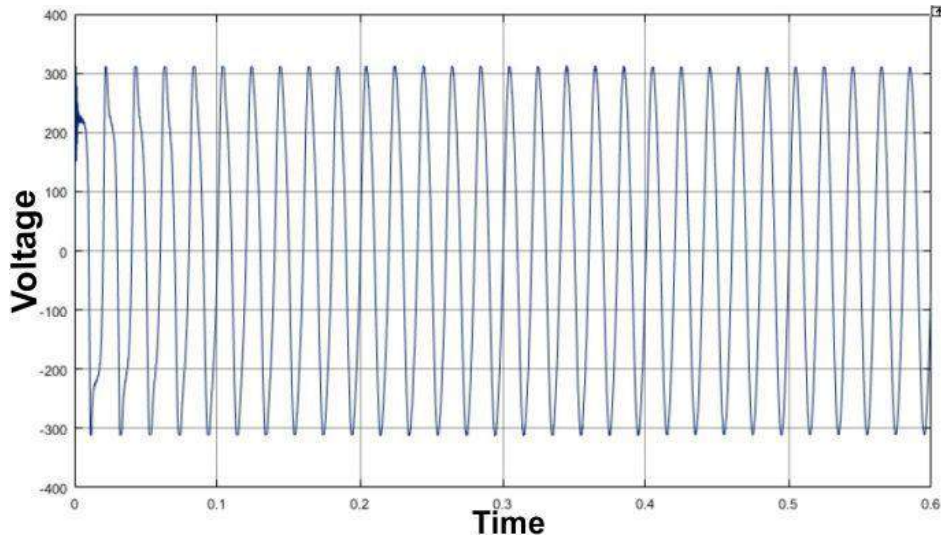


Fig.22 output voltage signal when step change in load current is applied.

VIII. THD percentage comparison using PI controller and fuzzy logic controller (FLC)

Different set points and load values are tested and the THD values for the output voltage signal is compared.

1-THD percentage of the PI controller and fuzzy logic controller (FLC) under variation of reference signal.

Under fixed load resistance of 400Ω, the simulation circuit of the both controllers is tested with different set point values, the following table shows the THD value of the output voltage with reference signal taken from (250V to 320V).

Table 2. The THD of the output voltage under reference signal variation

V_r (V)	THD % V	
	PI	Fuzzy
250	5.52	3.64
260	5.21	3.52
270	4.95	3.43
280	4.77	3.25
290	4.64	3.23
300	4.48	3.05
310	4.26	3.01
320	4.19	2.90

2-THD percentage of the PI controller and fuzzy logic controller (FLC) under variation of resistive load.

Under fixed reference voltage of 220V, a variation of the load resistance has been done (300Ω to

460Ω) and the THD results of the output voltage are obtained as shown in table 3 for both controlling schemes.

Table 3. The THD of the output voltage under resistive load variation

R _{load} (ohm)	THD % V	
	PI	Fuzzy
300	4.19	2.95
320	4.20	2.96
340	4.21	2.97
360	4.23	2.98
380	4.24	2.99
400	4.25	3.00
420	4.26	3.02
440	4.27	3.02
460	4.28	3.05

From the results of the tables shown above, it is clear that the THD percentage of the output voltage is mitigated using fuzzy logic controller (FLC) scheme under set point and load variation.

In the paper named, “Use of PWM Techniques for Power Quality Improvement (2009)”, the author discussed different PWM techniques, and show that the result of modified SPWM technique is best. The THD of such technique is about 3.76 %.

In the paper named “Fuzzy Logic Controller for MPPT SEPIC Converter and PV Single-Phase Inverter (2011)”, four IGBTs were used to implement the single phase inverter, 4.5% THD was achieved, and tracking for the maximum power using SEPIC was attained, all via optimization for PID controller.

Conclusion

In this paper both controller schemes (PI controller and fuzzy logic controller (FLC)) have been presented and explained and simulation circuits has been done using MATLAB/SIMULINK, MATLAB also has very useful tool which calls FIS editor which was very useful in creating input/output membership functions as well as the fuzzy rules which all have been formed to decide how much of the error signal should be corrected, , THD percentage of both controllers are compared and presented in tables, also the simulation circuit is tested in terms of step change in reference signal and sudden step change in load, the fuzzy logic controller has better performance in terms of rise time, steady state error and overshoot as well as the THD

percentage which has outperformed using FLC as shown in tables 2 and 3.

References

- [1] V. K. Kishan., P. P. Puthra, and K. N. Reddy, "Paralleling of inverters with dynamic load sharing", Power India International Conference (PIICON), IEEE 7th,2016.
- [2] G. N. Jadhav, and D.D. Changan, Modelling of inverter for stability analysis of microgrid", Power India International Conference (PIICON), IEEE 7th,2016.
- [3] Muhammad H. Rashid, "Power Electronics", 3rd Edition, BH Publications.
- [4] Wing-Chi So, Chi K. Tse, and Yim-Shu Lee, "Development of a Fuzzy Logic Controller for DC/DC Converters: Design, Computer Simulation, and Experimental Evaluation," IEEE Trans. Power. Electron. vol. 11, NO. 1, pp. 24-32, 1996.
- [5] S. M. Cherati N. A. Azli S. M. Ayob and A.Mortezaei, "Design of a Current Mode PI Controller for a Single-phase PWM Inverter" Power Electronics and Drive Research Group IEEE, 2011.
- [6] Sivanandam, S. N., and S. N. Deepa. *PRINCIPLES OF SOFT COMPUTING*. John Wiley & Sons, 2007.
- [7] Michael Negnevitsky "Artificial Intelligence" Second edition 2005.
- [8] Halpin S.M., "Harmonics in Power Systems", in *the Electric Power Engineering Handbook*, L.L. Grigsby, Ed. Boca Raton: CRC Press, 2001.
- [9] The MathWorks. [Online]. Fuzzy Logic Toolbox.Available : <http://www.mathworks.com/products/fuzzylogi>

Radioactive Safety Assessment for Surface Contamination by using SAFRAN Tool

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Abstract

This research presents the deterministic safety assessment for work activities carried out to remediate the surface radioactive contamination which found during the decommissioning of Radioisotopes Production Laboratory (RPL) at Al-tuwiatha nuclear site, to demonstrate that the dose acceptance criteria and the safety goals are met with a high degree of confidence. Work activities comprised characterizing, removal, packaging and relocating of the generated waste into specified zone. The physical status of the affected area is soil and debris and radiologically contaminated with (Cs-137, Eu-152, Co-60) and small amounts of natural Uranium. Safety assessment calculations have done by using SAFRAN (Safety Assessment Framework) version 2.3.2.7 software. The radiation exposure for workers in the affected area is considered as an endpoint to be compared to the worker dose limit. Dose to the public is considered to be negligible and is not numerically assessed in the SAFRAN file due to that RPL is located in a restricted zone far away from the public, low level radioactivity for the affected area and 30m berm surrounded Al-tuwiatha site. Assessment for accident conditions, were also considered to be negligible because no accident occurs in all activities of work. Safety assessment calculations based on maximum external dose rate ($2.233\mu\text{Sv/h}$) and maximum air contamination (0.001Bq/m^3). Safety assessment results proved that the sum of external and internal doses to the workers for all work activities were 1.6mSv/y is less than 10% of the 20mSv/y dose limit. Hence, there are no activities that have been assessed to present a risk rating higher than low and the radiological risks remain below the relevant prescribed dose limits through implementing effective safety programs into remediation process of the surface contamination.

Key Words: Surface Contamination, SAFRAN Tool, Safety Assessment, Al-tuwiatha site.

تقييم السلامة لتلوث اشعاعي سطحي بأستخدام البرنامج الحاسوبي SAFRAN

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 **مديرية المختبرات المركزية/وزارة العلوم والتكنولوجيا

الخلاصة

يقدم هذا البحث تقدير السلامة الاشعاعية لفعاليات العمل التي جرت لمعالجة التلوث الاشعاعي السطحي والذي وجد خلال تصفية مختبر انتاج النظائر المشعة (RPL) الواقع في موقع التويثة النووي، لأظهار تحقق معيار الجرعة المقبولة واهداف السلامة وبدرجة عالية من الثقة. اشتملت فعاليات العمل على توصيف ورفع ورزم ونقل النفاية الناتجة الى المكان المخصص. ان الحالة الفيزيائية للمنطقة المتأثرة بالتلوث هي تربة وانقاض ملوثة اشعاعيا بنظائر (Cs-137 و Eu-152 و Co-60) وكميات قليلة من اليورانيوم الطبيعي. تمت حسابات تقدير السلامة بأستخدام البرنامج الحاسوبي (SAFRAN) الاصدار 2.3.2.7. اعتبر التعرض الاشعاعي للعاملين في المنطقة المتأثرة كنقطة معايرة نهائية للمقارنة مع الحدود المقبولة للجرعة الاشعاعية للعاملين. تم اهمال الجرعة الاشعاعية لفرد الجمهور ولم يتم تقديرها عدديا في ملف برنامج الـ (SAFRAN) بسبب وقوع مختبر انتاج النظائر المشعة في المنطقة المقيدة والنشاط الاشعاعي الواطء للمنطقة الملوثة ووجود حاجز ترابي يحيط موقع التويثة وبأرتفاع 30م. ايضا تم اهمال تقدير السلامة للحوادث بسبب عدم حدوث اي حادث عرضي في كافة فعاليات العمل. اعتمدت حسابات تقدير السلامة على اعلى معدل جرعة اشعاعية خارجية (2.233 μ Sv/h) واعلى تركيز للملوثات خلال العمل (0.001Bq/m³). اثبتت نتائج تقدير السلامة أن مجموع التعرض الاشعاعي الخارجي والداخلي للعاملين ولكافة فعاليات العمل كان (1.6mSv/y) وهو اقل من 10% من الجرعة الاشعاعية المقبولة للعاملين (20mSv/y). لذا فأن المخاطر الاشعاعية تكون واطئة، وتحت مستوى حدود الجرعة المقبولة والمتعلقة بالعاملين في حقل الاشعاع، وهذا ناتج من خلال تطبيق برامج سلامة فعالة في عملية المعالجة لمنطقة التلوث السطحي.

الكلمات المفتاحية: التلوث السطحي، اداة الـ (SAFRAN)، تقييم السلامة، موقع التويثة.

Introduction

There are a number of sites in Iraq which have been used for nuclear activities and which contain potentially significant amounts of radioactive materials [1]. Many of these sites suffered substantial physical damage during the Gulf War in 1991. Secret operations at Al-tuwaita site, combined with the bombing of nuclear facilities and the subsequent looting by local residents, have contributed to the perception that the site and nearby residents suffer widespread radioactive contamination [2].

A general requirement in decommissioning is the development of a decommissioning plan which includes, or has associated with it, an evaluation of the potential radiological consequences to the public and workers during planned decommissioning activities and as a result of any credible accidents that might occur during these activities [3]. The primary purpose of the safety assessment is to identify hazards during normal and potential accident conditions, and then to identify engineered and administrative control measures to mitigate the hazards and their consequences [4]. As a part of this process, it should be demonstrated that risks have been reduced to meet As Low As Reasonably Achievable (ALARA) principle [5] and to within nationally prescribed safety criteria.

The SAFRAN tool allows the user to visibly, systematically and logically address pre-disposal radioactive waste management and decommissioning challenges in a structured way. It also records the decisions taken in such a way that it constitutes a justifiable safety assessment of the proposed management solutions.

A safety assessment is a systematic process to verify that applicable safety requirements are met in all decommissioning works. Safety analysis is a key component of a safety assessment. It incorporates both probabilistic and deterministic approaches, which complement each other [6].

Probabilistic safety analysis was attached with the RPL decommissioning plan to demonstrate that the safety goals are met for work and potential accidents within the decommissioning activities. It identifies vulnerabilities not necessarily accessible through deterministic safety analysis alone.

The deterministic safety analysis is used here to verify that the dose acceptance criteria and safety goals are met with a high degree of confidence for all works. The Safety Assessment Framework (SAFRAN) software tool was implemented for safety analysis [7]. It developed to apply the methodology developed within the Safety Assessment Driving Radioactive Waste Management Solutions (SADRWMS) project. The International Atomic Energy Agency (IAEA) organized the International Project on SADRWMS to examine international approaches to safety assessment for predisposal management of all types of radioactive waste, including disused sources, small volumes of waste, legacy and decommissioning waste, operational waste, and large volume naturally occurring radioactive material residues. The initial outcome of the SADRWMS Project was achieved through the development of a series of flowcharts which were intended to improve the mechanisms for application

of safety assessment methodologies for predisposal management of radioactive materials [8].

The evaluation of all decommissioning works and the preliminary safety assessment has been undertaken with the best available data and applying a mixture of quantitative and qualitative approaches based on site characterization.

Materials and Methods

The Instruments and equipment used are:-

(1) Ludlum (type 2241) [figure (1-a)] used in field measurement with two probes. The first was Geiger-Muller (GM) detector (type 44-9) used for detecting surface contamination by count per second (cps) unites. And the second was (NaI) detector (type 44-10) used for measuring dose rate by micro-Sievert per hour ($\mu\text{Sv/h}$) unites.

(2) Interceptor identifier (thermo scientific type) used in field measurement to identify radioisotopes [figure (1-b)].

(3) Radeye-sx [figure (1-c)] with 100cm^2 scintillation probe model DP6BD for measuring (α β γ) contamination. A zinc sulfide ($\text{ZnS}(\text{Ag})$) scintillator is used for detecting alpha particles, and a thin plastic scintillator is employed for detecting beta particles with gamma sensitivity approximately 15-20 cpm/ $\mu\text{R/hr}$ for Cs-137.

(4) RAdDeCO instrument [figure (1-d)] model H-809VII with cellulose filter paper type 0750-029 used for air sampling.

(5) Ludlum (type 3030) Alpha Beta radiation sample counter [figure (1-e)]. It has radiation detector $\text{ZnS}(\text{Ag})$ adhered to

plastic scintillation material with 0.4mg/cm^2 aluminized window.

(6) Vacuum cleaner [figure (1-f)] to suck up and containerize the generated dust and aerosols.

(7) Gamma spectrometer [figure (1-g)] with semiconductor detector of high purity germanium used for laboratory analyzing of homogeneous contaminated materials (debris and soil) samples.

(8) Barrels of 200 liter in volume, made of carbon steel, painted with brightly colored (yellow) and have closed sealed, used to containerize the homogeneous contaminated materials (debris and soil).

(9) Freight container with dimensions ($6 \times 2.5 \times 2.5\text{m}$) with closed sealed, used as accumulation zone for containers containing radioactive waste [figure (1-h)].



a-Ludlum2241 b-Interceptor c-Radeye-sx

d-RAdDeCO e-Ludlum3030 f- Vacuum cleaner

g-Gamma meter h-freight container

Figure (1) the used instruments

The research has done in Radioisotopes Production Laboratory (RPL) which is located at Al-tuwaitha nuclear site. It used to produce the radioisotopes kits for medical and industrial uses after being irradiated in IRT-5000 reactor [9]. The decision was taken to decommission the facility as a part of Iraqi Decommissioning Project and the work began in 2010 and finished in 2014. The surface contamination is found during decommissioning of RPL. The affected area occupied 600m² and laid out in five hot spots (figure 2) HS3, HS4, HS5, HS6 and system 6100. The contaminated materials in the affected area are soil and debris [10].

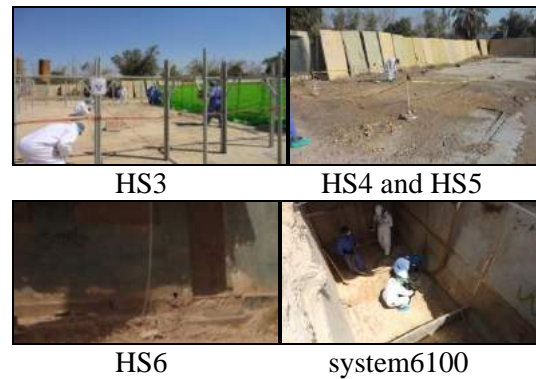


Figure (2) the affected area

Passive safety and defense in depth ensure that radiation protection is optimized and doses are kept within appropriate limits. With respect to the need for radiation protection during work activities, certain points considered and tabulated in table (1) below.

Table (1) indicates the engineered safety features

Safety feature	Safety function	Passive/active
Site fencing and gates	To separate the facility from normal access areas, providing physical access barriers	Passive
Radiation protection detectors	To detect and alarm in case of high dose rates within the work area.	Active
Ventilation system	To suck and mitigate the aerosols with activities	Active
caravanes, access control	To control radioactivity movement	Active
Work areas classification	To control radiological risk and segregate the scattered material in affected area	Active
Security system	To prevent unauthorized access to the site (non-radiological function).	Passive and active
Decontamination equipment	To minimize generated waste and time of handling of radioactive materials	Active
Respiratory protection	To control the concentrations of radioactive material in the air	Passive

Regulatory limitations which implemented here are (20mSv/y) maximum dose to the workers from all pathways; (0.4Bq/cm²) clearance levels for surface contamination of radioisotopes have β and γ emitters,

(0.04Bq/cm²) clearance levels for surface contamination of radioisotopes have α emitters, (0.1Bq/g) clearance levels for radioisotopes (¹³⁷Cs, ¹⁵²Eu and ⁶⁰Co) in bulk materials and (1Bq/g) clearance

levels for radioisotopes has natural origin [11-13].

The assessments covered work took place over 2.5 years period. The activities characterization, removal, packaging and relocating were practiced to manage radioactive waste according to calculated work time for each activity 180h/y, 300h/y, 160h/y and 80h/y respectively. Work time was 3h/day, 5day/week, 4week/month and 12month/year.

A realistic approach is taken in respect of data used in the assessment, with real measured values taken from characterization results. The assessment based on the maximum external dose (2.233 μ Sv/h) to the worker and maximum air contamination (0.001Bq/m³) which came from the arising dust in work area. Calculations of air contamination have done by using air sampler device (RADeCO) type (H-809VII) with cellulose paper filter type (0750-029) then, filter measured in Ludlum type (3030) Alpha Beta radiation sample counter in unit (dpm). The radiation measurement to this filter refers to the amount of radiological activity in volume by comparison with radiation background. Then, the following equation was used to transfer (dpm) units into (Bq/m³) units [14].

$$\text{Beta (pCi/cm}^3\text{)} = B / (2.22 \times D \times V)$$

Where:-

pCi (picocurie) = 0.037 Bq (Becquerel);
 B= net beta count rate; D= beta efficiency factor (cpm/dpm); V= volume of sample;
 2.22= conversion factor from dpm/pCi

One type of endpoints is considered in exposure assessment of normal operation

scenarios. It refers to workers in the affected area. In this assessment the worker endpoint is defined as a cumulative endpoint in SAFRAN. The worst case is a generic worker who charged with different activities. The annual dose for this worker is then calculated as the sum of all exposures for all the mentioned activities. Dose to the public is considered to be negligible and is not numerically assessed in the SAFRAN file due to that RPL is located in a restricted zone far away from the public, low level radioactivity for the affected area and 30m berm surrounded Al-tuwiatha site. Assessment for accident conditions, were also considered to be negligible because no accident occurs in all activities of work.

Workers under control of personal radiation protection segregated and picked up radioactive from non-radioactive waste (soil/debris) [15-17] and containerized it in the proper container carefully [18]. The engineered safety feature, in this manner, had done by establishing a boundary around the suspected contaminated area. The boundary should be as small as possible, but large enough to allow workers and equipment to access the area and to allow work to be accomplished with the safe manner. Sufficient ground cover should be placed below suspected items (soil/debris) in the work area. The ground cover should be made of thick nylon, waterproof and capable of withstanding work activities without tearing or ripping. The ground cover should be sized enough to prevent contaminates dispersion. Then, segregation process was allowed to segregate contaminated from non-

contaminated waste at point of waste

generation (figure 3).



Fig. (3) Segregation and pick up processes

Homogeneous samples were sent to the Central Laboratories Directorate (CLD) to recognize the type and concentration of radioisotopes in the waste material. The analysis procedure has done according to IAEA-TECDOC-1092 [19]. Samples were dried in oven at temperature (80-100) degree Celsius for 12 hours milled by milling machine then sifted by specific sieve after that sample volume were (500ml) kept in locked (marinelli beaker) and stored for one month in order to let the chains of U-238 and Th-232 can reach to the radiological equilibrium finally.

Gamma spectroscopy system (Canberra) was used to measure the samples. This system consist of detector, preamplifier, pulse-height analyzer (DSA1000), lead shield and vertical high purity germanium (HPGe) detector with relative efficiency 40% and resolution (<1.8KeV) based on measurements of 1.332MeV gamma ray at photo peak of Co-60 source and multichannel analyzer (MCA) with 8192 channel. Both high voltage supply and amplifier device are compact in one unit (DSA1000), detector shield with a cavity adequate to 10cm lead, absorbed grid from Cadmium 1.6mm and Copper 0.4mm to reduce radiological back ground. System calibration efficiency is

carried out by using multi gamma ray standard source (MBSS-2 Canberra) of marinelli beaker geometry. A library of radionuclides which contained the energy of the characteristic gamma emissions of each nuclide was analyzed and their corresponding emissions probabilities were built from the date supplied in the software (Genie-2000). The radioactivity concentration of U-238 can be determined by Gamma energy (1001KeV) which is belong to isotope (Pa-234m) for high radionuclide concentration samples and by (Bi-214) to low concentration, U-235 determine by (185KeV) of Gamma energy which is belong to the same isotope while (Th-232) is determine by (911.7KeV) of Gamma energy which is belong to (Ac-228), (K-40) can be determined by peak energy (1460.8KeV). Cs-137 and Eu-152 can be determined at (662KeV and 344.3KeV) peak energy respectively. The radionuclide concentrations determined in (Bq/kg) units.

Results and Discussion

The physical and radiological characteristics of the waste generated during remediation of the contaminated area are indicated in table (2).

Table (2) characteristics of the generated waste

Physical Status	Weight (kg)	Radionuclide	Specific activity (Bq/kg)
Soil	2650.9	Cs-137	1290.13
		Eu-152	12.5
		Co-60	127.32
	287.8	Co-60	4277
		Eu-152	5.35
		Cs-137	3.82
	33.2	U-238	4382.53
		Cs-137	48.2
		Eu-152	114.5
Co-60		24.1	
Debris	1197	Cs-137	14478.3
	8.4	Eu-152	297.62
	150	Co-60	2700

Safety assessment calculations have done by using SAFRAN (Safety Assessment Framework) version 2.3.2.7 software that incorporates the methodologies developed in SADRWMS (Safety Assessment Driven Radioactive Waste Management Solutions) project.

doses from decommissioning activities were shown in fig.(2). The doses come from different waste management activities which took place in field pretreatment for radioactive wastes generated during remediation of the affected areas.

SAFRAN calculations are tabulated in tables (3). The Assessment results for

Table (3) characteristics of waste processing activities

Impact	Exposure time (h/year)	Dose rate (μSv/h)	Annual dose (μSv/year)
Characterization	180	2.23	401.4
removal	300	2.23	669
Packaging	160	2.23	356.8
Relocating	80	2.23	178.4

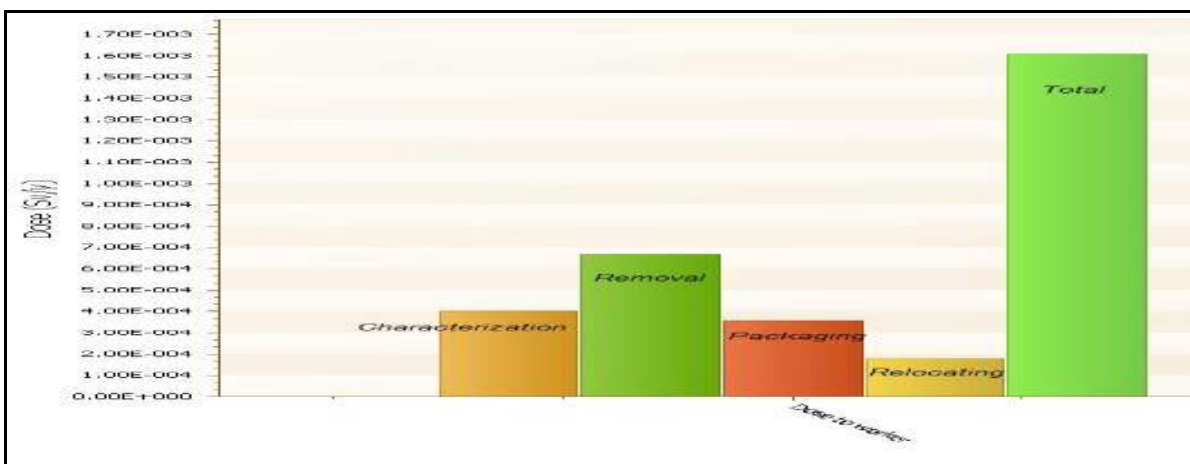


Fig. (2) SAFRAN dose calculation to workers from all activities

From table (2) we can note that the generated waste are physically segregated into soil and debris then radiologically classified according to content of radioisotope type in waste material. The dominated radioisotopes were Cs-137, Eu-152, Co-60 and small amounts of natural Uranium.

Table (3) named activities of waste processing which followed in field pretreatment to remediate the contaminated soil and debris. The duration, periodic and accumulative dose rate for each activity also have showed in table (3). The exposures are calculated (in SAFRAN) based on the annual durations of the different activities which are provided in table (3). The external dose rate is estimated based on results of the radiological measurements of hot spots by dividing the maximum of the recorded doses by the number of hours spent for all activities. This dose rate was then multiplied by the duration number of each activity to obtain the annual dose for each activity. Assessment takes into account the external and internal dose rate. The maximum concentration of airborne radioactivity under normal operation conditions was manually calculated after air sampling by RADeCO device and measured by Ludlum (3030) instrument.

Fig.(2) shows the total and dose rate for each activity which affecting to the worker from all pathways. There are no activities that have been assessed to present a risk rating higher than low and the risk remain below the relevant prescribed dose limits. From fig.(2), the sum of the doses to the workers for all activities, 1.6 mSv/y, is less than 10% of the 20 mSv/y dose limit.

We can say that worker who have taken doses from normal operations remain within the legal annual limits. The assessment undertaken indicates that the works complied with international safety standards and meet the relevant dose limitation criteria with respect to workers.

Conclusions

Effective safety programs have been included into remediation process of the surface contaminated area. The required level of remediation was established on a site specific basis and in accordance with the radiation protection principles that apply to intervention situations.

The radiological risk associated with the remediation activities is assessed as low. Assessment taking into account specific aspects like contact dose rates, concentration of contaminants in air. The measures which were identified in the safety assessment are elicited from contaminated areas through detail characterization and formally laid down in operational procedures and work instructions.

The International Commission on Radiological Protection (ICRP) derive the limit of an average of 20 mSv per year over five years for the occupational dose limit and 1 mSv per year for the public dose limit. The maximum worker dose is 1.6 mSv per year, Public dose has been found to be negligible and no accident was mentioned during works. Thus, remediation works to complete surface contamination is considered to be adequately with the reduced associated risks As Low As Reasonably Achievable.

References

- [1] Abbas, M., Al-Atia, M., Bushra, A., Helou, T., Al-Mubarak, M., Danneels, J., Cochran, J. R., Sorenson, K. and Coates, R. (2007) Decommissioning of the Iraq Former Nuclear Complex. Proceedings of the 11th International Conference on Environmental Remediation and Radioactive Waste Management ICEM2007. Bruges. Belgium.
- [2] Kenagy, W. D. (2013) The Iraq Decommissioning Project –Eight Years of Accomplishments. the 57th IAEA General Conference. Vienna
- [3] IAEA. (2005) standard format and content for safety related decommissioning documents. safety reports series No. 45. Vienna.
- [4] IAEA. (2013) Safety Assessment for Decommissioning. safety reports series No.77. Vienna.
- [5] IAEA. (2000) Predisposal Management of Radioactive Waste Including Decommissioning. Safety Standards Series No. WS-R-2. Vienna.
- [6] IAEA. (2013) The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste. Safety Standards Series No. GSG-3. Vienna.
- [7] SAFRAN tool and SAFRAN User Guide (<http://goto.iaea.org/safran>).
- [8] IAEA. (2011) Safety Guide DS 284 for Safety Case and Safety Assessment for Predisposal Facilities and Activities. IAEA. Vienna.
- [9] IAEA. (2011) Al Tuwaitha-Italain Radioisotopes Production Facility. Report on decontamination activities in Iraq. Vienna.
- [10] Abdulhadi, Q.A. (2009) Project Management Plan of RPL. Iraqi Decommissioning Program of Previous Nuclear Sites and Facilities. Baghdad-Iraq.
- [11] Radiation Protection Center (RPC). (2012) Concentration Values for Clearance Levels of Radionuclides in Solid and Liquid Waste. Ministry of Environment. Baghdad-Iraq
- [12] IAEA (2004) Application of the Concepts of Exclusion, Exemption and Clearance. Safety Guide No.RS-G-1.7. Vienna
- [13] IAEA. (2005) Derivation of Activity Concentration Values for Exclusion, Exemption and Clearance. Safety Series No.44. Vienna
- [14] Environmental Protection Agency (1980) Method 900.0:Gross Alpha and Gross Beta Radioactivity. www.epa.gov . USA
- [15] IAEA. (2003) Predisposal Management of Low and Intermediate Level Radioactive Waste. Safety Standards Series No.WS-G-2.5. Vienna
- [16] IAEA. (2007) Categorizing Operational Radioactive Wastes. TECDOC-1538. Vienna.
- [17] IAEA. (2008) Managing Low Radioactivity Material from the Decommissioning of Nuclear Facilities. Technical Reports Series No.462. Vienna
- [18] IAEA. (2006) Development of Specifications for Radioactive Waste Packages. TECDOC1515; ISSN 1011-4289. Vienna.
- [19] IAEA. (1999) Generic Procedure for Monitoring in a Nuclear or Radiological Emergency. IAEA-TECDOC-1092. Vienna.

Effect of deposition parameters on kinematics growth and optical properties of Fe₂O₃ nano films deposited by PLD.

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Abstract:

The optical and structural properties of Fe₂O₃ thin films deposited via pulsed laser deposition (PLD) have been studied. In PLD the energy of laser pulses was varied to investigate the properties of Fe₂O₃ thin films. In this work, different thickness of Fe₂O₃ thin film are deposited on glass substrates, namely, 63 nm, 110 nm and 189 nm. The structure of Fe₂O₃ thin films is investigated by the X-Ray diffraction, and it was formed to be polycrystalline structure. The XRD measurements show that these nano films have sharp peaks at $2\theta = 25^\circ$ indicating a preferred orientation along (012) plane and the grain size (GS) increase with energy of laser pulses. The surface morphology of the deposited material has been tested via (SEM) gives good homogeneous films. According to the results, the nanoparticles GS and the thickness are ranging from (6.8 nm to 12.4 nm) and from (63 nm to 189 nm) is observed, respectively. The optical band gap of prepared films in range about (2.28-2.8eV).

Key words: Fe₂O₃ nano thin films, structure and optical properties, PLD method.

تأثير معاملات الترسيب على حركية النمو والخواص البصرية لاغشية أكسيد الحديد الثلاثي النانوية المرسبة بواسطة الترسيب الليزر النبضي.

الخلاصة:

تم دراسة الخواص البصرية والتركيبية لاغشية أكسيد الحديد الثلاثي المرسبة بواسطة الترسيب بالليزر النبضي.

في الترسيب بالليزر النبضي كانت طاقة الليزر متنوعة لاستقصى الخواص البصرية لاغشية اوكسيد الحديد. في هذا العمل استخدمت اسماك مختلفة للاغشية (63-189) نانومتر. الخواص التركيبية لاغشية اوكسيد الحديد الثلاثي درست من خلال فحص حيود الاشعة السينية وبينت انها تملك تركيب متعدد التبلور. قياسات حيود الاشعة السينية بين ان الاغشية النانوية تمتلك قمم حادة عند زاوية مساوية 25° مشيرة لافضل اتجاه عند المستوي (012) وحجم حبيبي يزداد بزيادة طاقة الليزر. تشكيلية السطح تم اختبارها عن طريق المجهر الالكتروني الماسح واعطت الاغشية تجانس جيد. وفقا لهذه النتائج فان الحجم الحبيبي والسمك بمعدل من (6.8-12.4) نانومتر و(63-189) نانومتر على التوالي. فجوة الطاقة البصرية للاغشية المحضرة فانها تتراوح من (2.28-2.8) الكترون فولت.

الكلمات المفتاحية: اغشية اوكسيد الحديد الثلاثي النانوية الرقيقة، الخواص التركيبية والبصرية، طريقة الترسيب بالليزر النبضي.

1-Introduction

Iron oxides exist in different crystal structures, namely, ferrimagnetic magnetite (Fe_3O_4), maghemite ($\gamma\text{-Fe}_2\text{O}_3$), antiferromagnetic wustite (Fe O) and hematite ($\alpha\text{-Fe}_2\text{O}_3$) [1]. The Maghemite especially used in magnetic data storage media. It is a metastable cubic spinel structure which transforms into hematite above 400°C [2]. The iron oxides are used in several electronic devices which requiring polarized or magnetic materials [3]. In addition, the

maghemite high Faraday rotation has applications in optical devices.

Furthermore, there is a little information about the optical and magnetooptical characteristics for iron oxides, especially those of the metastable maghemite phase [4]. Thus, the optical properties of the iron oxide in terms of; refractive index, absorption coefficient, and Faraday rotation have attracted attention by many researchers in order to use it in magnetooptical devices. There are several deposition techniques

are used hitherto, namely, plasma assisted molecular-beam epitaxial (MBE) [5] pulsed laser deposition (PLD) from oxide targets and reactive sputter deposition from an Fe target with Ar-O₂ mixture gas flow besides Fe₃O₄ [6], other iron oxides, Fe₂O₃, FeO, and some non-stoichiometric oxides, have been reported to be present in the deposited films, depending on the deposition conditions [7,8]. The Fe₂O₃ is brown or reddish brown and hence can be easily distinguished from the other oxides, FeO and Fe₃O₄, which are black. There are two important optical parameters for the Fe₂O₃ which are called optical constant, namely, the refractive index (n) and the extinction coefficient (k).

2-Experimental Details

A pure powder of Fe₂O₃ within a high purity of 99.99% is used as a target in order to prepare the samples. In this work, the glass

substrates are adopted for the prepared thin film utilizing the pulsed laser deposition (PLD). Both of the chemically and ultrasonically methods are adopted in order to clean the glass substrates as follow; both of the ethanol and the distill water are used to clean the glass substrate. Then, the samples are placed in beaker contain distill water inside ultrasonic device for 2 hours at 353K, the powder Fe₂O₃ was compressed by sing compression tool at pressure 160 kg and the samples were compressed in disks at a diameter of 1cm and thickness 3 mm and the substrates and target were fixed in the chamber of PLD system. The deposition chamber pressure is kept at 10⁻⁵ Torr.

2-1- Deposition of Fe₂O₃ Films:

The Fe₂O₃ was deposited on the glass substrates by using pulsed laser deposition system with temperature 300°C, the frequency

of laser (3Hz) and the number of pulses is 150 pulses. The base energy of laser was changed by

the energy (700,800 and 900mJ). The figure (1) shows pulsed laser deposition system.



Fig.(1): Schematic diagram of the PLD system.

2-2- X- Ray Diffraction Spectra:

In order to determine both of the nature and structural characteristics of the growth film, the Philips PW 1840 X – ray

$$G.S = \frac{A\lambda}{\Delta\theta \cos\theta}$$

2-3- Scanning Electron Microscope (SEM):

diffractometer of $\lambda = 1.54 \text{ \AA}$ from Cu – K α is used.

The polycrystalline material GS is calculated utilizing X–ray spectrum [9]:

$$\dots (1)$$

Morphology studies of the films on the glass substrate were

carried out scanning electron microscope (SEM) type VEGA TE SCAN, with an accelerating voltage of 30kV and magnification of 10000X.

2-4- Optical Measurements:

The optical transmission of prepared thin film is recorded via UV-VIS, Phoenix-2000V device within the optical spectrum from

$$I_t = I_o \exp(-\alpha t) \quad \dots (2)$$

where I_t is the intensity of the transmitted photon at a thickness (t) and I_o is the intensity of the incident photon at surface of material[11]:

$$A = \log(I_o/I_t) \quad \dots (3)$$

We have

$$\alpha = 2.303 A/t \quad \dots (4)$$

The reflectance (R) has been found by using the relationship:

$$R + T + A = 1 \quad \dots (5)$$

For normal reflectance, we have [12]:

$$R = (n-1)^2 / (n+1)^2 \quad \dots (6)$$

By using the above relation, the refractive index can be determined from the relation:

$$n = (1 + (R)^{1/2}) / (1 - (R)^{1/2}) \quad \dots (7)$$

The extinction coefficient k is related to the absorption coefficient by the relation:

200 nm to 1000 nm. The other optical characteristics are calculated from the followed well known formulas based on the data that extracted from the optical transmission and absorption results.

The absorption coefficient (α) is calculated from Beer–Lambert law [10]:

$$K = \alpha\lambda/4\pi \quad \dots (8)$$

Optical energy gap determined from the relation [13]:

$$\alpha = (h\nu - E_g)^{1/2} \quad \text{for } h\nu > E_g \quad \dots (9)$$

Both of the real (ϵ_r) and imaginary part (ϵ_i) of dielectric constant are calculated from [12]:

$$\epsilon_r = n_2^2 - k_2^2 \quad \dots (10)$$

$$\epsilon_i = 2nk \quad \dots (11)$$

3- Results and Discussion:

3- 1 Structural properties:

3-1-1 X-ray diffraction results:

XRD pattern of Fe_2O_3 thin film was shown in figure (2). Laser energy affects the surface morphology, and optical properties of thin films. The peaks were appearing at 2θ range of 24.16° , 33.12° , 35.63° , 40.64° , 54.08° and 58.3° can be attributed to the 012, 104, 110, 113, 116 and 112 crystalline structures corresponding to pure Fe_2O_3 thin film. From the X-Ray diffraction peaks, it could be shown that the film structure changed from an amorphous

phase to crystalline with the increased in laser energy from (700- 900mJ). Films deposited at lower laser energy have defects and impurities of interstitial atoms whose concentration decreases with an increase in laser energy density.

The crystallinity of the deposited films enhances as noticed by the sharpness of the peak corresponding to the (012) plane and the occurrence of the peak corresponding to the (104) plane as show in figure (a and b). The average crystalline size of thin film was increased with increasing in laser energy; it was calculated using equation (1).

From the results, the samples at a thickness of 63, 110 and 189 nm is produced nanoparticles within

a GS of 6.8nm, 9.7 nm and 12.4 nm, respectively.

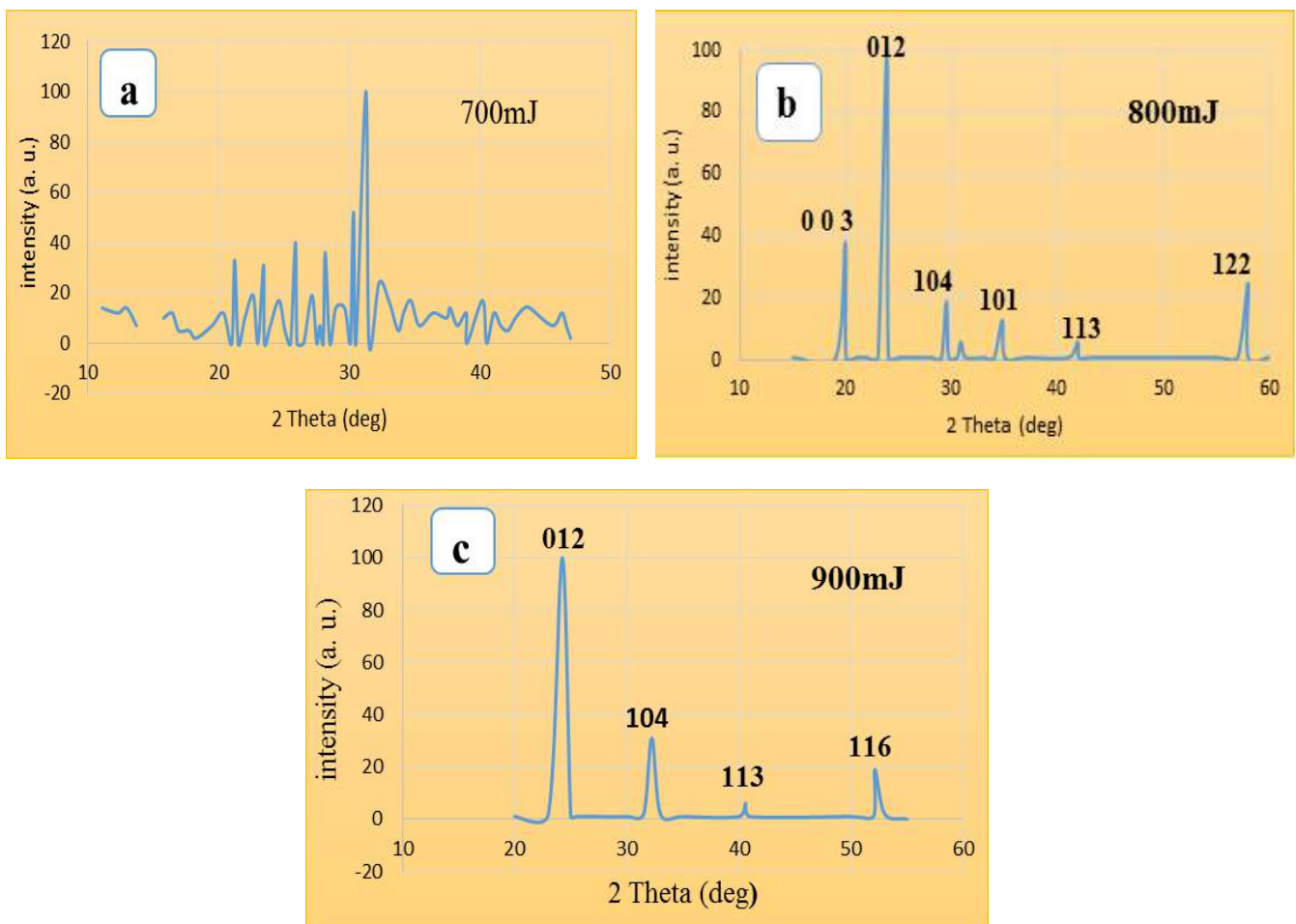


Fig.(2): X-ray diffraction pattern for Fe_2O_3 thin film.

3-1-2 Morphology results (SEM):

The surface morphological information of the prepared films is investigated via the SEM as illustrated in figure (3). According to the topographic images, the films in optimum conditions resulted in a well adherent, compact dense layer which covers the entire substrate surface, but this film has a sponge nature of elongated fibers.

The average GS which measured via SEM is larger than it

determined via XRD. This can be attributed due to the agglomeration of grains. The surface of the films is smooth and well coherence to the glass. [14]. In fig. (4) shown the grain size of the films versus of the base energy of laser pulses. Grain size was determined by using the Debye - Scherrer equation (1). Increasing of energy deposition produce an increase in the GS of the Fe_2O_3 films approximately from (6.8 to 12.4 nm) for the films deposited at (700 to 800mJ), respectively.

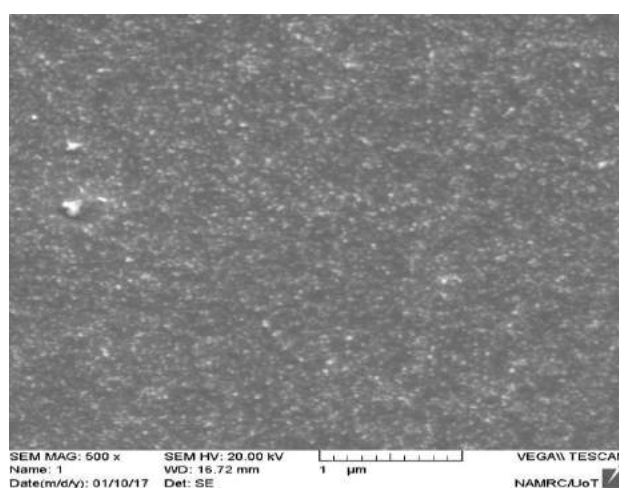


Fig.(3): Scanning electron micrograph of nano Fe_2O_3 thin film.

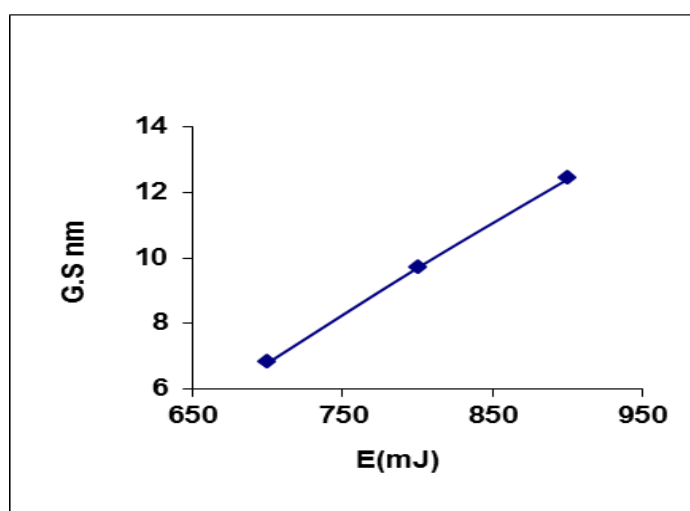


Fig.(4): The GS of nano Fe₂O₃ films versus of laser energy.

3-2 Optical Properties:

The transmittance spectrum of Fe₂O₃ films for several laser energy is depicted in figure (5). All films have high transmission at long wavelengths approximately (70 – 80 %), and decreasing transmission to (10%) at short wavelength. The

transmission of the film increases with increasing energy of laser up to (800 mJ) after which it starts decreasing with further increase in energy of laser up to (900 mJ). From the results, the optimum energy to deposit nano Fe₂O₃ film for photovoltaic applications is about 800 mJ.

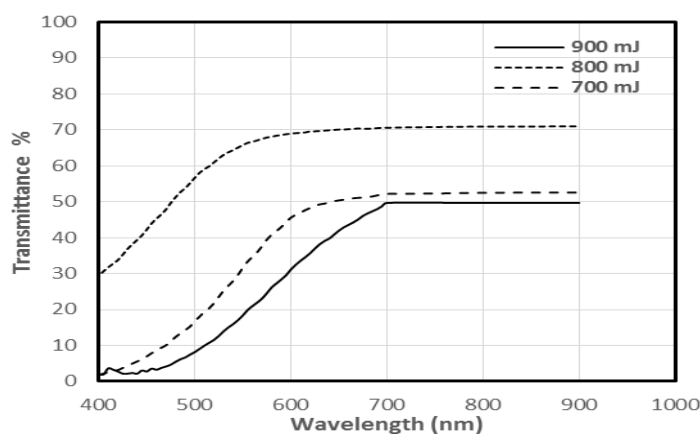


Fig. (5): The optical transmission spectrum of nano Fe₂O₃ films for different energy of laser.

Fig.(6) shows the absorbance variation versus wavelength. It is clear that the absorbance decreases when wavelength increases.

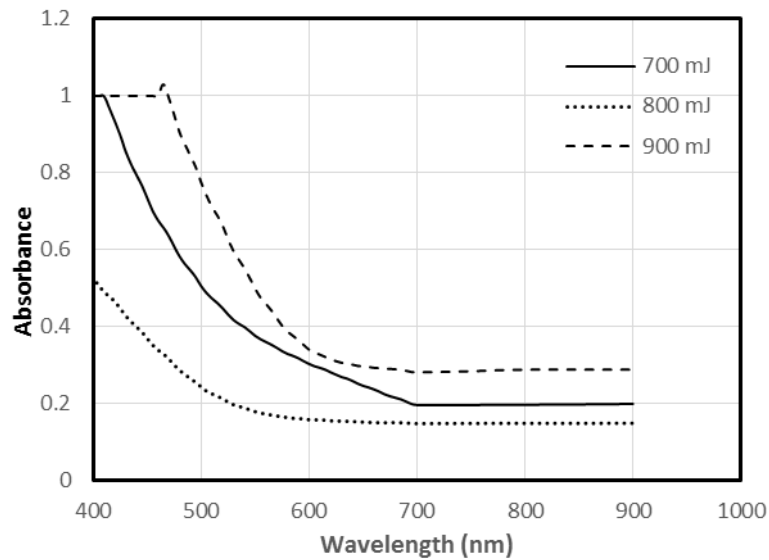


Fig.(6) :The optical absorption spectrum as a function of wavelength.

Equation (2) is used to calculate the absorption coefficient utilizing the analyzed data from the transmission spectrum. Figure (7) shows the optical absorption spectra recorded with the Fe₂O₃ films for several deposition parameters.

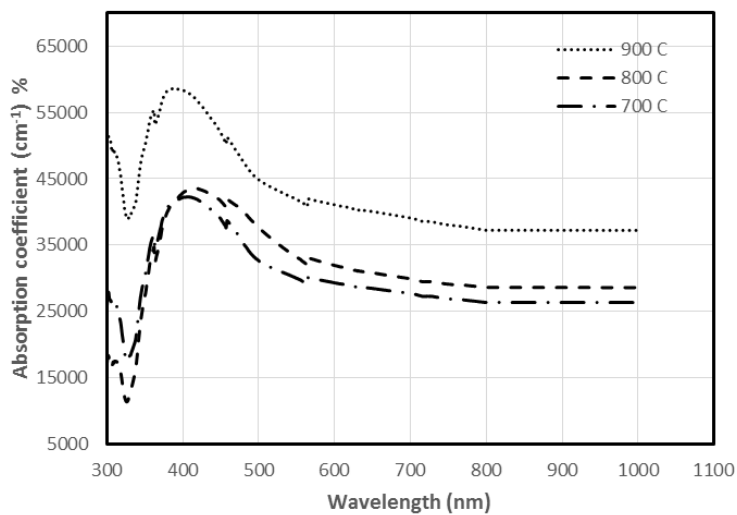


Fig.(7) The optical absorption coefficient versus wavelength of Fe₂O₃ films for different deposition parameters

The band gap depends on different parameters includes; the film structure, the arrangement and distribution of atoms in the crystal lattice. Direct and indirect energy gaps were calculated from the $(\alpha h\nu)^2$ and $(\alpha h\nu)^{1/2}$ versus photon energy respectively, according to equation (9) for several deposition parameters as illustrated in Figure (8). The band

gap value was determined via extrapolating the linear region of the curves until they intercept the photon energy axis. The linear dependence of $(\alpha h\nu)^2$ with $h\nu$ indicates $h\nu$ is the direct energy gap. It can be observed from Figure (8) that the energy gap decreases with the increasing energy of laser pulses.

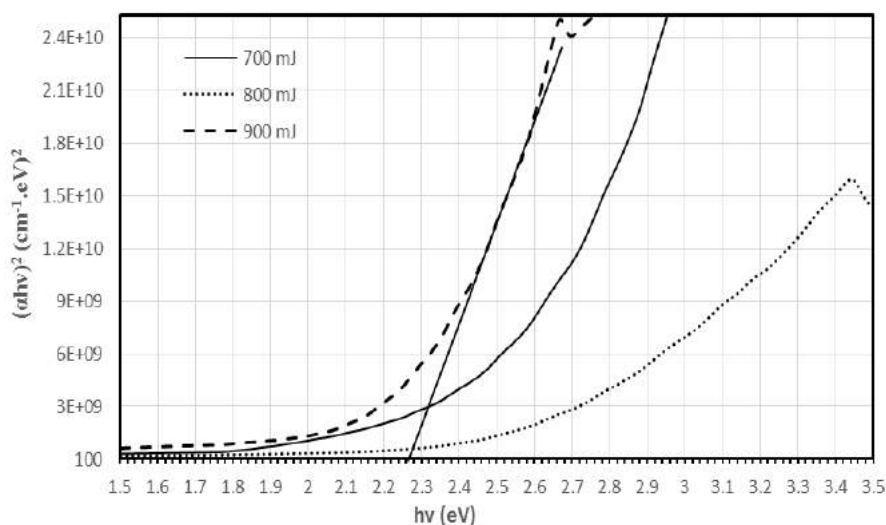


Fig. (8) A plots of $(\alpha h\nu)^2$ versus $h\nu$ of Fe_2O_3 films for several laser energy.

The extinction coefficient represents the electromagnetic wave attenuation that is propagating through the material, where it values depends on both of the density of free electrons

and structural nature of the material [15]. The extinction coefficient was evaluated using the relation (8) as a function of photon energy for several deposition parameters which is

depicted in figure (9). The values of extinction coefficient are directly related to the absorption of light. For all deposition parameters, it can be noticed that

there is a slight increase of extinction coefficient values at energies higher than (2.25 eV). After that, there is an increase with increasing photon.

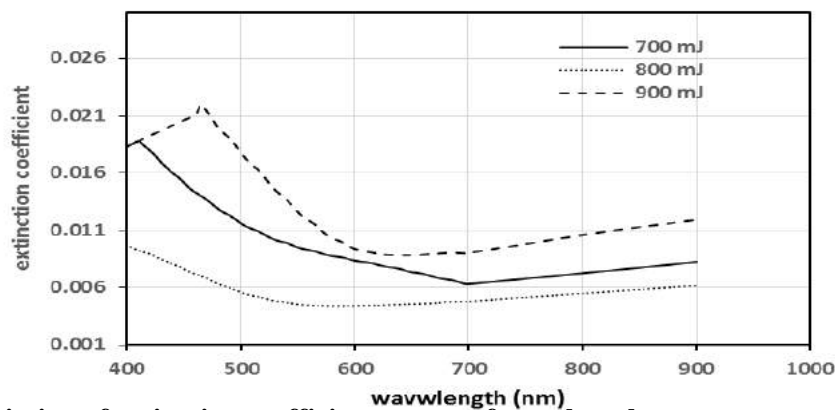


Fig.(9):Variation of extinction coefficient versus of wavelength.

The refractive index was determined from the reflectance data and equation (7). The increase of the film thickness causes an overall decrease in the

refractive index. The decrease is due to the overall decrease in the reflectance with the increase of film thickness.

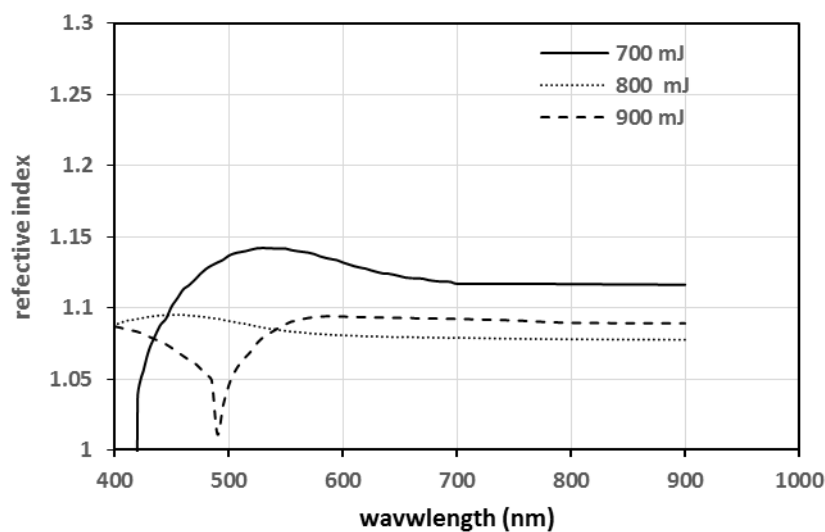


Fig.(10) :Variation of refractive index as a function of wavelength of Fe₂O₃ films for different deposition conditions

Both the real and imaginary parts of the dielectric constant versus the photon energy are illustrated in figure (11). The real part represents the amount of actual saving of electrical energy. While, the imaginary part represents the absorption losing associated with free carriers. The complex dielectric constant were calculated using Equations (10

and 11). The curves for both parts are found to be oscillatory in nature for all deposition conditions depending upon both of the crystal structure and the thickness of the prepared film. The curves in Figure (11) show similar behavior of those curves of extension coefficient due to the depending the values of (ϵ_i) on the concept of (K) [16].

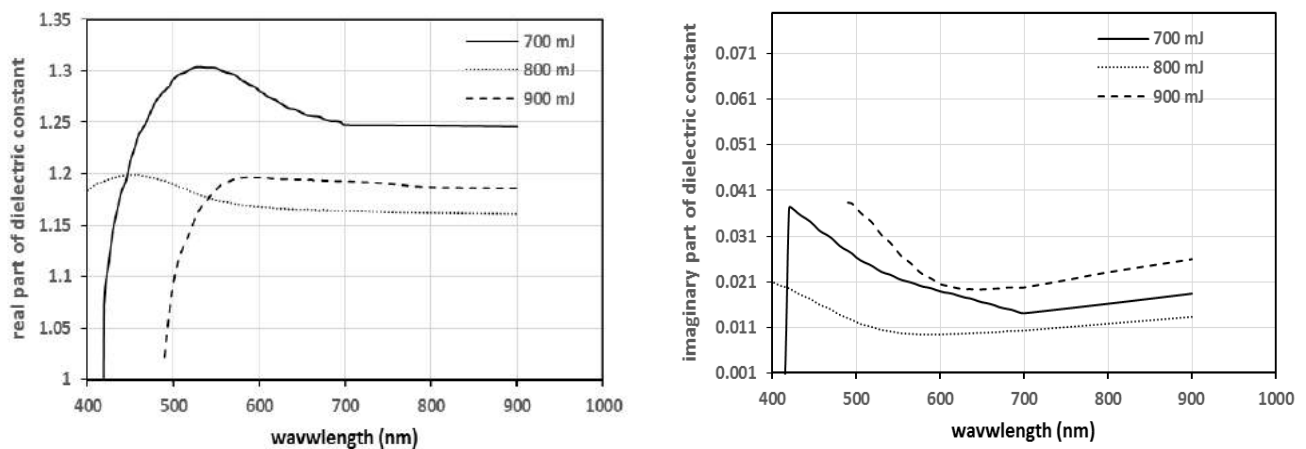


Fig.(11) : The real and imaginary part of dielectric constant versus wavelength of Fe₂O₃ films for different deposition conditions.

Conclusions:

In this paper we have reported the energy of laser pulses dependent optical properties of Fe₂O₃ thin films deposited by PLD method. The film thickness is changed from 63nm –

189nm, the GS was changed from 6.8nm –12.4 nm, with change in optical band gap from (2.28–2.8eV). The optimum energy to deposit nano Fe₂O₃ film for photovoltaic applications is about 800 mJ.

References:

- 1- I. Kazeminezhad and A. Sadollahkhani, *Mater. Lett.*, 2014,120, 267.
- 2- K. Vignesh, A. Suganthi, M. Rajarajan and S. A. Sara, *Powder Technol.*, 2012, 224, 331.
- 3- W. Lu, C. Jiang, D. Caudle, C. Tang, Q. Sun, J. Xu and J. Song, *Phys. Chem. Chem. Phys.*, 2013, 15, 13532.
- 4- A. Roychowdhury, S. Prakash Pati, S. Kumar and D. Das, *Powder Technol.*, 2014, 254, 583.
- 5- Z. Zeng, C. S. Garoufalis, A. F. Terzis and S. Baskoutas, *J.Appl. Phys.*, 2013, 114, 23510.
- 6- P. Liu, Y. Li, Y. Guo and Z. Zhang, *Nanoscale Res. Lett.*, 2012, 7, 220.
- 7- X. Xu, M. Wu, M. Asoro, P. J. Ferreira and D. L. Fan, *Cryst. Growth Des.*, 2012, 12, 4829.
- 8- S. Sahare, S. J. Dhoble, P. Singh and M. Ramrakhiani, *Adv.Mater. Lett.*, 2013, 4, 169.
- 9- W. H. Nam, Y. S. Lim, W. S. Seo and J. Y. Lee, *Philos. Mag.*,2013, 3, 4221.
- 10- X. Zhang, M. L. Chen, J. Wen, L. L. Wu, H. Gao and D. Zhang, *CrystEngComm*, 2013, 15, 1908.
- 11- B. H. Ahn and J. Y. Lee, *CrystEngComm*, 2013, 15, 6709 .
- 12- Y. Liao, C. Xie, Y. Liu, H. Chen, H. Li and J. Wu, *Ceram. Int.*, 2012, 38, 4437–4444 .
- 13- Y. H. Mun, S. H. Park, H. S. Ko and C. M. Lee, *J. Korean Phys.Soc.*, 2013, 63, 1595.
- 14- S. Suwanboon, P. Amornpitoksuk, A. Sukolrat and N. Muensit, *Ceram. Int.*, 2013, 39, 2811–2819.
- 15- S. M. Lam, J. C. Sin, A. Z. Abdullah and A. R. Mohamed, *Desalin. Water Treat.*, 2012, 41, 131–169 .
- 16- S. Ameen, H. K. Seo, S. M. Akhtar and H. S. Shin, *Chem. Eng.J.*, 2012, 210, 220–228.

Using Solar Energy and Photovoltaic Power in Air-Conditioning Processes by Adsorption Technique

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Abstract

The research is present the heat-driven adsorption chiller performance by using low temperature water which be extracted from the solar energy through using photovoltaic solar panels and solar thermal collectors as a main energy source. The adsorption system employs the silica gel-water as the adsorbent. Also this system has an advantage such as the maintenance is low, no major parts movement and environmental friendly. The numerical simulations have been carried out for heat sources temperatures ranged between 60-80°C, chilled water and cooling from 15 °C to 35 °C respectively. Program in FORTRAN was built to achieve the numerical simulation for adsorption system. The results indicated the coefficient of performance for lower hot water temperature is increased with time processes of heating or cooling. The refrigeration capacity for high hot water temperature is increased with time processes of heating or cooling while the effect of low hot water temperature is low.

Keyword: photovoltaic, solar energy, Adsorption

استخدام الطاقة الشمسية والطاقة الكهروضوئية في عمليات تكييف الهواء بواسطة تقنية الامتزاز
جبار خلف محمد
الجامعة التكنولوجية

المستخلص

يقدم البحث الحالي دراسة أداء منظومة تبريد تعمل بتقنية الامتزاز باستخدام ماء ساخن بدرجة حرارة واطئة يمكن الحصول عليها من الطاقة الشمسية وذلك من خلال استخدام طاقة الخلايا الشمسية والمجمعات الشمسية كمصدر اساسي لطاقة النظام . تستخدم المنظومة الماء-هيلام السيليكا كمكثف لعمل النظام. الفائدة الرئيسية لاستخدام أنظمة التبريد التي تعمل بتقنية الامتزاز هي عدم وجود أجزاء متحركة ، تحتاج إلى صيانة قليلة إضافة إلى إنها صديقة للبيئة. المحاكاة العددية نفذت لمصدر ذي درجة حرارة تتراوح بين 60 °C الى 80 °C ودرجة حرارة الماء المثلج وماء التبريد من 15 °C إلى 35 °C على الترتيب، لإنجاز الحل للمحاكاة العددية تم بناء برنامج بلغة فورتران 90 لإنجاز المحاكاة العددية، النتائج بينت إن معامل الأداء يزداد مع الزمن عند درجة حرارة الماء الساخن الواطئة. سعة التبريد تزداد مع زمن اشتغال المنظومة لحالة درجة حرارة الماء العالية.

الكلمات المفتاحية :- الطاقة الكهروضوئية ، الطاقة الشمسية، الامتزاز

Introduction

In Iraq, the refrigeration and air condition systems are major energy consumers. These systems normally use CFCs as working fluid that induces ozone depletion and consequently greenhouse effect. The solid adsorption system is considerably an alternative way to reduce of CFC usage [1].

Adsorption cooling equipment can be converted for using -heated fluids with solar, also the modification was suggested for high performance applications of solar is not have major design changes. The adsorption equipment represent the majority of units used in solar air-conditioning systems in future. The water sent to the absorption generator is heating by solar collectors and photovoltaic array, the DC power supplied by PV require battery for energy storage, and fed to one or more resistive elements that are immersed in a water storage tank. The coefficients of performance used for solar adsorption equipment will be the same as those used for the steam-driven adsorption equipment, since no boiler losses are involved [2,3]

Carl Munters develop the adsorption cycle, and is often known as the Munters system. This system drying the air with various kinds of crystals, salts, silica gel, or zeolite. Heat and

moisture are typically exchanged between an exhaust air stream and air stream using a heat exchange wheel and a drying wheel as shown in figure (1) [4].

In order to keep the heat exchange is cool, the exhaust air takes ambient air to humidifies and cools it. Additional heat from a solar or gas source is added to the air stream passing through the heat exchange wheel, because the air is still not hot enough to drive the moisture out of the drying wheel, so that Through the drying wheel the hot air are passes to evaporates moisture from the desiccant, and the moist, heated air is exhausted to the atmosphere [5].

In Iraq, the solar cooling was initiated since 30–35 years ago; however, none of commercially system was demonstrated though many works were being done. The major difficulties needed to overcome were its naturally non-continuous processes, requirement of maintain vacuum conditions and leakage problems. This research work has focused on the development of a combined solar/solid adsorption system, which was prediction for hot water and cooling production. The system was theoretically study, and coefficient of performance (COP) was estimated as well as its operational performance.

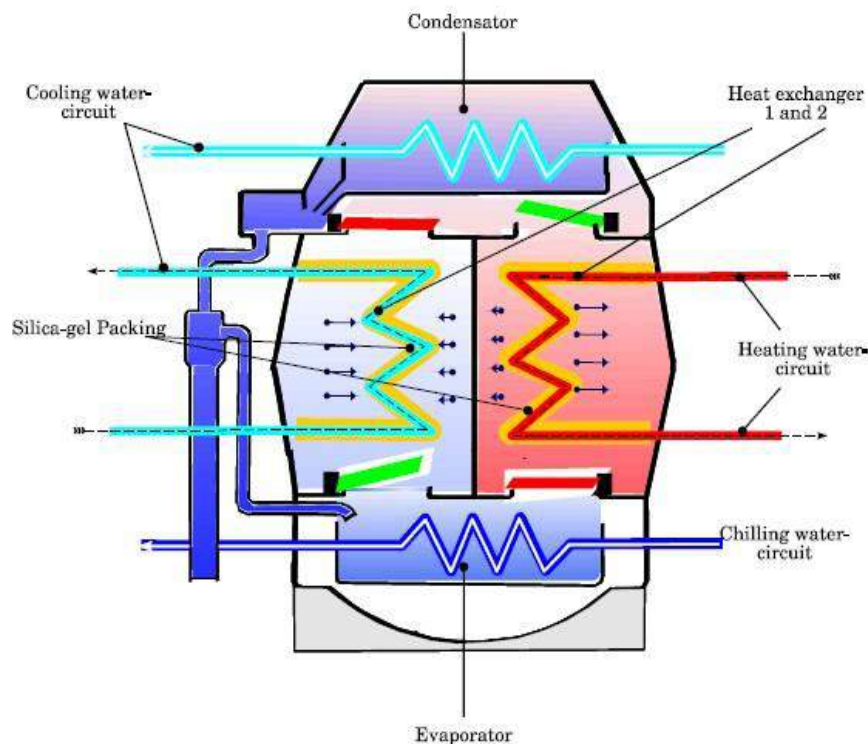


Figure (1): Schematic diagram of absorber system [4].

Objective of Research

Many adsorption systems were developed by various research groups to improve their coefficient of performances (COP). The solar adsorption system, the schematic diagram is shown in figure (2). Due to the low regeneration temperature of silica gel and the high latent heat of vaporization of water, the silica gel–water has been selected as the adsorbent–adsorbate pair. And to

improve the cooling effect, a strategy of mass recovery cycle is proposed. This study is different from the conventional mass recovery cycle because no cooling process and heating during the process of mass recovery in conventional mass recovery cycle. In this strategy additional cooling accelerate the desorption/adsorption and heating process; therefore the system improving the cooling output.

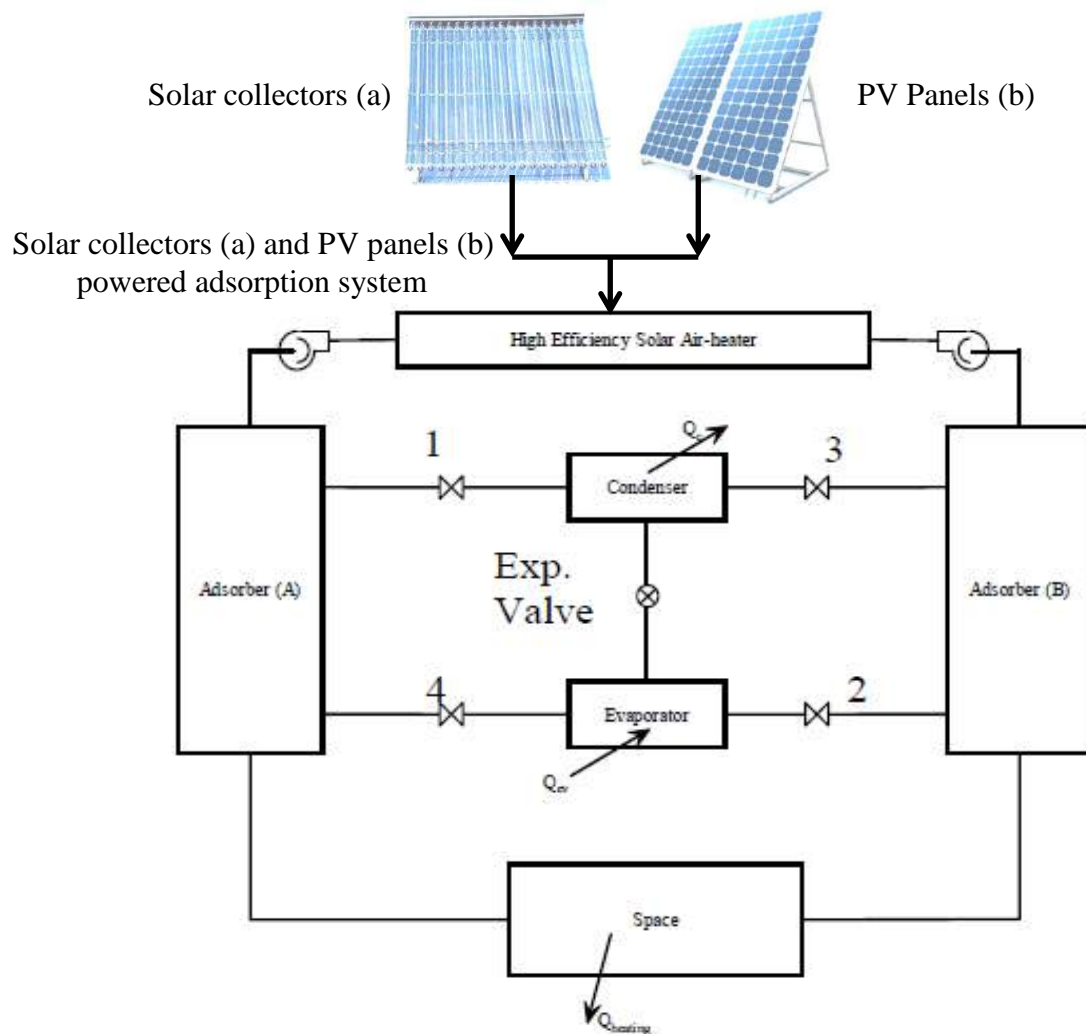


Figure (2): Block diagram for proposed system [5].

Mathematical Model

The mathematical model is built according to the model described in

[7] . The assumptions of this model are:

1. uniform the temperature and the pressure through the adsorbed whole

2. the water is a uniformly adsorbed
3. difference of the pressure are neglected between the absorber and condenser .
4. the saturated vapor inside the chamber.
5. the system has no heat loss to environment.

Components of the system used in the current study and shown in Figure (2) of the following parts: Photovoltaic solar panel, Solar collector system, in turn, consists of the complex solar thermal reservoir, Adsorption cooling system, Pumps and control equipment, Air handling unit or fan coil unit. Photovoltaic (PV) convert the solar radiation to electricity in terms of direct current (dc) using semiconducting materials. In adsorption system can be powered using PV where the PV panels produce dc electrical which is coupled to the electrical heater of the adsorption system. The main concerns in designing a PV adsorption system include suitably matching the electrical characteristics of the

$$Q_{Coll} = TF\dot{m}_c C_p (T_{f,o} - T_s) \tag{1}$$

Where TF represents a conversion function to control the temperature and is equal to one of eight in the morning until ten at seven and is zero for the rest of the hours [9].

$$\eta_{coll} = \frac{Q_{useful}}{A_a I_a} \tag{2}$$

Where, Q represents the output energy, A is aperture area of solar collector, I represents solar radiation.

$$\eta_{PV} = \eta_R [1 - \beta(T_C - T_R)] \tag{3}$$

Where, η_R represents the reference efficiency at 0 °C, β is a coefficient of variation of the photo-voltaic efficiency, T_C is the temperature of photo-

electrical heater powered the adsorption system with the available voltage and current being produced by the PV panels. The electricity production rate of being generated by a PV panels is typically based on solar radiation of 1000 W/m² and temperature of 25°C. Moreover, the electricity produced by a PV panels is as a parameter as the solar energy from which it is powered [8].

Basic governing equations used in the mathematical model to represent the system mathematically. To calculate the solar energy collected, where collected of solar energy and is represented mathematically as follows [9]:

The efficiency of solar collector for both photo-voltaic collectors and solar thermal collectors can be defined as following:

The efficiency of the photo-voltaic panels can be defined by the following equation as:

voltaic cell/panel, and T_R is the reference temperature. The available commercial photo-voltaic panels were ranged between 10-17% and it can

produce 1.5 kWh/m².day where the current is proportional to the light contact area.

The temperature of the photo-voltaic can be calculated based

$$T_{PV} = T_i + \frac{1 - FRQ_T}{F_R U_L} [1 - \beta(T_C - T_R)] \quad (4)$$

Where, T_i represents the inlet temperature, F_R is heat removal factor, Q_T is total energy, U_L loss coefficient, and A_c is the panels area.

$$m_s C_p \frac{dT_s}{dt} = \dot{m}_c C_p (T_{w,o} - T_s) + \dot{m}_p C_p (T_R - T_s) + (UA)_s (T_a - T_s) \quad (5)$$

Where

$$T_s = \frac{T_{s1} + T_{s2}}{2}$$

$$\frac{dT_s}{dt} = \left(\frac{\dot{m}_c C_p}{m C_p} T_{co} + \frac{\dot{m}_L}{m C_p} T_r + \frac{(UA)_s}{m C_p} T_a \right) - \left(\frac{\dot{m}_c C_p}{m C_p} + \frac{\dot{m}_L}{m C_p} + \frac{(UA)_s}{m C_p} \right) \left(\frac{T_{s1} + T_{s2}}{2} \right) \quad (6)$$

Where

\dot{m} Mass flow rate, \dot{m}_c Water mass flow rater through solar collector,

\dot{m}_L Water mass flow rate from storage tank

The adsorption rate can be written as [7]

$$x = 0.346 \left(\frac{P_s T_w}{P_s T_s} \right)^{1/1.6} \quad (7)$$

(1) the adsorber/desorber energy balance written as:

$$\frac{d}{dt} \left\{ m_a (C_a + C_{p,w} x) + C_{cu} M_{tube,ad} + C_{al} M_{fin,ad} \right\} T_a = m_a \Delta h \frac{dx}{dt} + (1 - \delta) C_{ww} m_a \frac{dx_{ads}}{dt} (T_e - T_a) + \dot{m}_{p,w} C_p (T_{ad,in} - T_{ad,out}) \quad (8)$$

$$\frac{T_{ad,out} - T_a}{T_{ad,in} - T_a} = e^{\left(\frac{-KA_{ad}}{\dot{m}_w C_{p,w}} \right)} \quad (9)$$

where $\delta=1$ for desorption process and $\delta=0$ for adsorption process, k is thermal conductivity

(2) the condenser energy balance

$$c_{cu} m_c \frac{dT_c}{dt} = \delta \left[-L m_a \frac{dx_{des}}{dt} + c_{wv} m_a \frac{dx_{des}}{dt} (T_c - T_a) \right] + \dot{m}_{cool} C_{pw} (T_{cool,in} - T_{cool,out}) \quad (10)$$

$$\frac{T_{cool,out} - T_c}{T_{cool,in} - T_e} = e^{\left(\frac{-KA_c}{\dot{m}_{cool} C_{p,w}} \right)} \quad (11)$$

(3) the evaporator energy balance

$$\frac{d}{dt} \left[(C_{pw} m_{e,w} + C_{cu} M_e) T_e \right] = (1 - \delta) \left[-L M_a \frac{dx_{ads}}{dt} + \dot{m}_{chill} C_{p,w} (T_{chill,in} - T_{chill,out}) \right] + \delta \left[\theta C_{p,w} (T_e - T_c) m_a \frac{dx_{des}}{dt} - (1 - \theta) L m_a \frac{dx_{des}}{dt} \right] \quad (12)$$

$$\frac{T_{chill,out} - T_e}{T_{chill,in} - T_e} = e^{\left(\frac{-KA_e}{\dot{m}_{chill} C_{p,w}} \right)} \quad (13)$$

where

$\theta = 1$ for $T_c \leq T_e$ and $\theta = 0$ $T_c > T_e$

(4) the equilibrium liquid refrigerated in evaporator

$$\frac{dm_{e,w}}{dt} = M_{e,o} - M_a \frac{dx}{dt} \quad (14)$$

(5) the mass equilibrium equations in process recovery

$$-m_a \frac{dx_{des}}{dt} + \dot{m}_{e,evap} = \dot{m}_{e,cond} + m_a \frac{dx_{ads}}{dt} = \dot{m}_{mr} \quad (15)$$

The evaporator energy equation in

$$\frac{d}{dt} \left[(C_{p,w} m_{e,w} + C_{cu} m_e) T_e \right] = -L\psi + \upsilon \dot{m}_{chill} C_{p,w} (T_{chill,in} - T_{chill,out}) \quad (16)$$

where

$\psi = \dot{m}_{e,evap}$ for the chamber desorbing and $\psi = \dot{m}_{e,cond}$ for the chamber adsorbing

And $\upsilon = 1$ for $T_e \leq T_{chill,in}$ and $\upsilon = 0$ for $T_e > T_{chill,in}$

We can calculate The pressure in the chambers by this equation:

$$P_{wv,des} - P_{wv,abs} = \frac{v_{wv} \dot{m}_{mr}^2}{2A^2} \quad (17)$$

the equation of Van Der Waals is calculate parameters of water vapor:

$$\left(P_{wv} + \frac{a}{v^2} \right) (v - b) = RT_{wv} \quad (18)$$

And the Refrigerating capacity Performance as follows:

$$Q_{ref} = \frac{\int_0^t C_{p,w} \dot{m}_{chill} (T_{chill,in} - T_{chill,out}) dt}{t_{cycle}} \quad (19)$$

heating power is

$$Q_h = \frac{\int_0^t C_{p,w} \dot{m}_h (T_{h,in} - T_{h,out}) dt}{t_{cycle}} \quad (20)$$

the performance of coefficient calculate from [10]

$$COP = \frac{Q_{ref}}{Q_h} \quad (21)$$

$$COP_h = \frac{\left(M_{wt} C_{p,w} \frac{dT_{wt}}{dt} + Q_{ads} \right)}{I_T A + Q_{aux}} \quad (22)$$

Results and Discussion

Figures (3), (4) and (5) show temperature profiles for hot, cooling and chilled water temperature for $\dot{m}_h = 0.6$ kg/sec, $\dot{m}_c = 1.4$ kg/sec and $\dot{m}_{ch} = 0.7$ kg/sec respectively. These represent process of heating or cooling. The outlet temperature of hot water is approach to the inlet temperature after adsorber. Figure (6) show hot water effect inlet on the coefficient of performance and change it with operating time of adsorption system, we show increase of COP at $T_{h,w}=60$ °C and decrease at $T_{h,w}=80$ °C and we show opposite behavior for refrigeration capacity (RC) in figure (7).

Figure (8) show the behavior of coefficient of performance with time of mass recovery of hot inlet water temperature at 60 °C and 80 °C respectively, we show increase the performance coefficient and with increasing the inlet temperature hot water and the steady state of mass recovery reach at 140 sec approximately. The same behavior in figure (9) for refrigeration capacity. Figures (10) and (11) show variation of refrigeration capacity and the performance coefficient with hot water temperature at chilled water 15 °C and 20 °C respectively, we show increase coefficient of performance with increase hot water temperature and the same behavior for refrigeration capacity.

Figure (12) show the behavior the performance coefficient with cooling water temperature, found the coefficient of performance is

decreased with increased cooling water temperature, the behavior in figure (13) for refrigeration capacity.

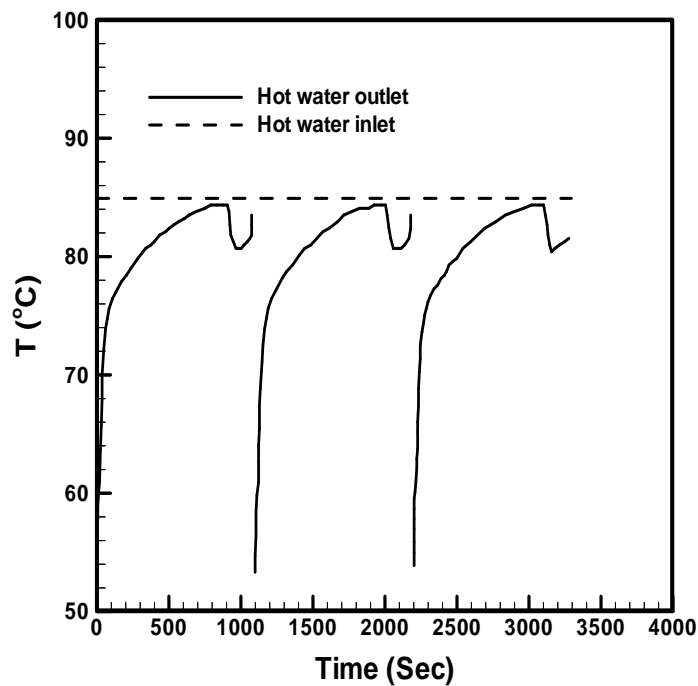


Figure (3): variation of hot temperature profile with operating time.

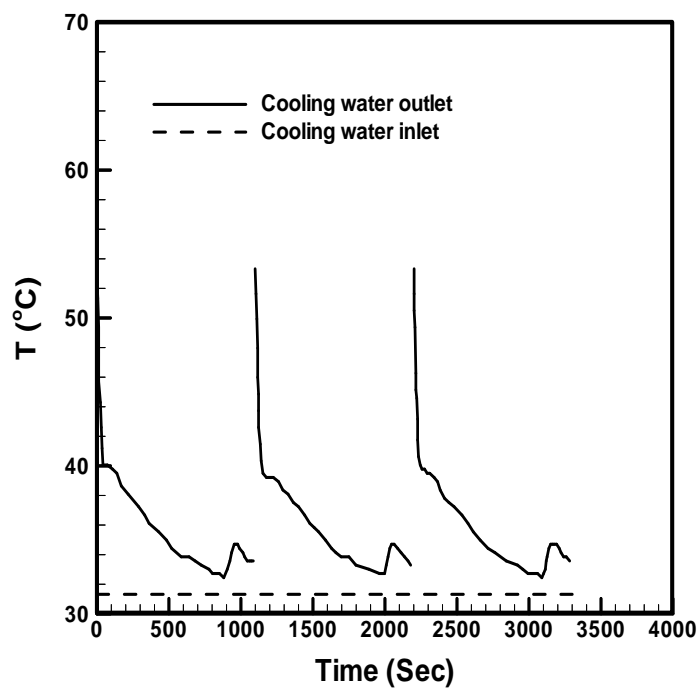


Figure (4): variation of cooling temperature profile with operating time.

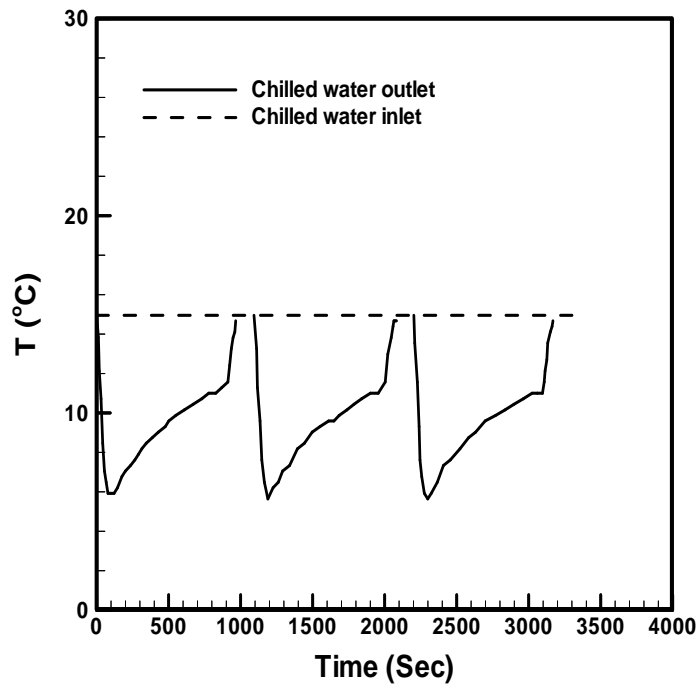


Figure (5): variation of chilled water temperature profile with operating time.

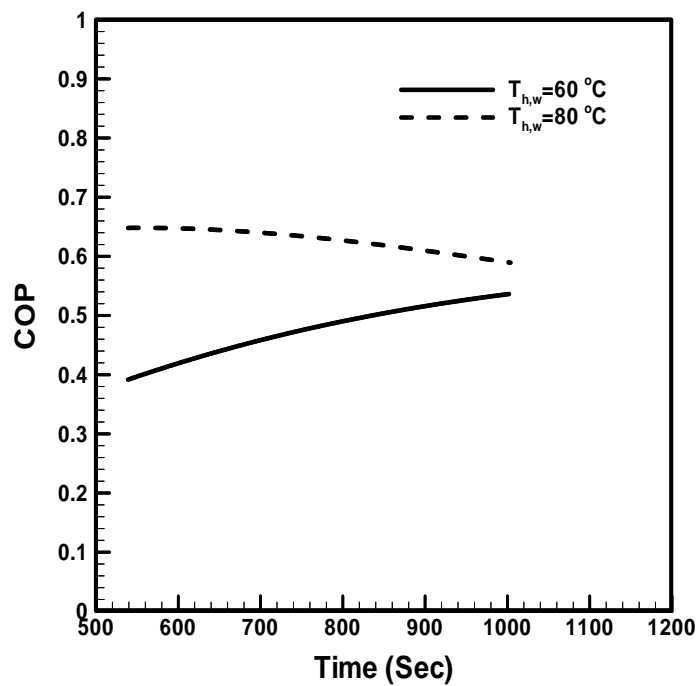


Figure (6): Variation of cooling time with coefficient of performance at different hot water inlet.

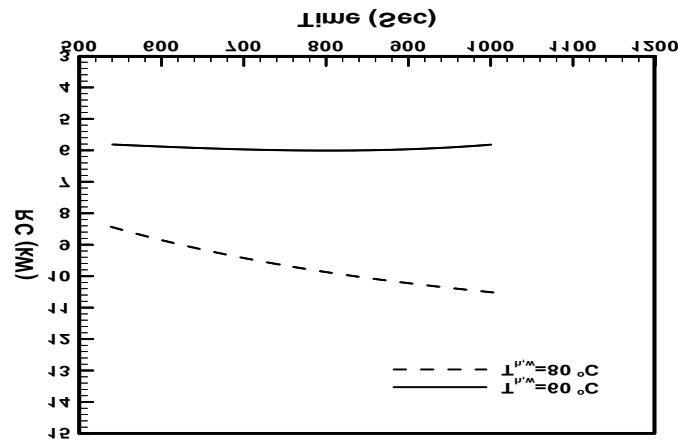


Figure (7): Variation of cooling time with refrigeration capacity at different hot water inlet.

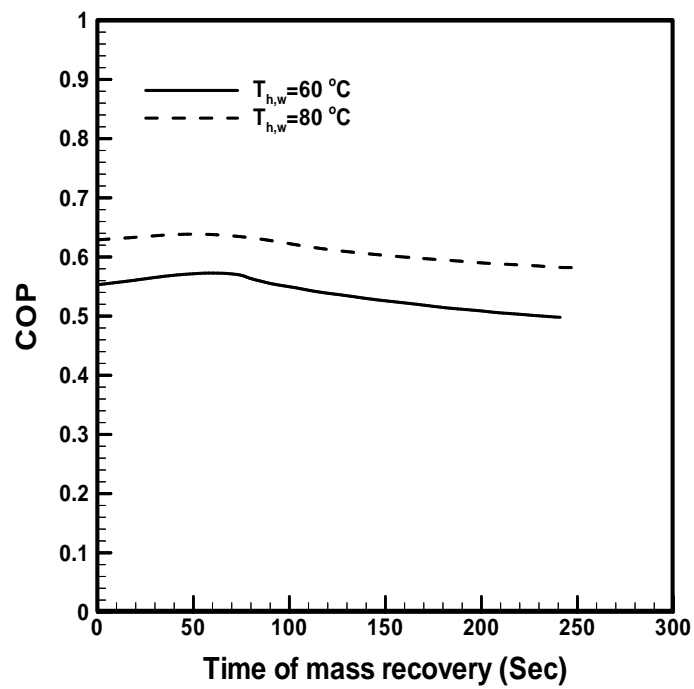


Figure (8): Variation of mass recovery time with coefficient of performance at different hot water inlet.

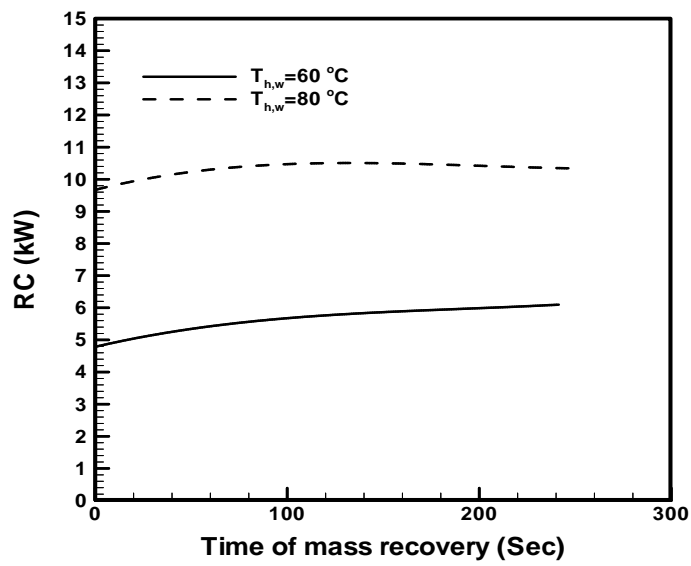


Figure (9): Variation of mass recovery time with refrigeration capacity at different hot water inlet.

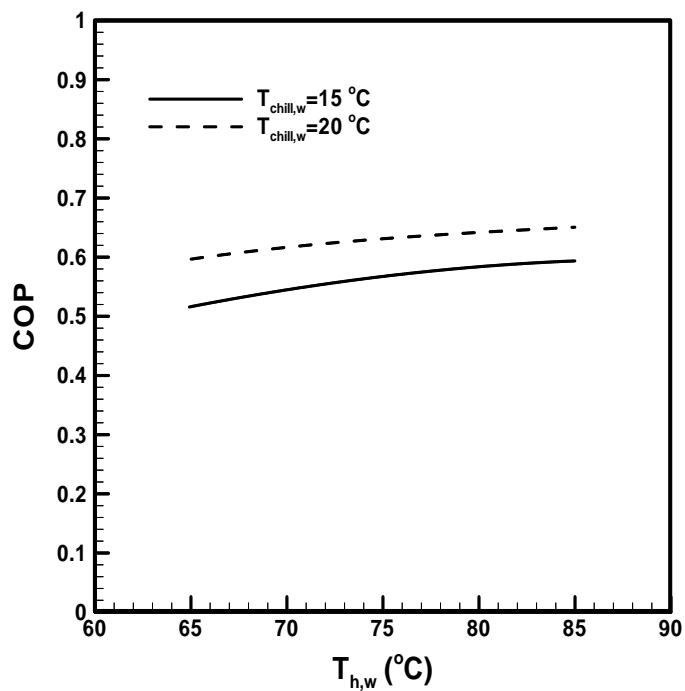


Figure (10): Variation of hot water inlet temperature with coefficient of performance at different chilled water inlet.

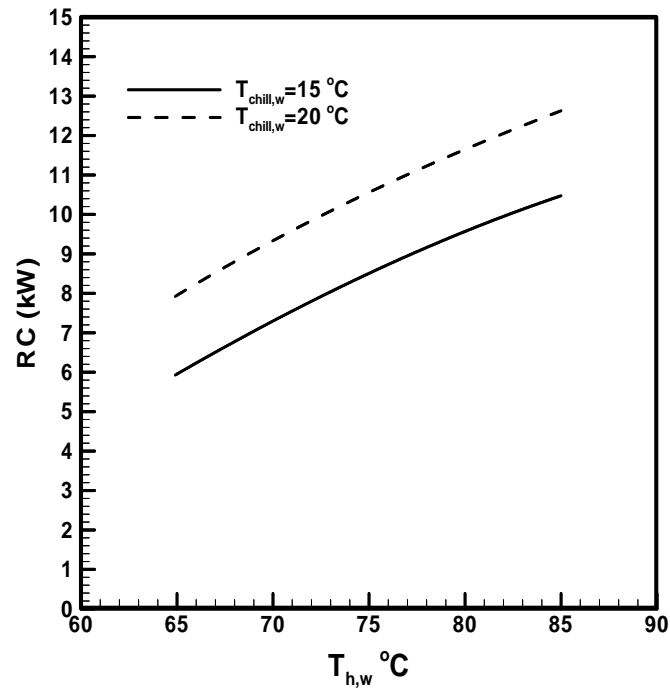


Figure (11): the temperature of inlet hot water and refrigeration capacity

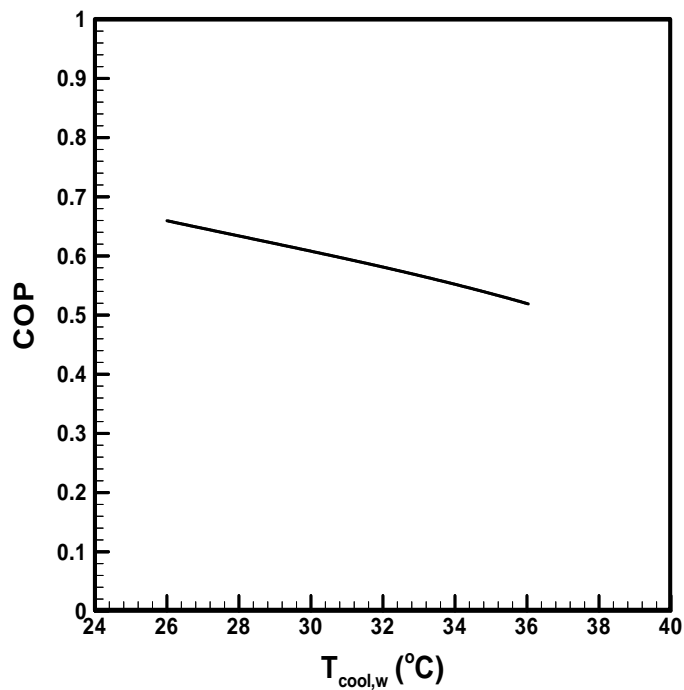


Figure (12): Variation of water cooling temperature with coefficient of performance.

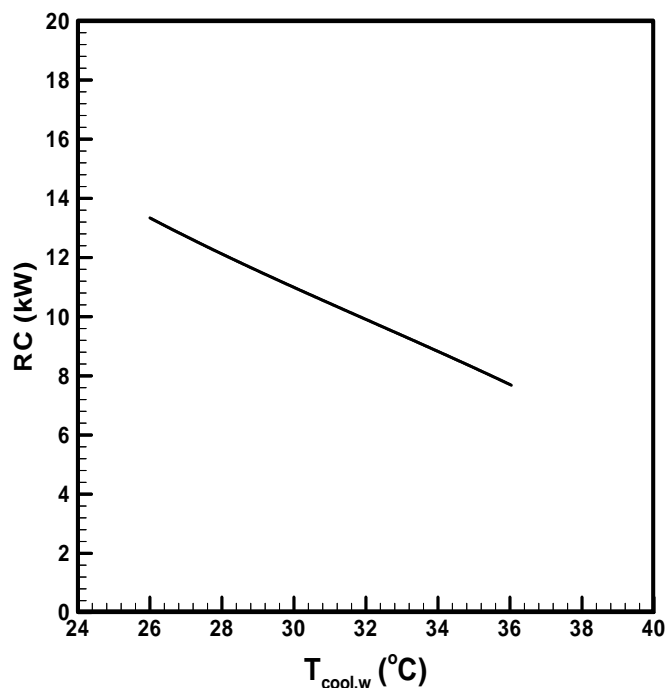


Figure (13): The cooling water temperature Variation with refrigeration capacity.

Conclusion

There is a significant amount from solar energy can be used at temperatures below 100 °C based on PV technology and thermal collectors. The exploitation of such energy can lead to a significant in energy saving which leads to reducing CO₂ emissions and the consumption of fossil fuel. This work investigated ability of using the low-temperature heat sources like solar energy in adsorption system powered by solar collectors and PV panels. The extract of the mathematical model is difficult due to the empirical characteristics of

adsorption theory, nonlinear system identification of adsorption processes. The COP for lower hot water temperature is increased with time processes of heating or cooling. The RC (refrigeration capacity) for high hot water temperature is increased with time processes of heating or cooling while the effect of low hot water temperature is low. The time of mass recovery reach at 150 sec. The COP and RC at chilled water temperature 20 °C is greater than it's from 15 °C. COP is decrease with increased cooling water

temperature and the same behavior for RC.

References

- [1] Dakkama HJ, Elsayed A, Al-Dadah RK, Mahmoud SM, Youssef P. Investigation of cascading adsorption refrigeration system with integrated evaporator-condenser heat exchanger using different working pairs. *Energy Procedia*. 2015; 75:1496-501.
- [2] R. Z. Wang and R. G. Oliveira, 2005, "Adsorption Refrigeration An Efficient Way to Make Good Use of Waste Heat and Solar Energy" International Sorption Heat Pump Conference, June 22-24, Denver, CO, USA.
- [3] Ahmed M. Qenawy and A. A. Mohamad, 2007, " Simulation of Double-Bed Cooling and Heating Hybrid Solar Adsorption Refrigeration Cycle" 2nd Canadian Solar Buildings Conference, Calgary, June 10 – 14.
- [4] Li Yong and Ruzhu Z. Wang, 2007, "Adsorption Refrigeration: A Survey of Novel Technologies", *Recent Patents on Engineering*, Vol. 1, No. 1, pp. (1-21).
- [5] Skander Jribi, Anutosh Chakraborty, Ibrahim I. El-Sharkawy, Bidyut Baran Saha, Shigeru Koyama, 2008, "Thermodynamic Analysis of Activated Carbon-CO₂ based Adsorption Cooling Cycles" *World Academy of Science, Engineering and Technology*, Vol. 43.
- [6] Vargas J. V. C., Sokolov M. and Bejan A., (1996), "Thermodynamic optimization of solar-driven refrigerators, *J. of Solar Energy Engineering*", vol.118, pp.130-136.
- [7] Constantin Alexandru Pandele, 2008, "Sorptions Processes in Space and Control System for Sorption Process", Master Thesis, Dept. of Space Science, Luleå University of Technology.
- [8] Kim DS, Ferreira CI. Solar refrigeration options—a state-of-the-art review. *International Journal of refrigeration*. 2008 Jan 31;31(1):3-15.
- [9] John A. Duffie and William A. Beckman, "Solar Energy Thermal Processes" Wiley New York, 1974.
- [10] M.Z.I. Khan, S. Sultana, A. Akisawa and T. Kashiwagi, 2006, "Numerical Simulation of Advanced Adsorption Refrigeration Chiller with Mass recovery" *J. Naval Architecture and Marine Engineering*, Vol. 3, pp. (59-67).

The Shortest Path to the Health Services in Baghdad Using the Improved Dijkstra Algorithm on mobile device

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Abstract

Shortest path problem is very significant in the study of transportation and communication network. Travelling is important part of daily life. Therefore the optimal shortest path (SP) to the particular destination becomes inevitable to reduce costs, losses in productivity, pollutions, and risks etc. An appropriate algorithm is used to find the shortest path between two known vertices is Dijkstra's algorithm which is submitted by the famous Dutch computer scientist Edsger W. Dijkstra, which was recognized as the optimal algorithm that can be applied to obtain the shortest path from a vertex (node) to any other vertex. In this paper design an android application based on improved Dijkstra algorithm which used constraint function and develop this algorithm by using priority queue and determine the source by GPS. This Application assist to find the shortest path to hospital from user location, time, distance, all hospital information related (like hospital name, contact number, e-mail, and specialization). It is helpful in terms of reducing transition time, effort, and cost. Android mobile's application considered as a guide for users toward the hospitals in Karada region from many locations within Baghdad city.

Keywords: Improved Dijkstra Algorithm, GPS, Mobile Application, Health services.

الطريق الاقصر للخدمات الصحية في بغداد باستخدام خوارزميه دايكسترا المحسنه على جهاز الموبايل

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الخلاصه

مشكلة المسار الاقصر جدا مهمه في دراسة التنقل وشبكة الاتصالات . التنقل هو جزء مهم في حياتنا اليوميه . لذلك السبب , اصبح المسار الاقصر الامثل لهدف معين لا مفر منه لتقليل الكلف , الخسائر بالانتاج , التلوث, والمخاطر ...الخ. الخوارزميه الملائمه لاجاد المسار الاقصر بين قمم او عقد معروفه هي خوارزميه الدايكسترا و التي قدمت من قبل عالم الحاسوب الهولندي المشهور اديسكير والذي عرفها كافضل خوارزميه التي من الممكن تطبيقها لاجاد المسار الاقصر من عقده الى اي عقده اخرى . في هذا البحث تم تصميم تطبيق اندرويد يعتمد على خوارزميه دايكسترا المحسنه التي تستخدم الداله الشرطيه وتطوير هذه الخوارزميه باستخدام الطابور المعتمد على الاولويه وتحديد المصدر بواسطه GPS . التطبيق يساعد في ايجاد الطريق الاقصر الى المستشفى من موقع

المستخدم، الوقت، المسافة، وجميع المعلومات المتعلقة بالمستشفى (مثل اسم المستشفى، ورقم الهاتف، البريد الإلكتروني، والتخصصات)، مفيد من حيث التقليل من وقت التنقل، الجهد، والتكلفة. يعتبر هذا التطبيق دليلاً للمستخدمين للتوجه نحو المستشفيات في منطقة الكرادة من مواقع عديده داخل مدينه بغداد.

الكلمات المفتاحيه : خوارزميه داكسترا المحسنه , نظام الموقع العام , تطبيق موبايل , الخدمات الصحيه .

1.

Introduction

Nowadays the transportation is important issue to travel from one place to another in efficient and easy way, reducing in time, cost, and effort through obtain a system that can give decisions in one of necessary domains in our daily life named health services domain [1]. Finding the shortest path to hospitals is implemented through this system by using the famous algorithm in graph theory known Dijkstra's algorithm to provide health service to all people who need this service and guide them to correct choice for route. Everyone wants easy access for their desired locations including all the requested details of the location [2]. Many people, whether they are patients or general people may benefit from this system in addition to pharmaceutical companies that need information about the specialties of a particular hospital for the purpose of providing drugs and medical supplies.

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hospitals various in their types, all these hospitals provide services for general people, most of these hospitals are free supporting by government and some other are not. Many regions and streets around Karada region within Baghdad are taken (about 75 regions and street) to test any location within these regions and find the shortest path from this location to all hospitals in Karada.

2.

Android Platform and Mobile Applications

Now a day, with the large expansion in the Internet, many information tools and systems have been modified dramatically. With the growth of mobile technology, smart mobile equipment such as smart phones become not only people's daily used tools, but also the lifestyle. A smart mobile equipment is promising being able to do almost everything that a personal computer can do from a common user perspective. Furthermore, mobile phones

are offered with flexibility, portability and instantaneity. Android is an open source mobile operation system developed by Google. Because of rapid development of smartphones, there are available variety of free and commercials applications of shortest path and spatial decision support systems where they are using various solutions. It has been become easy and efficient to build mobile application in the current study to accomplish task and provide simple technique for user to be used. The origin of android name is Greek word, the first part andr means “man” and the second part oid means “of the species”, in another words, it means “being human”. The definition of android is comprehensive, open and free platform which is designed mainly for touch screen mobile phones, like smart phones and tablet computers.

Android comprises operating system that is depending on the free linux kernel, the essential middle - ware, libraries, and key mobile applications [3]. Developers for Android are able to build their applications by using the software development kit (SDK) developed by Google. SDK contains APIs (Android Application Program Interfaces)) for android to provide a great services set of system in class files [4]. Android Mobile Application Development is depending on Java language codes. It permits developers to write codes in the Java language. The relational database SQLite is embedded into android to share information. The Android Development Tools (ADT) encompasses an emulator to run an Android system. Mostly the emulator is like the real android device which permits to test the application [5].

3. General System Architecture

The proposed system was built to find the nearest hospital from user. Improved Dijkstra algorithm has been used as a part of proposed system to provide the shortest path. The architecture of the proposed system in Figure (1), the Spatialite – gui (a GUI tool for SQLite or Spatialite) and android studio are used to contribute in implementation With a specific programming language like java language and Xml language (Extensible Markup Language) are used.

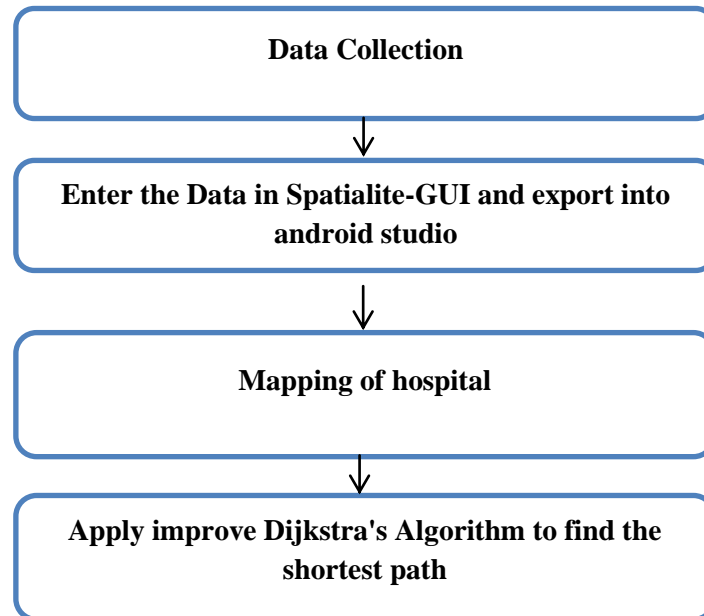


Figure 1: The Block Diagram of Proposed System

3.1 Data Collection

The data required for this mobile application is in the form of spatial data like the locations for hospitals, road nodes, edges of road network and the This spatial data are obtained through the process of digitizing base map of specific area and provide the locations coordinates for

the hospitals (longitude and latitude) by GPS (Table 1) and attribute data It collected by surveying of each hospital which contain name, departments, contact number, type of the health care provided and email id. All these information should be available for analysis. All the hospitals locate in Karada region.

Table 1: Karada hospitals and health services

ID	Names of hospitals	Longitude X	Latitude Y
1	Jenin Private Hospital	44.406140	33.293115
2	Al Khadria private hospital	44.408057	33.289154
3	Majeed private Hospital	44.412561	33.294193
4	AL-Jadiriiah private Hospital	44.422773	33.293669
5	Albishara private Hospital	44.419922	33.301658
6	Al Hayat Al Rahibat private Hospital	44.438857	33.306123
7	Al Alwaiya Children Teaching Hospital	44.451155	33.306968
8	Hay Babil clinic	44.459057	33.301019
9	Hospital St. Raphael	44.422376	33.307685
10	Dar Al Najat Private Hospital	44.429691	33.309638
11	Istishari Eyes private Hospital	44.431768	33.310776
12	International medical center	44.431897	33.311680
13	Ibn Al-Bitar Hospital for heart surgery	44.425919	33.310750
14	Al Alwaiya Private Hospital	44.426725	33.310866
15	Al Amal Private Hospital	44.429944	33.312066
16	Ibn Al Haitham Teaching Eye Hospital	44.429333	33.313023
17	Baghdad Private Hospital	44.426641	33.313406
18	Al-Jarah Private Hospital	44.426098	33.314250
19	Al Alwaiya center for dentistry	44.422201	33.313837
20	Shaikh Zayed Hospital	44.428439	33.316067
21	Al-Amal National Hospital for tumor treatment	44.429914	33.316695
22	Al Wasay Hospital for orthopedic surgery	44.432055	33.318399
23	Al-Elwiya Educationl Hospital	44.433393	33.319477
24	Ibn AL Nafees Hospital	44.427956	33.318041
25	Al Rafidain Private Hospital	44.427748	33.318943
26	al taj Private hospital	44.426925	33.321367
27	Ibn Rushd Psychiatry Hospital	44.425534	33.318143
28	AL- Ferdows Private hospital for ophthalmology	44.422991	33.316381
29	Al-Saadoon Private hospital	44.421368	33.317785
30	AL- Ferdows Private hospital	44.419148	33.318000
31	Kamal Al Samerra'y hospital	44.425634	33.317259

3.2: Enter the Data in Spatialite-GUI and export into android studio

The Spatialite–GUI has been used to store all information about Karada hospitals, nodes and edges of roads network. It is an open source Graphical User Interface (GUI) tool supporting Spatialite or SQLite.

3.3 Mapping of hospitals

The coordinates of the thirty one hospitals and health centers were taken by using Global Positioning System (GPS), then these hospitals mapping on map as a point (Figure2).



Figure 2: Mapping Hospitals on Study Area

3.4 Apply Improve Dijkstra's Algorithm to Find the Shortest Path

This stage is very important because it's the core of the proposed system. Implementation of the Dijkstra algorithm done after finishing the preparation of the all roads edges (streets), roads nodes (intersections), the hospital nodes, and map of study area , then

deciding the shortest path depend on this roads network. This search algorithm was implemented on the map after getting the start location of GPS and selects the desired hospital. The task of the algorithm is to find the shortest path to this hospital. Algorithm (1) illustrates the improved Dijkstra algorithm. The general sequence of processing the implementation of this algorithm explained in Figure (3).

Algorithm 1: Improved Dijkstra

Input: weighted Graph (G), // contains all node and edges for roads
 Source, // start node in graph to begin the algorithm
 Multiple destination // the hospitals

Output: shortest path from [source] to all multiple destinations in G

Process:

Step 1: Begin
 If GPS coordinates = node then // node is one of road nodes
 Source = node
 dist [source]=0, else // Distance from source to source
 nodes ∈{BBOx (location, r)} // Bounding Box is an area defined by min longitude- min latitudes -max longitude -
 max latitude, r is the radius from current location
 for each node in nodes
 Distance [node, location]
 End for
 Mindistance [node] = minimum {Distance [node, location]}
 Source= mindistance [node]
 end

Step 2: for each vertex v in Graph // Initializations

Step 3: dist [v]:=infinity // Unknown distance function from source to v

Step 4: previous[v]:=undefined // Previous node in optimal path from source

Step 5: end for

Step 6: add source to Queue

Step 7: if source = target

Step 8: return;

Step 9: while Queue is not empty // the main loop

Step 10: u: =vertex in Q with min dist[u] // source node in first case

Step 11: remove u from Q

Step 12: for each adjacencies of u:

Step 13: calculate angle

Step 14: If $(-\frac{\pi}{2} \leq \text{angle} \leq \frac{\pi}{2})$

Step 15: continue

```

Step 16: improved=impact*cos (angle (edge))
Step 17: distanceThroughU=dist [u] + edge.weight + improved
Step 18: if distanceThroughU<dist[v]           // A shorter path to v has been found
Step 19: dist[v] =distanceThroughU
Step 20: previous[v] = u
Step 21: end if
Step 22: end for
Step 23: end while
24  return dist [], previous []
25  end
    
```

Flowchart in **Figure (3)** explains how the algorithm works. The details definition of the elements used as explained below:

GPS: Current location (longitude (x), latitude (y)).

Nodes and Edges data base: The SQLite or Spatialite data base for nodes and edges of roads.

Intersection nodes ∈ Bounding Box: Contain the neighbors nodes from current location in bounding box when the current node not one of roads nodes.

Queue list: Using a priority queue instead of list because the queue is more efficient and it taking less memory storage.

Min {Di}: The nearest node from current location.

d: The shortest path weight value from start location to current node. The weights of roads edges available in meter when downloaded from OSM, it must convert to kilometer and then to decimal (decimal is equal 110 km on the earth) when insert it in equation of improved Dijkstra algorithm as follow:-

$$\text{Weight} = (\text{weight}/1000) / 110$$

The result is a weight in decimal degree, which can be handled in equation where also the impact factor in decimal degree.

r: Constraint function.

w: Impact factor, the value used is 0.05 decimal degree . The 1 decimal degree is equal about 110000m on the earth, so:

$$0.05 * 110000 = 5500 \text{m (impact factor in meter is 5500)}$$

Cosθ: Is the angle between the vector that consist of nodes from starting point to current node and the vector that consist of nodes from starting point to the end point, the spatial reference of these points is (3857) for ESRI company maps[6].

The angle has been get between two points a and b as in equation (3.1) [7].

Angle = atan2 (b. y, b. x) – atan2 (a. y, a. x) (1)

And this angle range is: $-\pi/2 \leq \text{angle} \leq \pi/2$

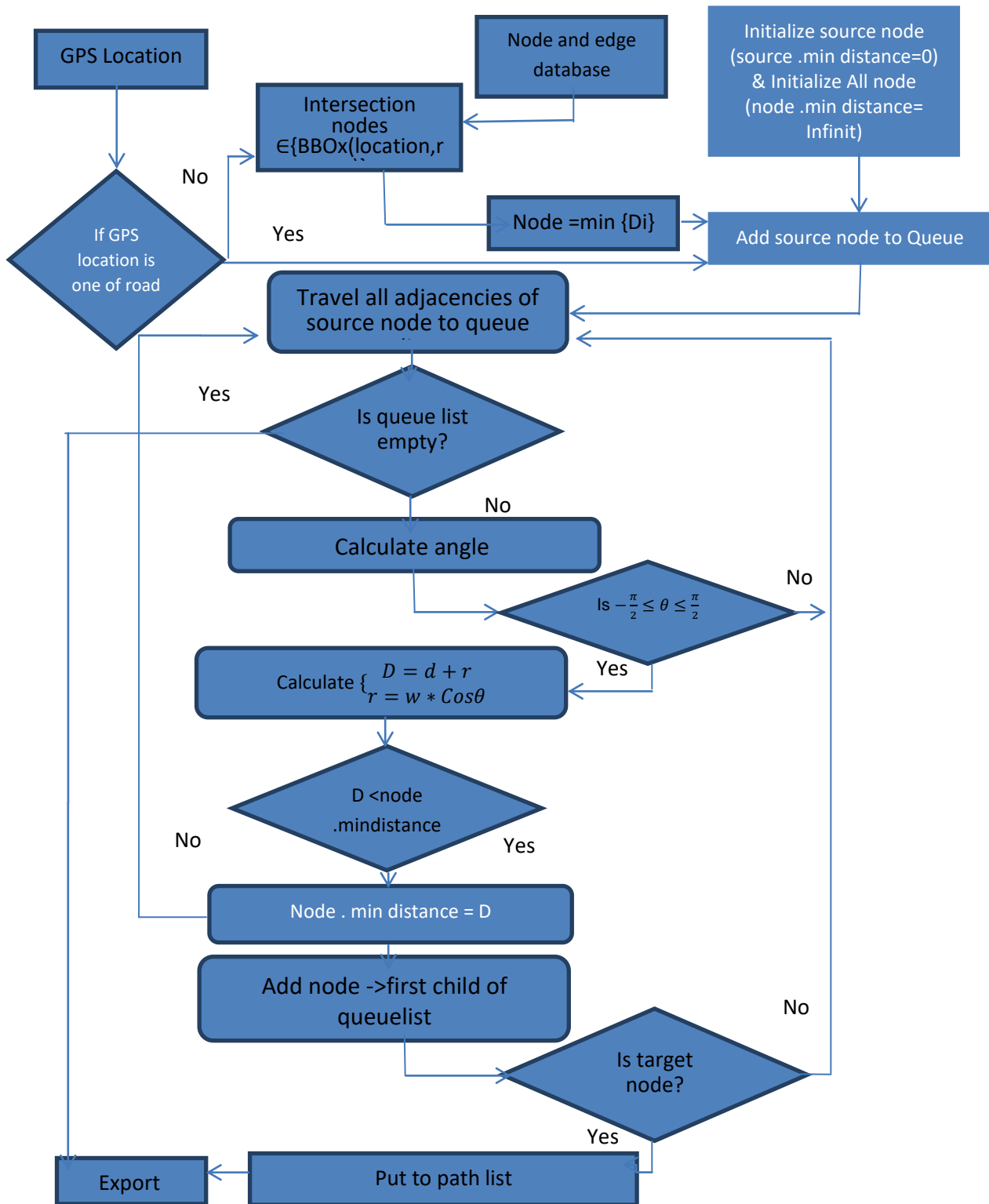


Figure 3: The Flowchart for Improved Dijkstra Algorithm

4. Proposed System Implementation

A virtual device called AVD (Android Virtual Device) is provided by Android studio to each application test. The device is independent in its running and run only one application at a time. This AVD is useless unless install the operating file for SDK, there is some factors that limit the virtual device such as speed. Generally the virtual device is much slower than a real device, it can use the Genymotion as a relatively fast Android emulator which suitable for application testing. Genymotion is definitely faster than the AVD manager, also contains the GPS where specific coordinates can be entered for testing the application.

The user is any person who wants to use this mobile application to benefit from the health services submitted by this application. The system of Android application begin from getting the current location of the user (longitude and latitude) from mobile GPS or can determine the specific coordinates of GPS in Genymotion emulator in windows system of computer. When the user chooses from menu as in Figure (4) and determine the options. The system starts to implement all the requirements. The user can select a particular hospital by Clicking the menu and select the desired hospital from the suggest hospitals (Figure 5).

The shortest path appear on map to hospital and all the details of this hospital also appear above it. User can zoom in and zoom out the map on screen.

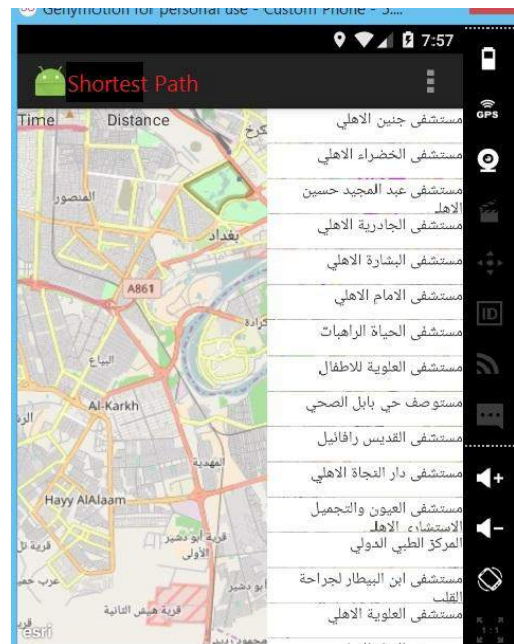
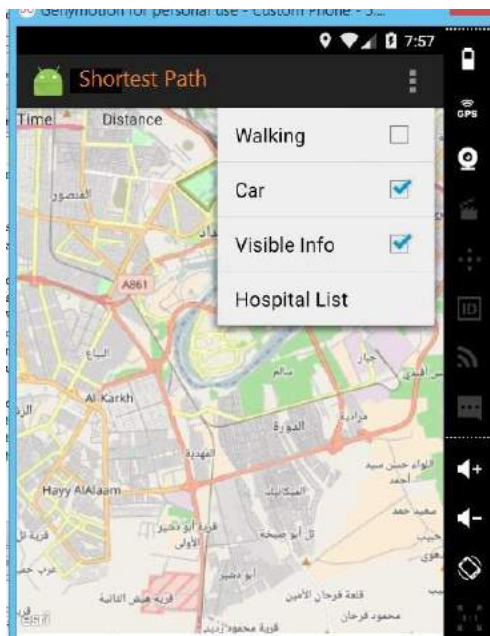


Figure 4: Interface Screen of the Shortest Path Application

Figure 5: The Hospitals Menu in Application

5. Experimental Results

The user should be selected options to activate the application. The shortest path application gives the user the shortest path to hospital with time and distance (Figure 6), in addition to the details about the hospital.

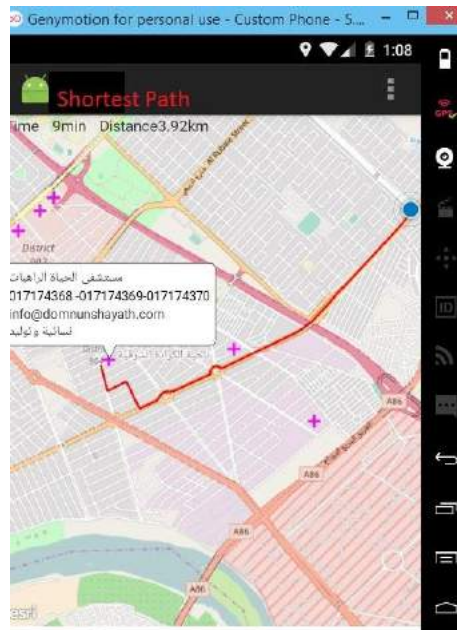


Figure 6: The Shortest Path to Hospital by Mobile Application

The current location (taken by GPS) is either one of the road nodes or close to the road nodes, in the lastly state the mobile application takes node that closest to the current location to start executing the algorithm, the representation for the two cases in the following points :-

1. The current location node not one of road nodes, as a result take the closest node to the current location and considered it the start of the algorithm to find the shortest path (Figure 7), the current location is indicated by blue circle (●) and the start of the red line is the shortest path begin at one of road node which closest to the current location.

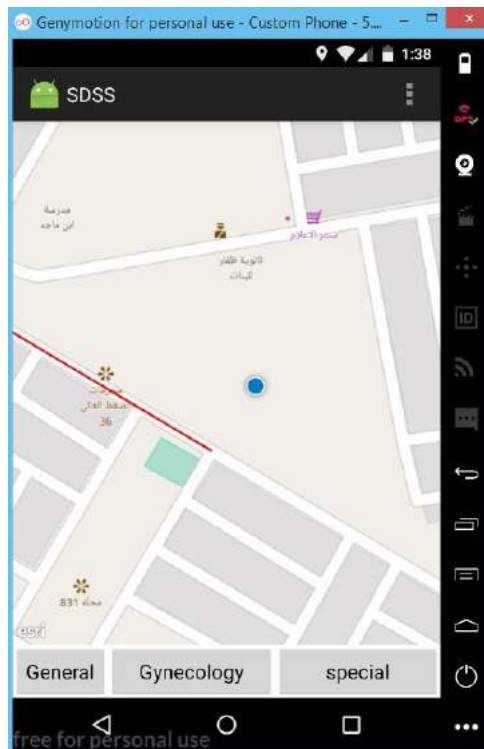


Figure 7: The Current Node not One of the Road Nodes

2. The current location node is one of road nodes, as a result take this node considered it the start of the algorithm to find the shortest path (Figure 8), the current location is indicated by blue circle (●) and the start of the red line is the shortest path begin at this road node.



Figure 12: The Current Node is One of the Road Nodes

Also to compare between improved Dijkstra algorithm in proposed system and traditional Dijkstra algorithm can get the results shown in Table (2)

Table 2: Comparison between Improved and Traditional Algorithm in both Search Nodes and Search Time

Start point	Target	Conventional algorithm		Improved algorithm		Weighted Value (Impact factor)
		N	T	N	T	W
Latitude 33.286671 Longitude 44.354340	1	18731	741	4239	238	800
		18731	741	4165	212	5500
	2	18731	995	4230	217	800
		18731	995	4148	143	5500
	3	18731	895	4240	174	800
		18731	895	4169	152	5500
Latitude 33.292424 Longitude 44.391555	1	18725	768	3463	129	800
		18725	768	3369	113	5500
	2	18725	967	3036	141	800
		18725	967	2890	152	5500
	3	18725	577	3473	143	800
		18725	577	3380	127	5500
Latitude 33.295412 Longitude 44.425212	1	18707	673	14057	610	800
		18707	673	13769	468	5500
	2	18707	1015	14010	450	800
		18707	1015	13846	732	5500
	3	18707	777	14057	703	800
		18707	777	13789	877	5500

N is referring to nodes, T is the time for search in milliseconds and W is a weighted value. From the results of the table, we can note that by taking a specific point and applying the improved Dijkstra algorithm based on the search strategy to find the distance between this point and the first three hospitals from the menu in the mobile application for sequence (1, 2, 3). The number of the search nodes and the search time decreases when using this algorithm compared with the conventional algorithm because in improved algorithm it ignores reverse nodes that not led to the goal. The number of nodes is reduced about 77% and the time about 73% than conventional algorithm. Besides it is possible to observe from experimental results the weighted value (impact factor) is flexibly changed where it can see that when using impact factor (5500), the number of nodes and time consuming are reduced than when using (800). The selection of impact factor is very important. When $d(n)$ in equation of constraint function is large, it should set the impact factor to large value in order to the constraint function $r(n)$ not much less than $d(n)$ because if verified lastly case or the $r(n)$ equals to 0, there is no constraint

function and the algorithm is considered as conventional not improved. The constraint function in this improved algorithm directs the search towards the destination node in the complex network.

6. Conclusion

The large growth of technology in mobile applications assist people in daily life in various domains and especial in this study provide the health services to everyone need it. This application considered excellent guide for user or patient to benefit from its services by decrease time, cost, and effort by finding the shortest path to the hospitals from user location, most appropriate roads, time, distance, and all information related to this facilities. The improved Dijkstra algorithm its better than traditional algorithm because it reducing nodes number and consuming time.

References

- [1] Amrapali Dabhade, K.V. Kale and Yogesh Geda, Network Analysis for Finding Shortest Path In Hospital Information System, International Journal of Advanced Research In Computer Science and Software Engineering, 5(7):618-623, 2015.
- [2] Suneet Naithani, Abhishek Choudhry and Sandeep Chauhan, Decision Support System for Emergency Response, Scholarly

Research Journal for Interdisciplinary Studies, II/IX: 680-687, 2013.

[3] Semertzidis, K., Mobile Application Development to Enhance Higher Education Lectures, M.Sc. thesis, University of York, 2013.

[4] Poonam Bedarkar and Hemlata Meharkure, Literature Review on Android Application Developed on Eclipse Software, International Journal on Recent and Innovation Trends in Computing and Communication, 3(2):75-79, 2015.

[5] Bedarkar, P. and Meharkure, H., Literature Review on Android

Application Developed on Eclipse Software, International Journal on Recent and Innovation Trends in Computing and Communication, 3(2):75-79, 2015.

[6] Srinath, D., Assorted GIS Utilites, M.Sc. thesis, Faculty of San Diego State University, 2014.

[7]. Dragos Niculescu and Badri Nath, VOR Base Stations for Indoor 802.11 Positioning, MobiCom 4 Proceedings of the 10th Annual International Conference on Mobile Computing and Networking, Philadelphia, USA, 26 September - 1 October, 2004.

Determination of selenium concentration and glutathione concentrations in preeclampsia women in Balad city- Salah al-deen governorate.

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Abstract

Background: Selenium concentration was measured in women under oxidative stress and was found lower than normal healthy women. Also, there was significant reduction in serum Se in type 2 diabetic patients. Whole blood and plasma selenium and red cell glutathione concentrations were significantly lower in the patients with chronic liver disease as compared with the normal healthy controls. The **aim** of the study is Determination of selenium concentration and glutathione concentrations in preeclampsia women in Balad city- Salah al-deen governorate. **Subjects and methods:** A cross sectional study was done in Balad hospital – Salah al-deen governorate. A 90 pregnant women were participated in the present study, (60 women with pregnancy induced hypertension and 30 normotensive pregnant women). In the present study, there is significant elevation in the concentration of MDA in the serum of hypertensive pregnant women as compare with normotensive pregnant women, ($p \leq 0.01$). However, there is significant reduction in the concentration of glutathione (GSH) in the serum of hypertensive pregnant women as compare with normotensive pregnant women, ($p \leq 0.01$). Also, there is significant reduction in the concentration of serum selenium in the serum of hypertensive pregnant women, as compare with normotensive pregnant women, ($p \leq 0.01$). The present study **concludes** that there was a highly significant trend for decreasing plasma selenium concentrations in hypertensive pregnant women as compare to normal pregnant and pre-eclamptic women.

Key words: Pregnant women, hypertension, MDA, GSH, selenium.

الخلاصة

الخلفية: تم قياس تركيز السيلينيوم في النساء تحت الضغط التأكسدي ووجد أنه أقل من النساء السليمات. أيضا، كان هناك انخفاض كبير في مصل الدم في مرضى السكري من النوع الثاني.

كان تركيز الدم والسيلينيوم في الدم الكامل وتركيزات الجلوتاثيون في الخلايا الحمراء أقل بشكل ملحوظ في المرضى الذين يعانون من مرض مزمن في الكبد مقارنة مع الضوابط الصحية الطبيعية. الهدف من هذه الدراسة هو تحديد تركيز السيلينيوم وتركيزات الجلوتاثيون لدى نساء التي لديهن مقدمات في ارتفاع ضغط الدم. المواد والطرق: تم إجراء دراسة مقطعية في مستشفى البلد - محافظة صلاح الدين. وشارك 90 امرأة حامل في هذه الدراسة ، (60 امرأة مع ارتفاع ضغط الدم الناجم عن الحمل و 30 من النساء الحوامل طبيعيات) في هذه الدراسة ، هناك ارتفاع كبير في تركيز المألونداي الدهايد في مصل الحوامل المصابات بارتفاع ضغط الدم MDA في مصل النساء الحوامل المصابين بارتفاع ضغط الدم مقارنة مع النساء الحوامل ومع ذلك ، هناك انخفاض معنوي في تركيز الجلوتاثيون مع النساء الحوامل المصابات بارتفاع ضغط الدم مقارنة مع الحوامل طبيعيات. ، ($p \leq 0.01$) أيضا ، هناك انخفاض معنوي في تركيز السيلينيوم في مصل النساء الحوامل المصابات بارتفاع ضغط الدم ، بالمقارنة مع النساء الحوامل طبيعيات. ، ($p \leq 0.01$). تلخص الدراسة الحالية: إلى أنه كان هناك اتجاه مهم للغاية بان هنالك انخفاض تركيز السيلينيوم في البلازما في الحوامل المصابات في ارتفاع ضغط الدم مقارنة مع من الحوامل طبيعيات.

الكلمات المفتاحية: النساء الحوامل، ارتفاع ضغط الدم، المألون داي الدهايد، كلوتاثيون و السلييوم.

Introduction

The role of Se in health has been widely studied in the past two decades; however, there are still gaps in our understanding of the biology of this element, especially concerning the possible roles of Se in human metabolism, the bioavailability and relative effectiveness of different sources and chemical forms of Se (1, 2), and the value

of supra-nutritional supplementation (i.e., greater than recommended daily intake) for chemoprevention of disease (3,4).

Selenium concentration was measured in women with oxidative stress and was found lower than normal healthy women, (4). Also, there was significant reduction in serum Se in type 2 diabetic patients, (5).

Whole blood and plasma selenium and red cell glutathione concentrations were significantly lower in the patients with chronic liver disease as compared with the normal healthy controls, (6).

Se content in blood varies widely, depending on various factors such as the Se content of soil (which influences the Se content of foods), dietary intake, age, and furthermore the errors inherent in the various methods of analysis. In the blood of normal adults, people in New Zealand showed the lowest values with 54 ± 1 ng/ml (n =113) in whole blood, 66 ± 3 ng/ml (n =109) in erythrocytes, and 43 ± 2 ng/ml (n =109) in plasma, (7). Selenium (Se) content in blood varies widely, depending on various factors such as the Se content of soil (which influences the Se content of foods), dietary intake, age, and furthermore the errors inherent in the various methods of analysis. In human its deficiency of selenium level falls during oxidative stress, (8).

The **aim** of the study is to determine selenium concentration in preeclampsia pregnant women in Balad city.

Patients and methods

A cross sectional study was done in Balad hospital – Salah al-deen governorate. 90 pregnant women were participated in the present study; 60 women with pregnancy induced hypertension and 30 normotensive pregnant women.

Cases were defined on admission with a clinical diagnosis of preeclampsia, defined as a systolic blood pressure of ≥ 140 mm Hg and diastolic pressure (Korokoff V) of ≥ 90 mm Hg on 2 occasions after 20 weeks gestation in a previously normotensive women and proteinuria > 300 mg/L, 500 mg/day or 2+ on dipstick analysis of midstream urine (MSU) if 24-hour collection result was not available. Medical and obstetric histories, including delivery data, were obtained for each woman.

Five ml of blood was taken from every pregnant woman. *Biochemical measurements:* The plasma concentration of TBARS (a global measure of lipid peroxidation) was measured by the method of Urchiyama and Milhara. Samples were assayed in duplicate; the within- and between-assay coefficients of variation were 4% and 5% respectively. Serum

malondialdehyde was determined as conjugate with TBA, serum proteins were precipitated by TCA and then removed by centrifugation. The MDA –TBA complex was measured at 534 nm, (9). While, serum glutathione (GSH) was measured by reacting with 5'5-dithiobis (2-nitrobenzoic acid), which reacts with sulfhydryl groups, to develop a stable color. The absorbance was measured at 412nm, (9). Selenium was measured by atomic absorption.

All data were presented as a mean and standard deviation. P value less than 0.05($p \leq 0.05$), was accepted as a significant value.

Results

Table 1 shows the characteristic features of preeclampsia patients and normal healthy women. There were significant elevations in body weight and body mass index, (BMI), of hypertensive patients as compare with normotensive pregnant women, ($p \leq 0.01$).

Table 1 show the mean and SD of blood pressure, (BP), there is significant elevation in systolic blood pressure of patients, (148.4 ± 6.7 mmHg), as compare with

control healthy pregnant women, (115.4 ± 8.4 mmHg), ($p \leq 0.01$). Moreover, there is significant elevation in diastolic blood pressure of patients, (97.1 ± 7.5 mmHg), as compare with control healthy pregnant women, (74.5 ± 6.4 mmHg), ($p \leq 0.01$)

Table 2 show the mean and standard deviation of serum MDA, GSH and selenium in hypertensive and normotensive pregnant women. There is significant elevation in the concentration of MDA in the serum of hypertensive pregnant women as compare with normotensive pregnant women, ($p \leq 0.01$). However, there is significant reduction in the concentration of glutathione (GSH) in the serum of hypertensive pregnant women as compare with normotensive pregnant women, ($p \leq 0.01$).

Also, there is significant reduction in the concentration of serum selenium in the serum of hypertensive pregnant women, (161.3 ± 78 ug/l) as compare with normotensive pregnant women, (215.6 ± 98), ($p \leq 0.01$).

Discussion

In the present study, there were significant elevations in body weight and body mass index, (BMI), of hypertensive patients as compare with normotensive pregnant women, ($p \leq 0.01$). Moreover, there is significant elevation in diastolic blood pressure of patients, (97.1 ± 7.5 mmHg), as compare with control healthy pregnant women, (74.5 ± 6.4 mmHg), ($p \leq 0.01$). So, the study compare between hypertensive and normotensive pregnant women regarding MDA, GSH and serum selenium.

In the present study, there is significant elevation in the concentration of MDA in the serum of hypertensive pregnant women as compare with normotensive pregnant women, ($p \leq 0.01$). However, there is significant reduction in the concentration of glutathione (GSH) in the serum of hypertensive pregnant women as compare with normotensive pregnant women, ($p \leq 0.01$). The elevation in serum MDA in hypertensive pregnant women is due to increase the generation of reactive oxygen species (ROS) due to excessive oxidative damage generated in hypertensive pregnant women, (10, 11).

At present the source of the lipid peroxides in preeclampsia is unknown, but it has been suggested that poorly perfused placental tissue may evoke a free radical cascade and increase in generalized lipid peroxidation, (12). By entering the maternal circulation, these lipid peroxides could affect the maternal endothelial cellular membranes by the increased production of ROS, thus contributing to the maternal vascular dysfunction, (13). In similar study, it was found that there was a significant reduction GSh and elevation in MDA, (10).

In the present study, there is significant reduction in the concentration of serum selenium in the serum of hypertensive pregnant women, (161.3 ± 78 ug/l) as compare with normotensive pregnant women, (215.6 ± 98), ($p \leq 0.01$). Selenium is a unique element in that; it takes the place of sulfur in cysteine to form 21st amino acid selenocystine that is directly prosthetic groups or co-factors, (15).

The selenium concentrations are further reduced in normal pregnancies, illustrating a possible increased requirement

for selenium during pregnancy. However, this could also be due to inadequate absorption from the gastrointestinal tract, or inadequate renal reabsorption in the face of the increased glomerular filtration rate of pregnancy, (16).

Moreover this study also observed a further significant reduction in maternal selenium concentrations in the pregnant women with preeclampsia as compared to both the normal pregnant women, (17). The lower selenium concentrations seen in preeclampsia might adversely affect the functional activities of the selenoproteins, GPx, thus compromising the protection against oxidative stress. Also, a recent report linked increased selenium intake over two years with significantly decreased excretion of the major thromboxane metabolite, (18). An early imbalance between thromboxane and prostacyclin synthesis has been implicated in the pathogenesis of preeclampsia over the last 20 years (19, 20).

The selenium concentrations in the non-pregnant women were lower than the recommended levels, as observed in other studies, suggesting that the

selenium concentrations may not actually be high enough for optimum GPx activities even in the non pregnant population, (4). The reduction in serum GSH may due to increase turnover of antioxidants for preventing oxidative damage in hypertensive pregnant women, (12). However, the present study not agrees with previous finding, (14).

Hypertension in the pregnant women could be because of, under pathophysiological conditions, increased levels of ROS contribute to vascular dysfunction which results in hypertension (12).

The level of MDA in placenta of preeclampsia women is higher than its level in normal pregnancies. Significant elevation of MDA during pregnancy. This elevated level of MDA can lead to huge damage in endothelial which result in provocation of diastolic pressure (20-22). Overproduction of Reactive oxygen species (ROS) in hypertensive pregnant women can lead to significant damage in important biomolecules such as oxidization of the lipid of erythrocyte membrane. This oxidized effects of ROS result in elevation of MDA level. (23).

This study showed there is strong relationship between oxidative stress and oxidation or depletion of GSH; this is clear in hypertensive group compared with normal one. This is due to GSH defenses against oxidative damage in hypertensive individuals. Since oxidative stress is significantly high, there was reduction in GSH level. Also, GSH act as a cofactor by cellular glutathione peroxidase (Gpx-1) to reduce H₂O₂ and organic hydroperoxides, (23,24).

The present study **concluded** that there was a highly significant trend for decreasing plasma selenium concentrations in hypertensive pregnant as compare to normal pregnant.

If selenium deficiency is confirmed in women suffering from preeclampsia, and continues to be linked with GPx inadequacy, consideration could be given to a randomized controlled trial of selenium supplementation in pregnancy or advice pregnant women to take fruit and vegetables rich in selenium and other trace elements, (21, 22).

References

- 1-Taylor, J.B., J.W. Finley, and J.S. Caton. 2005. Effect of the chemical form of supranutritional selenium on selenium load and selenoprotein activities in virgin pregnant, and lactating rats. *J. Anim. Sci.* 83:422–429.
- 2-Pedrero, Z., and Y. Madrid. 2009. Novel approaches for selenium speciation in foodstuffs and biological specimens: A review. *Anal. Chim. Acta* 634:135–152.
- 3-Rayman, M.P., and S. Stranges. 2013. Epidemiology of selenium and type 2 diabetes: Can we make sense of it? *Free Radical Biol. Med.* 65:1557–1564.
- 4- Klotz, L.O., K.D. Kröncke, D.P. Buchczyk, and H. Sies. 2003. Role of copper, zinc, selenium and tellurium in the cellular defense against oxidative and nitrosative stress. *J. Nutr.* 133:1448S–1451S.
- 5- Kornhauser, C., J.R. García-Ramírez, K. Wrobel, E.L. et al. Serum selenium and glutathione peroxidase concentrations in type 2 diabetes mellitus patients. *Prim. Care Diabetes.* 2008; 2: 81–85.
- 6- Czuczejko, J, Bronisław A. Zachara, BA., Staubach-

- Topczewska, E. *et al.* Selenium, glutathione and glutathione peroxidases in blood of patients with chronic liver diseases. *Acta Biochimica Polonica.* 2003; 5(4): 1148-61.
7. Rayman MP. The importance of selenium to human health. *Lancet* 2000;356:233-41.
- 8-Uchiyama M, Mihara M. Determination of malonaldehyde precursor in tissues by thiobarbituric acid test. *Anal Biochem* 1978;86:271-8.
- 9-Shah, JK., Walker's AM. Quantitative determination of MDA. *Biochem. Biophys. Acta.* 1989;11: 207-211.
- 10-Mohan, KS, and Venkataramana, G. Status of lipid peroxidation, GSH, vitamin E and antioxidant enzymes in patients with PIH. *Indian J. Physiol. Pharmacol.* 2007; 51: 284-88.
- 11- Marbut MM., Majeed, BM., Rahim, SM, Yuusif, MN. Estimation of MDA as oxidative factor and glutathione as early detectors of hypertensive pregnant women. *Tikrit Med. J.* 2009; 15(2): 63-69.
- 12- Ramón R, Jaime G, Fabio P. The role of oxidative stress in the pathophysiology of hypertension. *Hypertension Research.* 2011; 34: 431-440.
- 13-Vanderlelie J, Venardos K, Clifton VL, Gude NM, Clarke FM, Perkins AV. Increased biological oxidation and reduced anti-oxidant enzyme activity in pre-eclamptic placentae. *Placenta* 2005;26:53-8.
- 14-Regan, CL., Levine, RJ., Baird DD. No evidence for lipid peroxidation in severe preeclampsia. *Am. J. Obstet. Gynecol.* 2001; 185: 572-78.
- 15- Alam, A, Ali, A., Alam, S. Serum selenium concentration and subsequent risk of DM in Pakistan. *J. Diabetic complication and Med.* 2016; 2(1):2-4.
- 16-Rayman MP, Bode P, Redman CW. Low selenium status is associated with the occurrence of the pregnancy disease preeclampsia in women from the United Kingdom. *Am J Obstet Gynecol* 2003;189:1343-9.
- 17- Atamer Y, Kocyigit Y, Yokus B, Atamer A, Erden AC. Lipid peroxidation, antioxidant defense, status of trace metals and leptin levels in preeclampsia.

Eur J Obstet Gynecol Reprod Biol 2005;119:60-6.

18. Sanders J. Selenium in Serum measured by Zeeman GFAAS. *Varian AA Instruments at Work* 1995;AA-122.

19-Rayman MP. The argument for increasing selenium intake. *Proc Nutr Soc* 2002;61:203-15.

20- Arnaud, J., Bost, M., Vitoux, D, *et al.* Effect of low dose antioxidant vitamin and trace element supplementation on concentration of thromboxane and prostacyclin metabolites. *J. Am. Coll. Nutr.* 2007; 26:405-11.

21- Al-Jobori, SM. Determination of zinc and Iron concentrations in different types of dates and vegetables in Baghdad. *J. Madent Alelem College.* 2015; 7(1):1-10.

22-Mahdi, Kh., Al-Kubaisy, RK., Al-Jubori, Sm., Hassan, RS. Analysis of grape fruit and grab seed for their major, mirror and trace elemental content by XRF. *Technique. Baghdad Sci. J.* 2011; 8(2): 618-24.

23- Orhan H, Onderoglu L, Yucel A, Sahin G. Circulating biomarkers of oxidative stress in complicated pregnancies. *Arch Gynecol Obstet.* 2003;267(4):189–195.

24-Suhail, M., Suhail, S., Gupta, B. K., & Bharat, V. Malondialdehyde and Antioxidant Enzymes in Maternal and Cord Blood, and their Correlation in Normotensive and Preeclamptic Women. *Journal of clinical medicine research.* 2009; 1(3), 150–157.

Table 1 the mean and standard deviation of age, body weight, height, body mass index (BMI), and blood pressure.

Parameters	Hypertensive Patients	Normotensive women	P value
Age (years)	27.6 ± 5.8	25.6 ± 4.5	NS
Body weight (kg)	84.43± 7.3	71.4 ± 7.84	0.01
Height (Cm)	154.7 ± 3.2	158.7 ± 3.4	NS
BMI (kg/m ²)	28.12 ± 3.6	22.6 ± 2.4	0.01
Systolic BP (mmHg)	148.4 ± 6.7	115.4 ± 8.4	0.01
Diastolic BP (mmHg)	97.1 ± 7.5	74.5 ± 6.4	0.01

Table 2 the mean and standard deviation of Malondialdehyde (MDA), glutathione, (GSH) and selenium in the serum of hypertensive and normotensive pregnant women.

Parameters	Patients	Normotensive	P value
MDA (micromole/L)	83.9 ± 10	34.2 ± 3.5	0.01
GSH (micromole/L)	399 ± 48	945 ± 112	0.01
Selenium (ug/l)	161.3 ± 78	215.6 ± 98	0.01