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The Scholar Journal for Sciences & Technology

Published in this issue **Index**

Prof. Dr. Harith Salman Hasaani

Editor-in-chief of the Scholar Journal for Sciences & Technology

In the Name of Allah the Merciful

Praise be to Allah, Lord of the Worlds, and prayers and peace be upon the Seal of Messengers Muhammad Bin Abdullah and on his family and companions.

After here we meet with you in the first number of the Scholar Journal for Sciences & Technology, which we hope to be a lamp illuminating, For students of science everywhere, They receive the science and knowledge they need ،We are optimistic that we are on track to achieve the objectives of the Nordic Academy And its scientific journal, the dissemination of knowledge and the real information and provide it to anyone looking for it , and since it is difficult for any Journal to draw its features and determine its destination since the first issue, but we are trying to provide the basic indicators of ambition and direction in the way of culture long and difficult by careful to complete the requirements of scientific research sound in the published research and studies.

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FULL PAPER

The Estimation of the Engine Emissions Ensuing from Jet Fuel Combustion and its Contribution to Worldwide Warming at Aden International Airport. Case Study

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Abstract

This paper is an try and have a look at the quantity of plane emissions due to the combustion of jet fuel for the duration of the touchdown and takeoff (LTO) operations at Aden International Airport (AIA) in 2018. All statistics changed into taken from the airport's statistic data. The have a look at centered on the subsequent emitted plane gases: (CO2,CH4, N2O, CO, NMVOCs and SO2). It was found that there were 3,148 LTO activities in the course of 2018 which resulted in an approximate amount of 4,747,940 kg CO2, 346.68 kg CH4, 166.2 kg N2O, 23482 kg CO, 3186.9 kg NMVOCs and 1495 kg SO2. Boeing 737, Airbus 310 and CRJ700 were found to be the most polluting aircraft, while other aircraft were less polluting. Furthermore, despite the fact that there was very little aircraft traffic in Aden International Airport compared with either Sana'a or any of the remaining airports who had always been a major aviation hub, however, it is possible to use these results as a useful scientific base for the assessment of aircraft emissions locally, regionally or internationally. Finally, a number of recommendations have been presented by the study aimed at enhancing and developing the environment in the vicinity of the airport.

Key words: Aden International Airport, aircraft emissions,

1. Introduction

Human beings, like different dwelling organisms, have usually inspired their environment. It is handiest seeing that the start of the Industrial Revolution, mid-18th century, that the effect of human sports has started to increase to a far large scale, continental or maybe global. Human sports, mainly the ones concerning the intake of fossil fuels for commercial or home usage, and biomass burning, produce greenhouse gases that have an effect on the composition of the surroundings[1]. Scientific proof shows that human sports consisting of burning fossil fuels and deforestation have appreciably extended the percentage of greenhouse gases within side the surroundings during the last a hundred and fifty years [2].

Research on climate change has recognized a big range of sources that cause the greenhouse effect. The biggest sources of those emissions, especially in developed economies, are electric powered utilities and the transportation sector (fig.1) [3]. Aviation is one of the transportation sorts producing emissions which have the capacity to effect air pleasant within side the local, local and international environments[4]. ICAO/CAEP's preliminary estimate is that the full extent of aviation CO_2 emissions in 2006 (both domestic and international) is within side the variety of six hundred million tones. At present, aviation accounts for approximately 2% of general international CO2 emissions (fig.1) and approximately 12% of the CO2 emissions of all transportation sources [5,6]. While the impact of noise on communities around airports has historically been the most prominent environmental issue of aviation, the local and global effects of aircraft emissions on air quality are emerging as issues of equal, if not greater, importance [7].

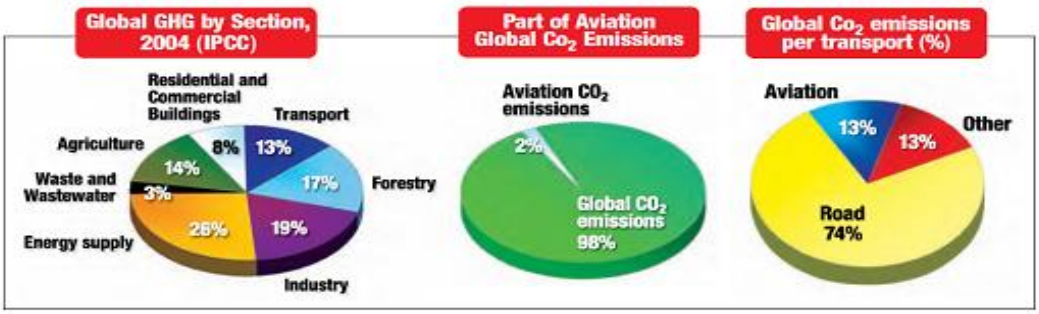

Figure 1: Aviation emissions and their contribution to global environment [6]

In the scientific literature there are many scientists and organizations carried out numerous studies considering estimation of the aircraft emissions at airports around a world. For example, EPA [8], Perl et al. [9] and Stefanou and Haralambopoulos [10] have studied and calculated annual environmental loads and proved that significant amounts of pollutants are received in areas around airports.

There are a lot of air pollution present as gaseous and particulate emissions from aviation and aviation- related activities which could probably effect human health and the environment. They are: NOx Nitrogen oxides along with (N2O); VOC Volatile natural compounds (along with non-methane unstable natural compounds (NMVOCs);

Carbon dioxide (CO_2); CO Carbon monoxide; SOx Sulphur oxides; and PM Particulate matter (fraction size PM 10 and PM10) [4].

The ability damaging consequences of air pollution released within an aircraft's landing and takeoff cycle (LTO) and airport-related sources of emissions can make contributions to the degradation of air quality in their close by communities. The table (1). indicates the representative health effects of a few emissions released from aircrafts.

Table 1. Potential effects on human health due to various species of emissions [11]

Pollutant	Health effect
CO – Carbon Monoxide	● Cardiovascular effects, especially in those persons with heart conditions
HC – Unburned Hydrocarbons (a primary component of Volatile Organic Compounds, or VOC)	● Eye and respiratory tract infection ● Headaches ● Dizziness ● Visual disorders ● Memory impairment
NOx – Nitrogen Oxides	● Lung irritation ● Lower resistance to respiratory infections
O_3 – Ozone (HC is a precursor for ground-level O3 formation)	● Lung function impairment ● Effects on exercise performance ● Increased airway responsiveness ● Increased susceptibility to respiratory infection ● Increased hospital admissions and emergency room visits ● Pulmonary inflammation, lung structure damage
PM – Particulate Matter (smoke is a primary component of PM.)	● Premature mortality ● Aggravation of respiratory and cardiovascular disease ● Changes in lung function ● Increased respiratory symptoms ● Changes to lung tissues and structure ● Altered respiratory defence mechanisms

During the past five years, in 2018 Aden International Airport had one of the maximum number of landing and take-off (LTO) aircraft operations. 3907 LTO-cycles were made [12]. Of course, this process left behind a lot of pollutants from aircraft engines. So this research is an attempt to estimate the aircraft emission gases such as: (CO_2,CH_4, N_2O, CO, NMVOCs and SO_2) at Aden International Airport to use them in any local, regional or even international inventories and also to help local authorities to improve environmental situation in the vicinity and surrounding areas by offering some helpful recommendations.

2. Materials and methods

2.1. Study area

Aden International Airport is one of the most important airports in the Yemen Republic. Aden International Airport is an international airport in Aden, Yemen (IATA: ADE, ICAO: OYAA) and the oldest airport in the Arabian peninsula. Prior to its use as a civil air facility, the aerodrome was known as RAF Khormaksar, which opened in 1917 and closed as an RAF station in 1967. In

the 1970s and 1980s it was both a civilian airport and a Soviet Air Force air base. It continues to be used for military purposes by the Yemeni Air Force.

(2005-2025), has population of 1,218,000 people [13]. During the last four years there were a noticeable increase in the aircraft movements and also in the number of arriving and departing passengers in the Aden airport (fig. 3 and 4).

From the figure 3 it is clear that the number of the aircrafts that used AIA increased from 1578 in 2015 to 3907 in 2018, i.e. more than twice. Despite this high increase in the number of aircrafts operation, the number of the arriving and departing passengers remained still very low comparing with aircraft movements. This is because Yemenia airlines has reduced the domestic flights since October 2015

Fig.2. Aden airport by Google map

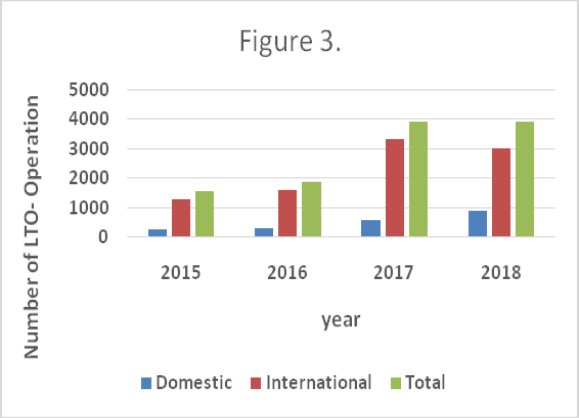

Fig.3. Annual distribution of aircraft

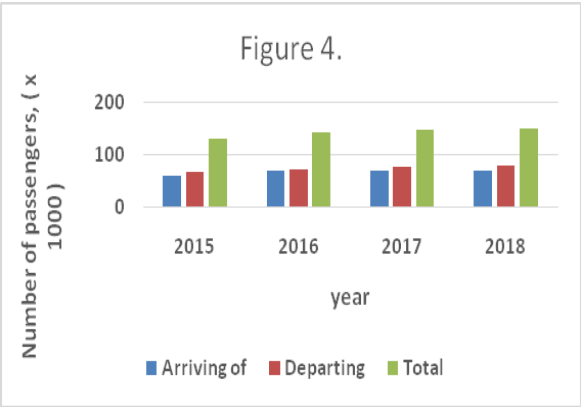

Fig. 4. Numberof arriving and departing passengers in Aden International

Airport movements at Aden International Airport

2.2. Flight operations:

Emissions from an plane originate from fuel burned in plane engines. The fuel utilization and emissions rely on the fuel type, plane type, engine type, engine load and flying altitude. Operations of an plane are typically divided into foremost parts [14].

1. ***The Landing/Take-off (LTO)*** cycle which includes all activities near the airport that take place below the altitude of 3000 feet (1000 m). This therefore includes taxi-in and out, take-off, climb-out, and approach-landing (fig.5).
2. ***Cruise*** which here is defined as all activities that take place at altitudes above 3000 feet (1000 m). No upper limit of altitude is given. Cruise, in the inventory methodology, includes climb to cruise altitude, cruise, and descent from cruise altitudes.

The focus of this study was to determine the aircraft emissions during aircraft LTO cycles (domestic and international) in 2018 at AIA. This is because the most emissions produced from aircrafts happen in this part of the flight.

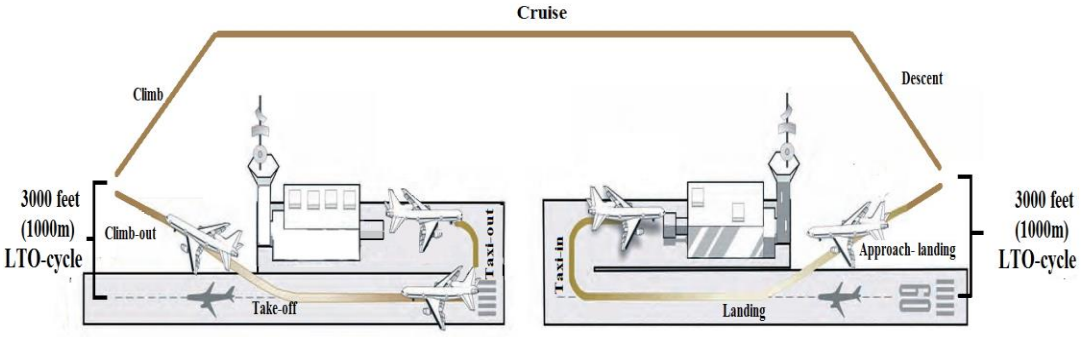

Figure 5: A typical flying cycle which includes LTO-cycle

2.3. Calculating aircraft emissions:

The ICAO emission stock methodologies constitute three approaches: Simple, Advanced and Sophisticate Approach [4]. The desire of any of those techniques relies upon especially on records availability and, of course, their accuracy will increase from the Simple to the Sophisticated Approach.

In this paper the Simple Approach turned into used, due to the fact for estimating plane engine emissions it calls for most effective the quantity of plane movements (over a certain period of time, together with a year) and the type of every plane involved in each movement. To calculate the emissions was used the equation [4]. For every plane type, the quantity of LTO cycles of that plane (over the evaluation length) multiplies with the aid of using the emissions aspect for every of the pollutant species posted in ICAO emissions stock after which upload up the values for all of the plane to get the quantity of general emissions (in kilograms) for every pollutant.

$$E_x = \Sigma\ (LTO\ cycles\ of\ y)\ X\ EF_x$$

Where:

- E_x- *Emission of pollutant x, [kilograms], x-* (CO_2 - CH_4- N_2O- *CO- NMVOCs-* SO_2*);*
- *LTO- Number of the landing and take-off cycles of y, [LTO]*
- *Y- The aircraft types that landed and departed at MIA*
- EF_x*-Emission factor of pollutant x, [kg/LTO]*

For Aden International Airport there were 3907 LTO-cycles during 2018. But only 3148 LTO of particular type of aircrafts were known (data were available). In the rest 759 LTO-cycles operations the type of aircrafts was unknown. And also it's very important to mention that some aircrafts had no information about their emission factors, neither in ICAO data base nor in any other place. In this case it is helpful to use supplementary information such as weight, number of engines, size category, range, etc. to identify a suitable equivalent aircraft that has available data, as recommended by ICAO in such cases.

3. Results and discussion:

3.1. LTO-cycles operations:

During the 2018 at Aden International Airport there had been 3907 LTO-cycles operations. Of 3148 LTO-cycles become regarded every kind of plane that used the airport (desk 2), however 759 LTO – had been unknown (there had been no to be had data, perhaps they had been army airplanes). For this reason, the LTO emissions of those aircrafts had been now no longer calculated into the overall account of emissions.

Table 2: Shows the air traffic movements by the type at Aden International Airport during 2018

Aircraft type	Number of LTO-cycles	Aircraft type	Number of LTO-cycles	Aircraft type	Number of LTO-cycles
CRJ 700	1180	AN-32	15	EK 76592	1
PA-28/C170	765	C-55	14	CL-601	1
B 737-8	500	IL-76	11	A-33	1
A310	223	AN-12	10	BH-44	1
DH 8/9	152	DC-09	9	C-235	1
MD 82	112	ER 120	7	C-160	1
B-733	53	BE-20	3	BH-41	1
IL-18	36	GLF-4	2	JSS-41	1
AN-26	28	BELL 421	2	**Unknown**	**759**
DC-93	16	B-212	2	**Total**	**3907**

It is clear from the table 2 that CRJ-700, PA-28/C170, B 737 , A310 , DH 8/9 , MD 82 and B-733 were the most common aircrafts used the AIA in 2018. These aircrafts comprised more than 76% of all LTO cycles at AIA in 2018. And it's also obvious that

only CRJ-700 (AL-SAEEDHA) aircrafts comprised about 30% of the all LTO cycles operations at AIA (fig.6).

By comparison with Boeing or Airbus airplanes which are frequently used by Yemenia airline, CRJ-700 (AL-SAEEDHA) is small by size and it began to function in the end of 2008 [15]. This in turn explains the big jump in the traffic movements of aircrafts at AIA between 2014 and 2015, from 1891 LTO in 2014 to 3891 LTO in 2015 (see fig.3), but the motion of passengers were small, from 143000 passengers in 2014 to 148000 passengers in 2015.

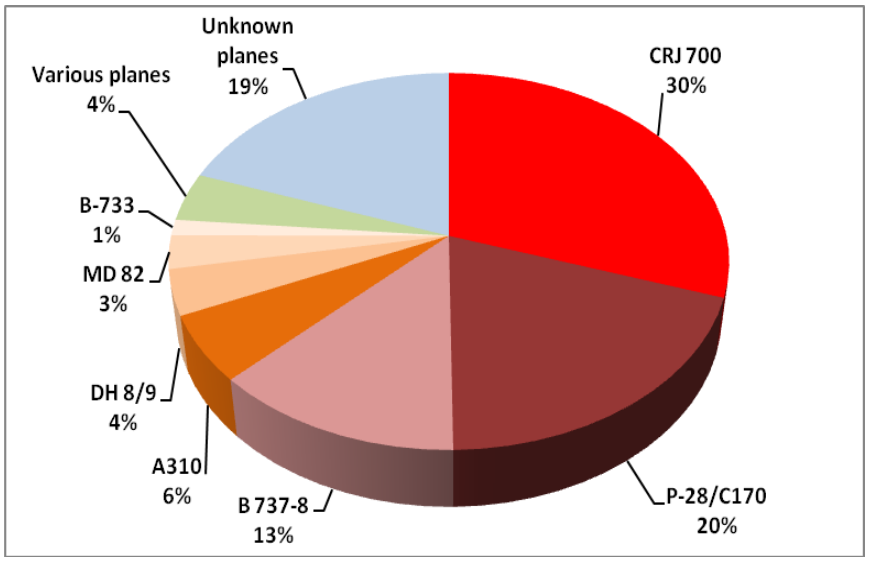

Figure 6: shows the most common aircrafts that made more than 50 LTO at AIA in 2018

3.2. LTO-cycle calculated emissions:

The total estimation of calculated aircraft pollutants (CO_2 - CH_4- N_2O- CO - NMVOCs- SO_2), emitted at Aden International Airport during 3148 LTO operations in 2018 were broken down into detailed analysis below.

- **CO_2 emissions:**

Although typically taken into consideration because the worst greenhouse gas, in fact carbon dioxide isn't the handiest greenhouse gas. However, as it has the very best attention within side the ecosystem as compared to all of the different greenhouse gases that human emit (besides water vapor), it's far the only that has the most important impact [16]. The overall emissions of the CO2 emitted from all aircrafts that used Aden International Airport for the duration of 2018 have been approximately 4747940 kg. The fig.-7A indicates the emissions from every sort of aircrafts.

It was found that the most common aircraft types that emitted about 93% of CO_2 emissions and which had more than 50 LTO operations at AIA in 2018 are CRJ-700, PA-28/C170, B 737 , A310 , DH 8/9 , MD 82 and B-733. Although Boeing 737 aircraft made less LTO operation (approximately 500) than CRJ-700 (about 1180 operations), but the CO_2 emissions per LTO cycle were the highest for Boeing 737 about 29% of all

CO_2 emissions (fig.7B). It happens because the large jet engines use a lot of fuel and of course emissions depend on the LTO emissions factors of each type of aircrafts.

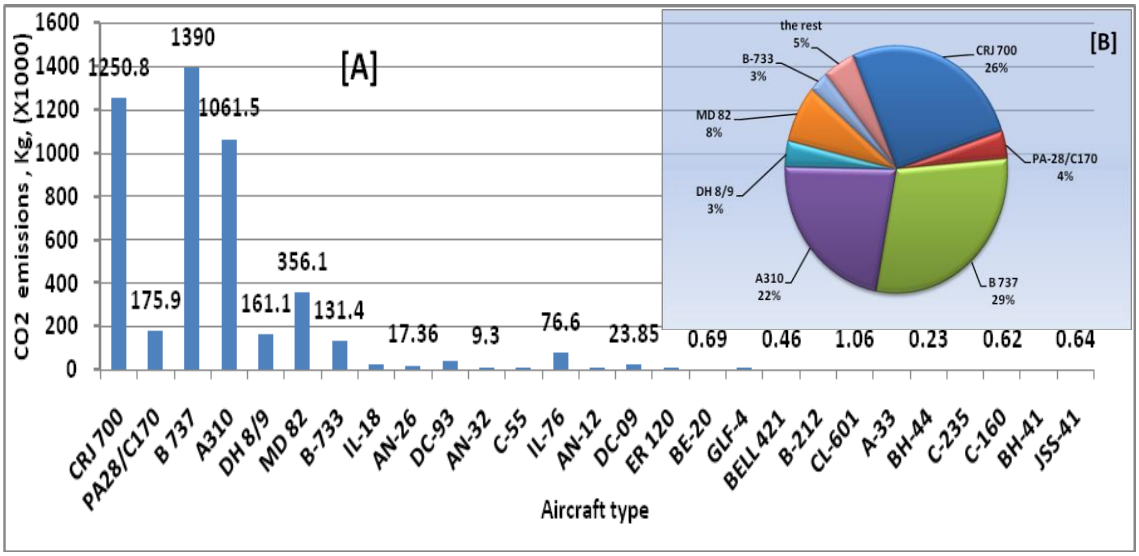

Figure 7: A- shows the CO_2 emissions from each aircraft, and B- the percentage of emissions from aircrafts that have made more than 50 LTO at AIA in2018

- **CH_4 emissions:**

Due to its exceptionally quick lifestyles time within side the atmosphere (9-15 years) and its worldwide warming potency — 20 instances greater powerful than carbon dioxide in trapping warmness within side the atmosphere, methane is at the pinnacle of greenhouse gases, as pronounced with the aid of using the Environmental Protection Agency [16].

The estimation of CH_4 emissions during all LTO operation of all aircrafts that used AIA in 2018 were about 346.68 kg. The figure 8A shows CH_4 emitted from each aircraft type. It's clear that the A310 aircraft type made the highest CH_4 emissions and that was about 41% of all CH_4 emissions at AIA (fig.8B).

- **N_2O emissions:**

N_2O is a greenhouse fuel line with incredible international warming potential (GWP). It has 298 instances greater impact 'in line with unit weight' (GWP) than carbon dioxide.

The total calculated N_2O emissions from all aircrafts were 166.2 kg and the figure 9A shows the N_2O emissions from each aircraft. Boeing 737, A310 and CRJ 700 emitted more emissions than all other aircrafts about 30%, 27% and 21% respectively (fig. 9B).

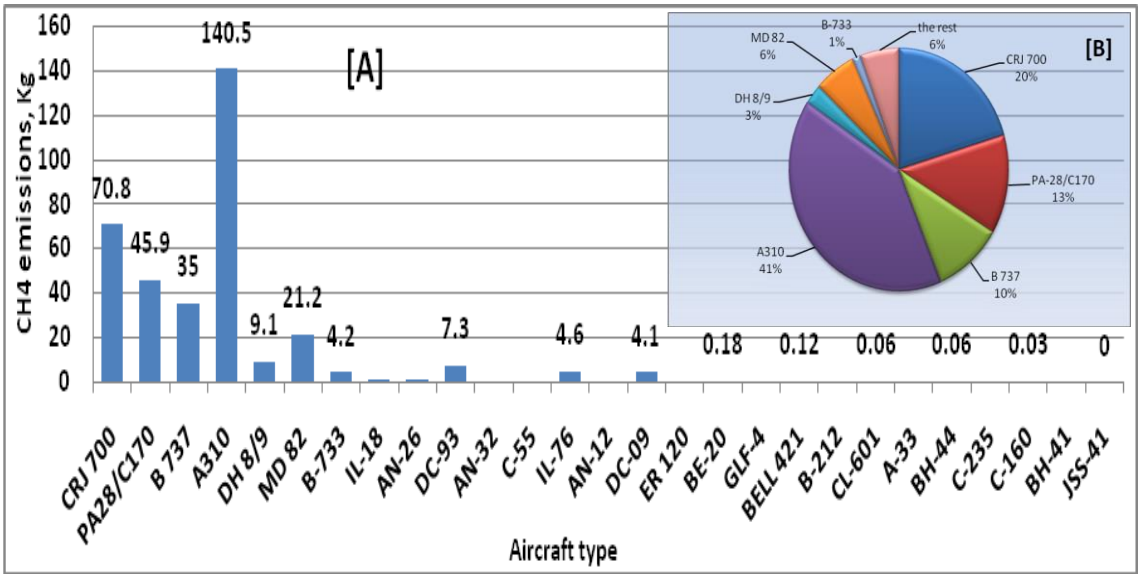

Figure 8: A- shows the CH_4 emissions from each aircraft, and B- the percentage of emissions from aircrafts that have made more than 50 LTO at AIA in2018

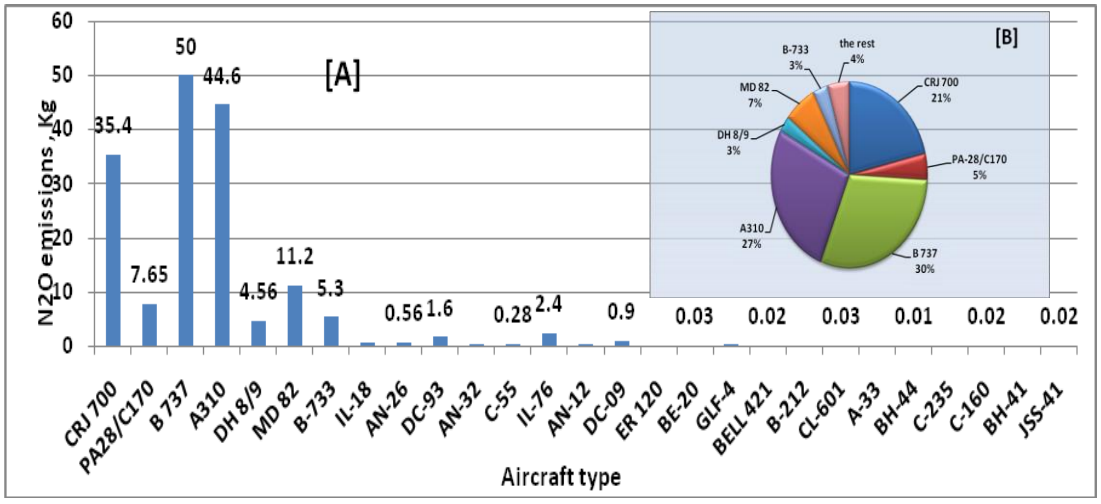

Figure 9: A- shows the N_2O emissions from each aircraft, and B- the percentage of emissions from aircrafts that have made more than 50 LTO at MIA

- **CO emissions:-**

Carbon monoxide is the maximum not unusual place sort of deadly air poisoning in lots of countries. It is highly toxic to humans and animals in higher concentrations. The total emissions of the CO emitted from all aircrafts that used AIA in 2018 were 23482 kg. The figure 10A shows the emissions from each type of aircrafts.

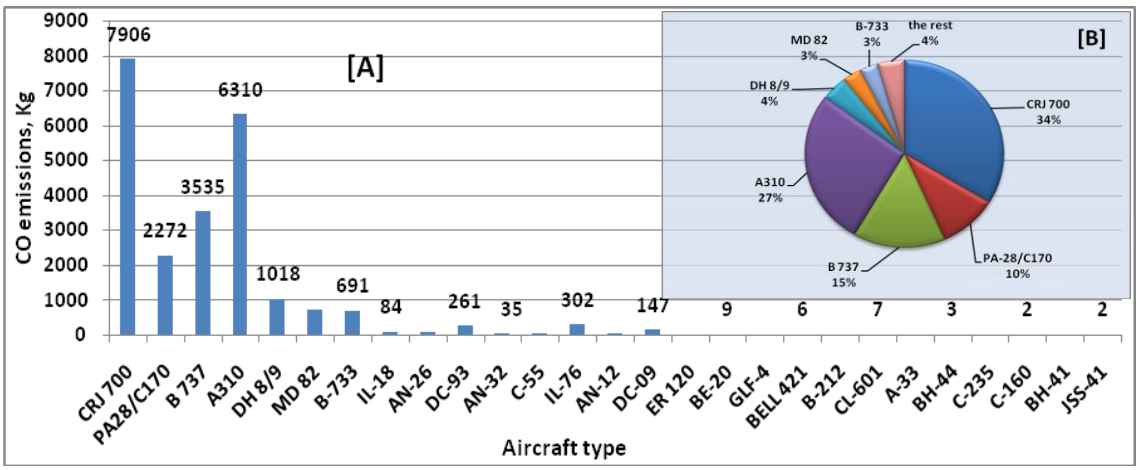

Figure 10: A- shows the CO emissions from each aircraft, and B- the percentage of emissions from aircrafts that have made more than 50 LTO at AIA in2018

In this case, it's clear that CRJ 700 aircraft emitted more than any aircraft type used by AIA, i.e. about 34% (fig.10B). Since the carbon monoxide is considered one of the most dangerous pollutants, it can be said that this type of aircraft is the most harmful to the environment and humans among all aircrafts.

- **NMVOC emissions:-**

Non-methane unstable natural compounds are a big sort of chemically one-of-a-kind compounds, like for example, benzene, ethanol, formaldehyde, etc. Essentially, NMVOCs are same to VOCs, however with methane excluded. Many of NMVOCs are poisonous to human beings and dangerous to the environment [17].

The total emissions of NMVOCs at AIA in 2018 were about 3186.91 kg. Each aircraft type emitted less or more as shown in fig.11A. However Airbus 310 emitted more than any other aircrafts, i.e. about 40% NMVOCs (fig.11B).

- **SO_2 emissions:-**

Sulfur dioxide is a poisonous gas that causes detrimental impacts on human health and the environment. The major health concerns associated with exposure to high concentrations of SO_2 include breathing difficulties, respiratory illness, and aggravation of existing cardiovascular disease. In addition to the health impacts, SO_2 leads to acid depositions in the environment [18].

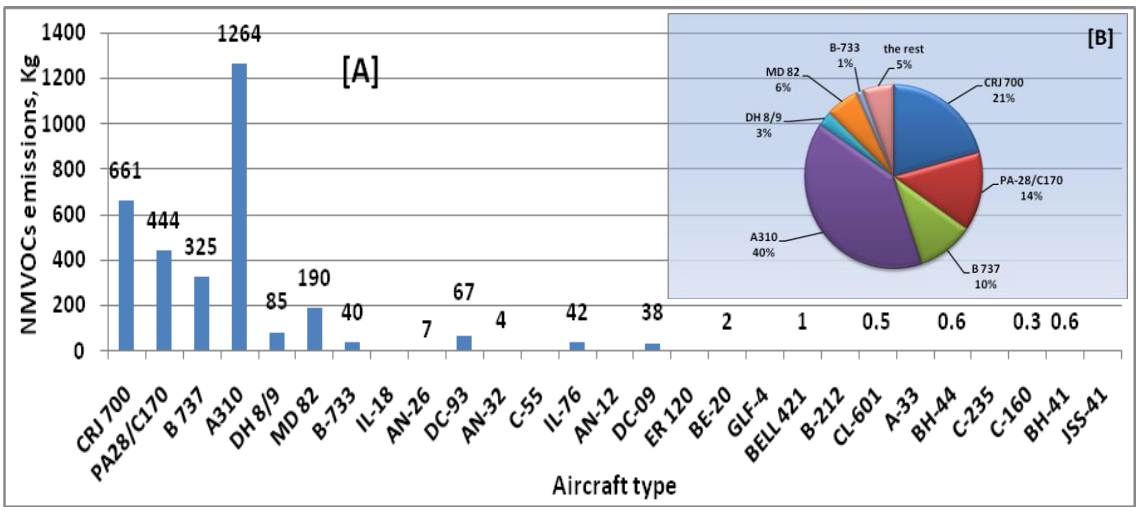

Figure 11: A- shows the NMVOCs emissions from each aircraft, and B- the percentage of emissions from aircrafts that have made more than 50 LTO at AIA in2018

The total SO_2 emissions in 2018 at AIA were 1495 kg. Figure 12A shows the quantities of SO_2 emitted from each kind of airplanes in 2018 at AIA. The most emissions of SO_2 were from B737 29%, CRI 700 26% and A310 22% respectively.

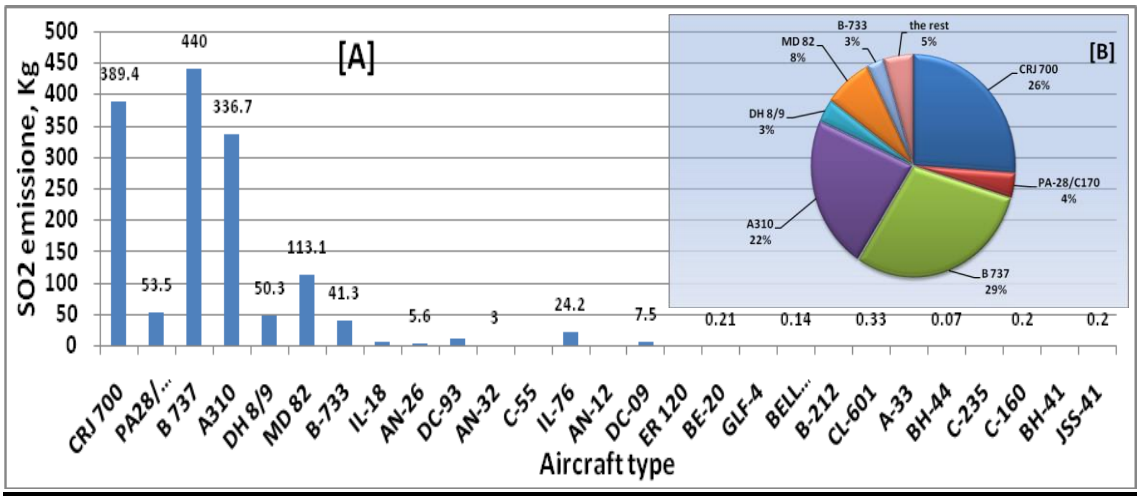

Figure 12: A- shows the SO_2 emissions from each aircraft, and B- the percentage of emissions from aircrafts that have made more than 50 LTO at AIA in2018

4. Conclusion and recommendations

From above-mentioned analysis, it is clear that the most damaging airplanes to the environment are B 737, Airbus 310 and CRJ700 (table 3). In 2018 at AIA during 500 LTO-operations Boeing 737-and its modifications have emitted about 29% CO_2, 30% N_2O and 29% SO_2. So, from an environmental perspective, this plane is the biggest polluter of the area.

Airbus 310 has been considered the second environmental polluter with two records of 41% of CH_4 and 40% of NMVOCs, and finally it's CRJ-700 with one greenhouse record of 34% of CO.

Table 3: The three most polluting aircrafts of AIA during LTO-operations in2018

Pollutants	The most polluting aircrafts at AIA in 2018 for specific emissions		The position of aircraft in terms of pollution	
	Aircraft type	Percentage, of all emissions	Aircraft type	Position
CO_2	B737	29%	B737	1
CH_4	A310	41%		
N_2O	B737	30%	A310	2
CO	CRJ-700	34%		
NMVOCs	A310	40%	CRJ-700	3
SO_2	B737	29%		

In general, it's found that 3148 LTO operations at Aden International Airport in 2018 have led to emissions of the following quantities of engine gases: 4747.940 ton of CO_2, 0.35 ton of CH_4, 0.17 ton of N_2O, 23.48 ton of CO, 3.19 ton of NMVOCs and 1.50 ton of SO_2 (fig. 13).

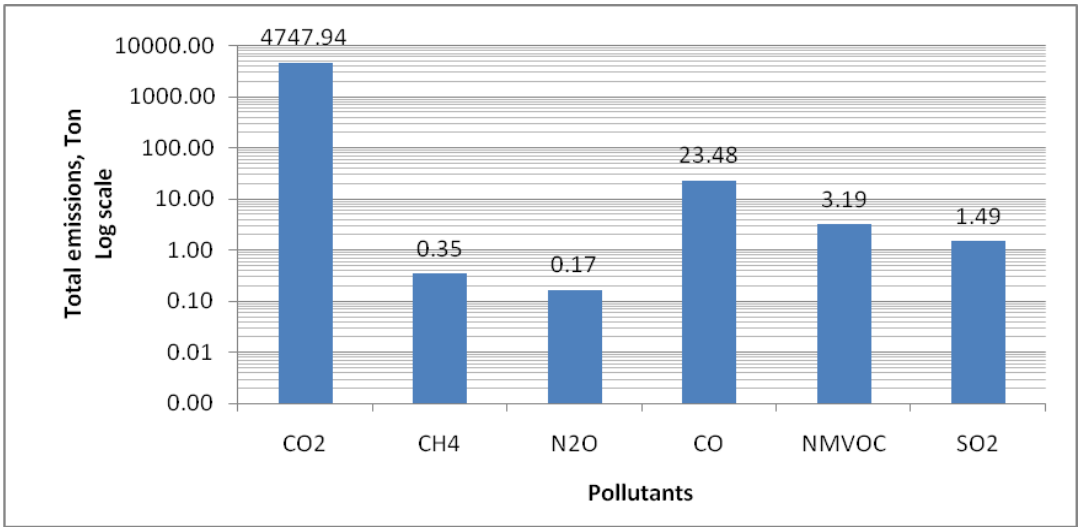

Figure 13: The total calculated aircraft engine emissions of 3148 LTO operations at Aden International Airport in 2018

If we take into account the aircrafts traffic at other airports such as in Sana'a or Al-Mukalla, or even neighboring countries, these quantities of gases are very low. But it must be noted that the effect on the surrounding areas of the airport with long term might be greater. Especially, since there are many studies that indicate the impact of airports on surrounding areas (on human health and on the environment). Therefore it is necessary:-

- To not allow the old aircraft to land and take off from the International Aden Airport because they usually have large rates of emissions.
- To Assess of the environmental situation of the airport zone and neighboring areas through a field study to measure the concentrations of pollutants.
- To establish of short corridors (taxiway) from/to the runway and last parking of the aircraft to minimize the amount of fuel used and thereby

- reduce engine emissions.

5. Acknowledgments

The author is grateful for the support of the general director of the Aden International Airport Mr. Abdel-Raqeeb Al-Amri, as well as want to thank all who contributed to provide any specific information for this study.

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FULL PAPER

Global warming phenomena it's harms and causes and previntations method

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Abstract

In this paper we study the global warming phenomena and its effect on the humanity on the earth and on the atmospheric , also we study its causes ,harms, and how to prevent it , we found that the progressing country have the great effect of causing this phenomena because of its industries and what's causes of it , also we found that the main causes of the global warming was the greenhouse gases effect , we find that we could reduce or prevent the global warming by encourage the agricultural of wide land of some kind of pants on the earth , and use clean fuel , or renewable energy sources by the glob to save the life on the earth .

Keywords: Global warming phenomena - harms - preventions method.

1.1Introduction

We try to understand the changed of the weathers happened at world so we study this global phenomena of warming which refer to rabid increasing in temperature of the atmospheric air at summer seasons specially and another seasons too around the world with many climatic changed all over the globe, the global warming is a phenomenon where it causes a rise in the average temperature of the Earth's atmosphere and water bodies since the latest century and is still in progress, then we try to find the global solution that reduced or prevent this phenomena where , Since the early 1900's, Earth's average surface temperature has rise by about 0.8 °C(1.4 °F), with almost two-thirds of this rate occurring since 1980 (1).
Also we study the effects of global warming on the human kind, plants and animals in numbers of ways. This effects, increase ocean levels, droughts and changed weather patterns. It is well recognized by scientists around the world as a serious public health and environmental concern.

According to NASA, in 2016 the Earth's surface temperature shattered the previous record for hottest year by 0.12°C. That record was set in 2015, which broke the previous record by 0.13°C. That record had been set in 2014.(2)

The Union of Concerned Scientists divided the effects of global warming in five categories: people, freshwater, oceans, ecosystems and temperature.(3)

1.2 **Review of this case** : Suggestions policy responses to global warming include mitigation through emissions reduction, adaptation to its effects etc. Most of the countries in the world are members of the United Nations Frame work Convention on Climate Change(UNFCCC) whose see that objective is to prevent dangerous anthropocentric i.e., human-induced climate change. All of the party members have taken an oath to adopt a range of policies that work around reducing greenhouse gas emissions that are the whole reason for an increase in global. Currently efforts as of the early 21st century that are mainly directed towards reducing emissions seem to be quite inadequate to cope up with the UNFCCC's 2 °C targets.(4)

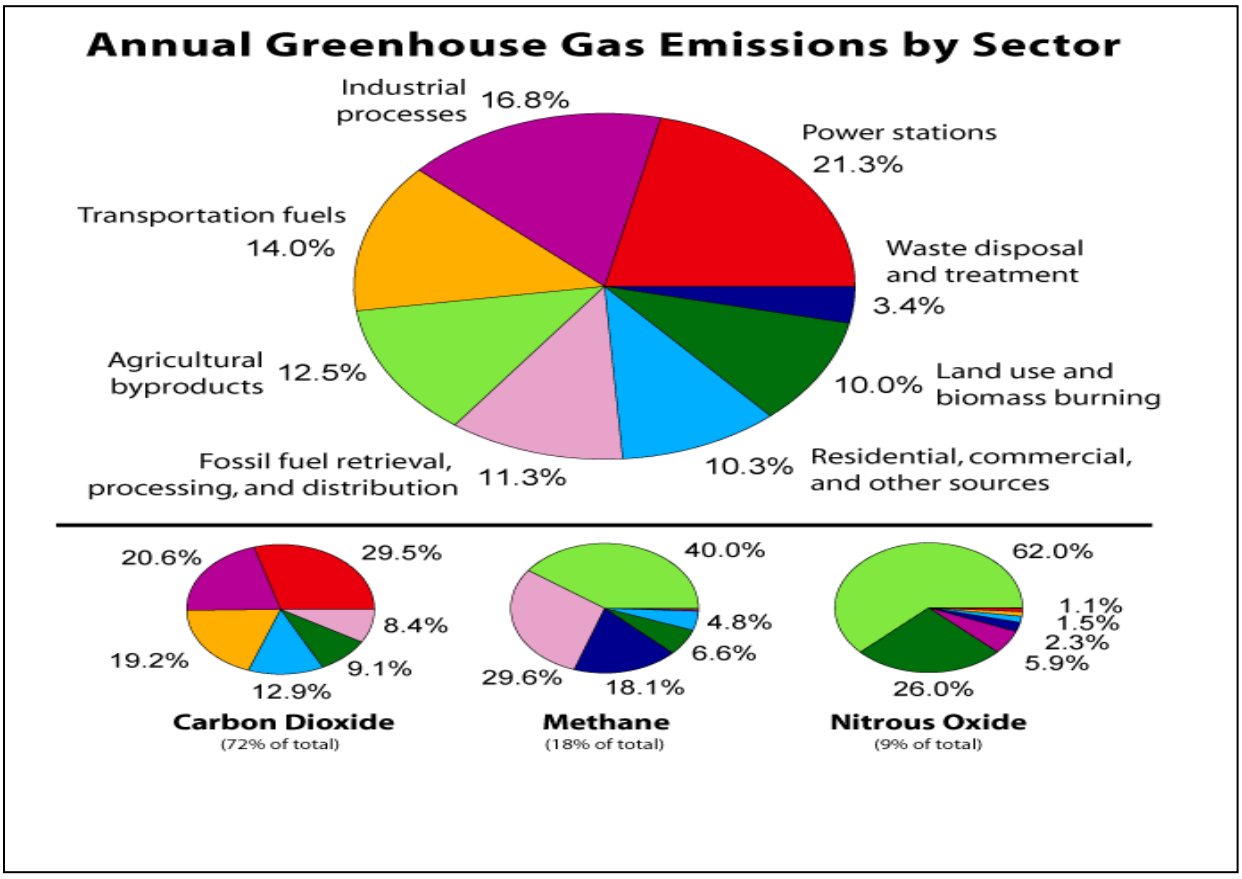
1.3 **A common view** is that the current global warming rate will Continue or accelerate. But we argue that rapid warming in recent decades has been driven mainly by non-CO2 greenhouse gases also (GHGs), such as chlorofluorocarbons, CH4, and N2O, not by the products of fossil fuel burning, CO2 and aerosols, the positive and negative climate forcing's of which are partially offsetting. The growth rate of non-CO2 GHGs has declined in the past decade. If sources of CH4 and O3 precursors were reduced in the future, the change in climate forcing by non-CO2 GHGs in the next 50 years could be near zero. Combined with a reduction of black carbon emissions and plausible success in slowing CO2 emissions, this
Reduction of non-CO2 GHGs could lead to a decline in the rate of global warming, reducing the danger of dramatic climate change.
Such a focus on air pollution has practical benefits that unite the interests of developed and developing countries. However, assessment of ongoing and future climate change requires composition specific long-term global monitoring of aerosol properties.

As we see in figure (1) Global Carbon Cycle (Billion Metric Tons Carbon) Which GHGs cause a global climate forcing, i.e., an imposed perturbation of the Earth's energy balance with space (5).

There are many competing natural and anthropogenic climate forcing's, but increasing GHGs are estimated to be the largest forcing and to result in a net positive forcing, especially during the past few decades (4, 6).

Evidence supporting this interpretation is provided
by observed heat storage in the ocean (7), which is positive and of the magnitude of the energy imbalance estimated from climate forcing's for recent decades (8).
The Intergovernmental Panel on Climate Change (IPCC) (4)

Figure (1) Global Carbone Cycle (Billion Matric Tons Carbone)



has considered a range of cases for future GHGs, which is
further expanded in its

1.4 **Special Report on Emissions rate** (9).as shown in fig.(2)Yet global warming simulations have focused on ''business as usual'' state with rapidly increasing GHGs.These case .yield a steep, relentless increase in global temperature throughout the twenty-first century (4, 10) with warming of

several degrees Celsius by 2100, if climate sensitivity is 2–4°C for doubled CO2, as climate models suggest (4, 11–13). These figures can give though that curtailment of global warming is almost

hopeless. The 1997 Kyoto Protocol, which calls for industrialized nations to reduce their CO2 emissions to 95% of 1990 levels by 2012 (14), is itself considered a difficult target to achieve. Yet the climate simulations lead to the conclusion that the Kyoto reductions will have little effect in the twenty-first century (15), and ''Kyoto's'' may be needed to reduce warming to an acceptable level (16)

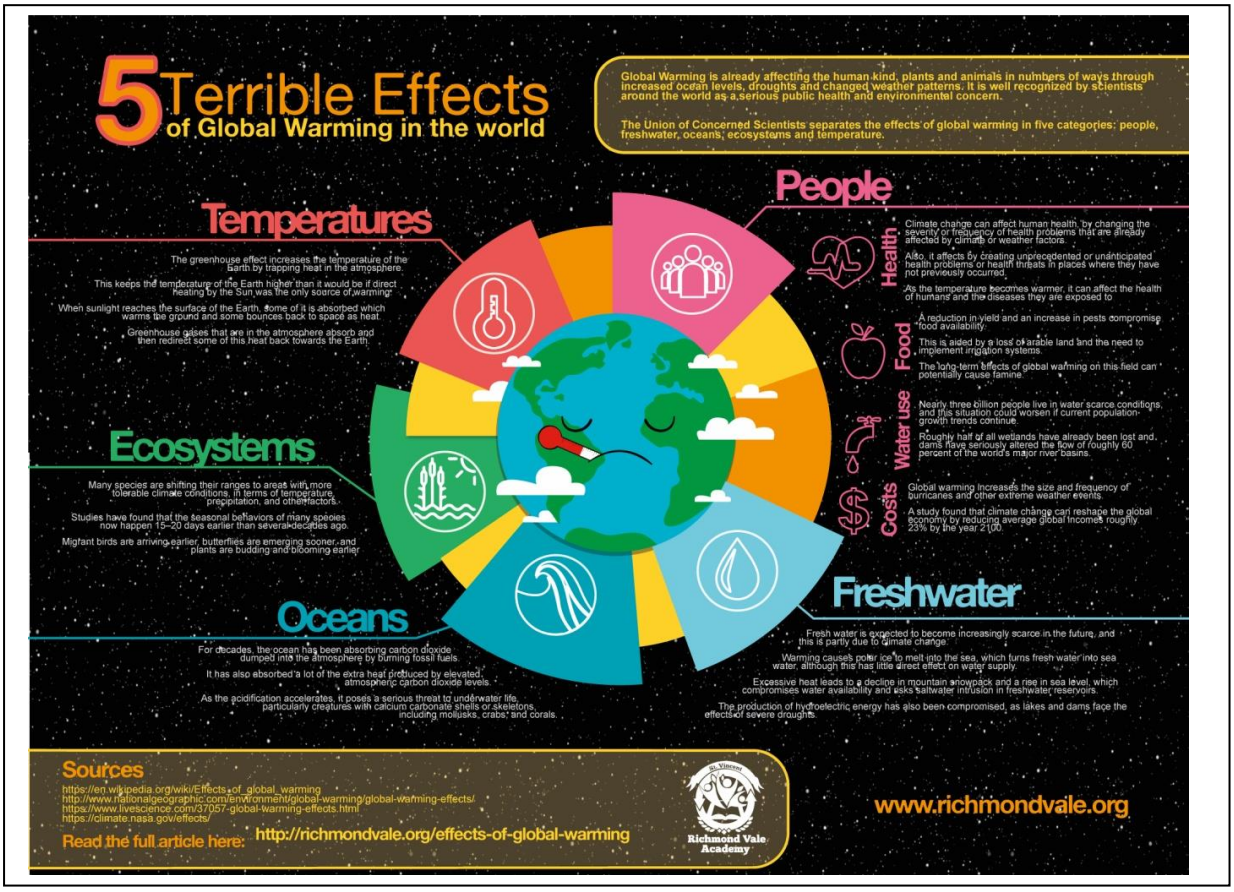


Figure (2) show the effect of global warming all over the world as sources

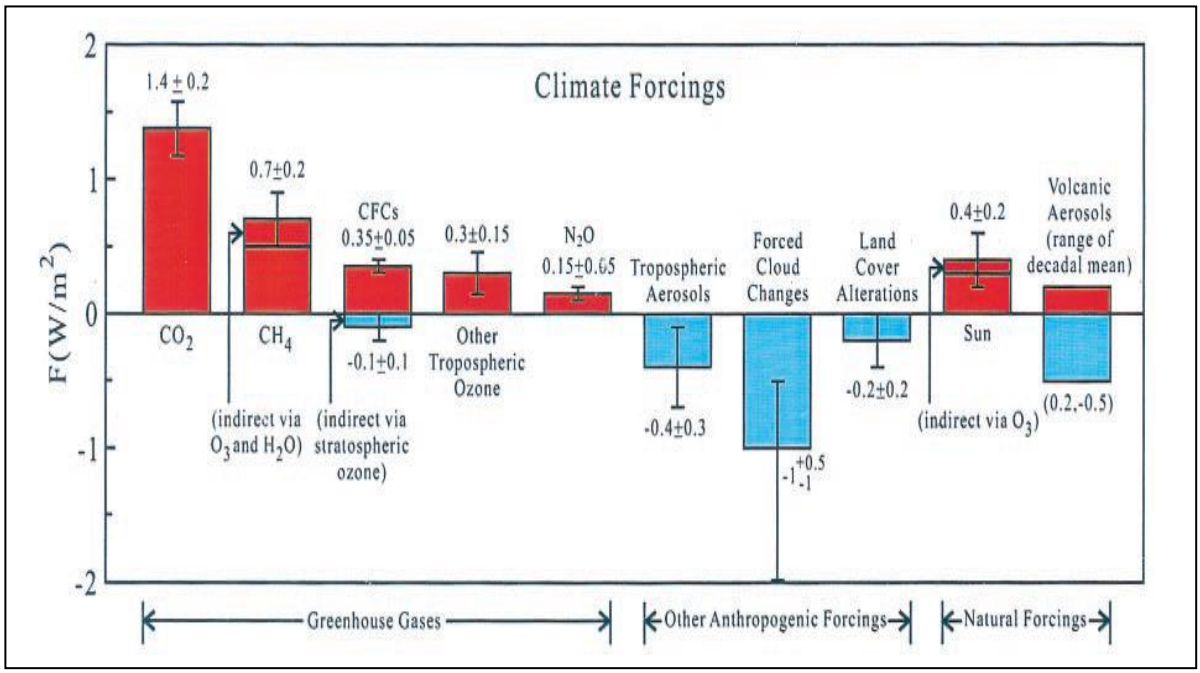
1.5 Climate Forcings in the Industrial:

Fig. 3 shows graphs of estimated climate forcing's since 1850, which are similar to previous presentations (4, 6). Forcing's for specific GHGs differ by as much as several percent from values we estimated earlier: CO2 (21%), CH4 (12%), N2O (23%), chlorofluorocarbon 11 (CFC-11) (16%), and CFC-12 (18%). Our prior results, used by the IPCC (4), were analytic fits to calculations with a one-dimensional radiative-convective model (17). The present results (Table 1) are based on calculations of

Adjusted radiative forcing (5), using the SI2000 version of the Goddard Institute for Space Studies three-dimensional climate model (8, 13), with the absorption coefficients fit to line-by-

line radiative transfer calculations, using current HITRAN (18) absorption line data. Thus the present results are improved in several ways.

Estimated Forcings**:**
We separate CO2, CH4, and CFCs in Fig 3 because they are produced by different processes and have different growth rates. We associate with CH4 its indirect effects on troposphere O3 and stratospheric H2O to make clear the importance of CH4 as a climate forcing. We assume that one-fourth of the 0.4 Wym2 climates forcing due to increasing
Troposphere O3 is caused by increasing CH4 (chapter 2 in ref. 4; ref. 19). We calculate an indirect effect of 0.1 Wym2 for CH4 oxidized to H2O in the stratosphere (20). The recent trend of stratospheric H2O (20, 21) is even larger than CH4 could cause but part of the observed trend may be a result of transport from the troposphere.



2. The greenhouse gases (GHGs) Rates:
Atmospheric amounts of green house gases is the principal human-influenced of it which have been monitored in recent years and extracted for earliertimes from bubbles of air trapped in polar ice sheets (37). Gases that cause the largest climate forcings, CO2 and CH4, are showing Fig. 4. IPCC IS92 scenarios (chapter 2 in ref. 4) for the next 50 years are also shown in Fig. 4. IS92a, at least so far, has been the most popular scenario for climate model simulations. These climate forcing projections involve many assumptions and are very uncertain.

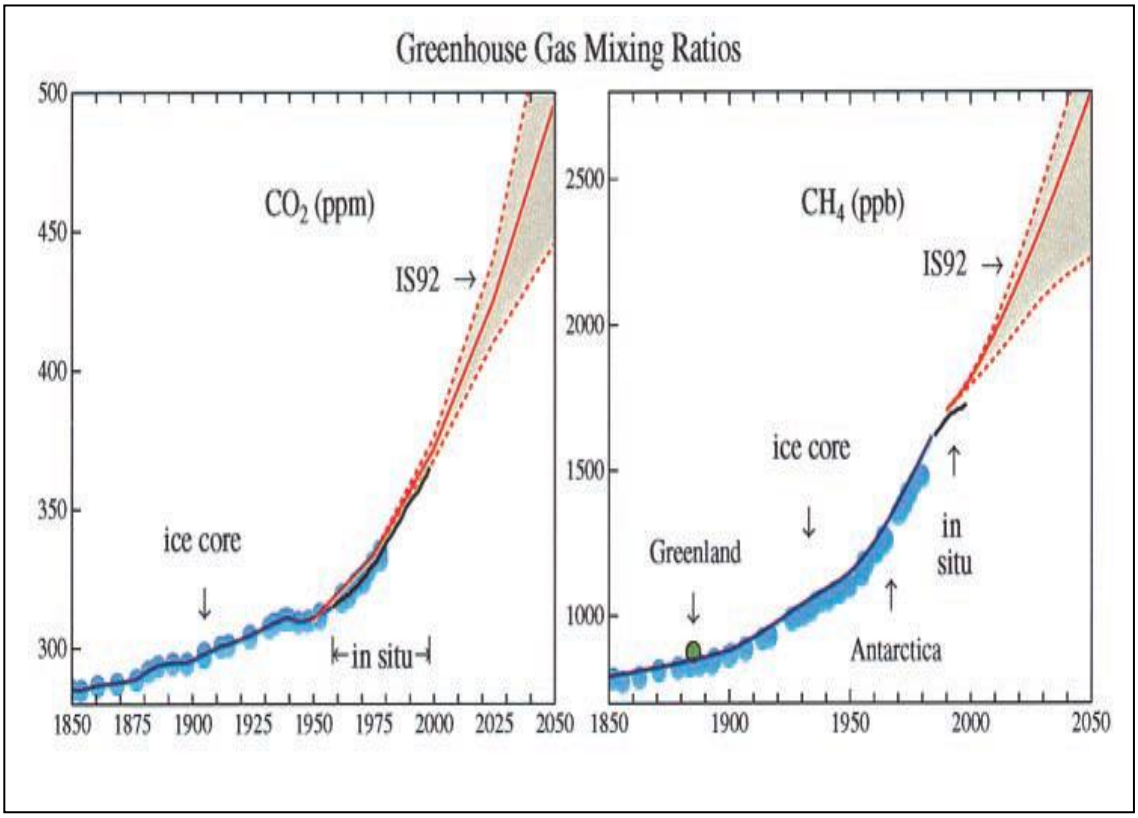


Figure (4) Atmospheric CO2 and CH4 observations and range of IS92 cases (the solid red line is IS92a).

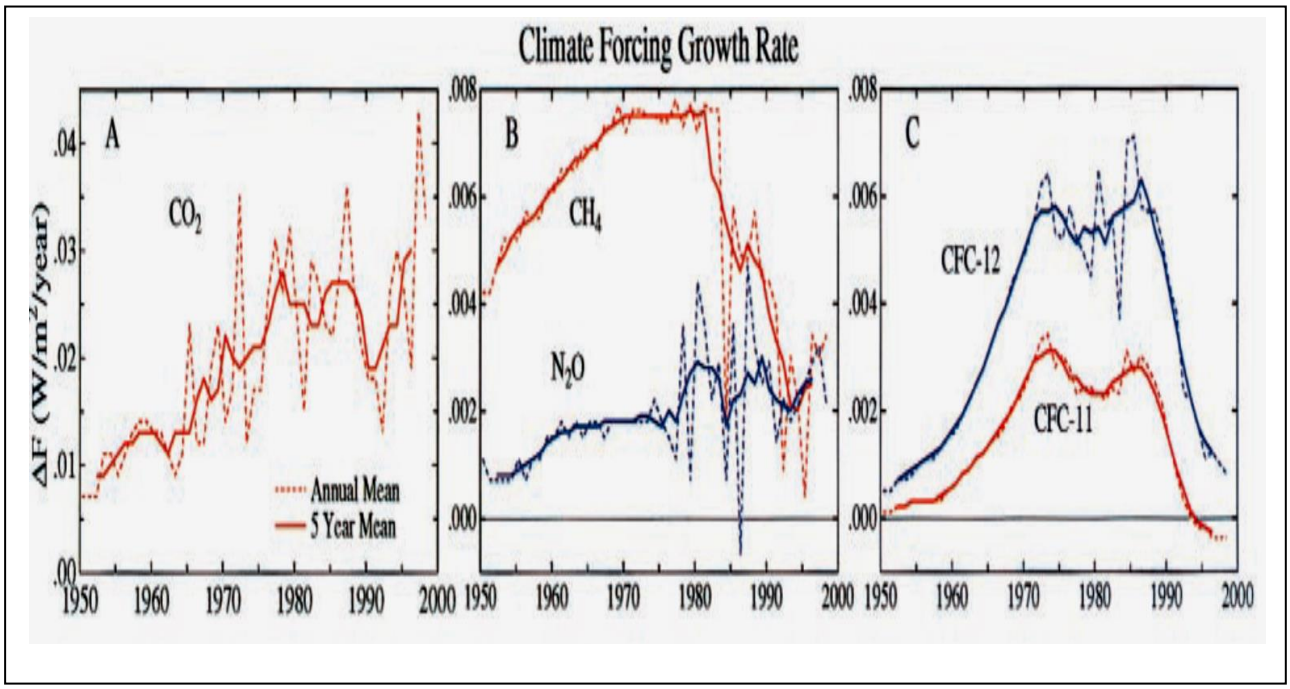
GHGs, including CFCs, was already a 15% reduction from the principal 1990 IPCC case 18). The observed increase inCH4 in the 1990s falls below the lowest IS92 case , whereas CO2 falls on the lowest IS92 case .

Trends of the climate forcings are revealed better by their annual growth rates, as shown in Fig. 5 for anthropogenic GHGs.

The forcings are calculated from the equations of Table 1. The CO2 and CH4 amounts for 1999 were kindly provided by Ed Dlugokencky and Tom Conway of the National Oceanic and Atmospheric Administration Climate Monitoring and Diagnostics Laboratory. The estimated negative forcing due to stratospheric O3 depletion, 20.1Wym2, is smaller than the20.2Wym2 that we used earlier (6) because of changes in the vertical profile of O3depletion estimated from observations. O_3 trends recommended by the World Meteorological Organization (22) have less depletion in the tropopause region (where O_3 loss causes surface cooling) and greater loss in the middle stratosphere (where O_3loss causes surface warming) compared with the O3 changes that we used previously (5,6). Climate forcing by CO2 is the largest forcing, but it does not dwarf the others (Fig. 1). Forcing by CH4 (0.7 Wym2) is half as large as that of CO2, and the total forcing

by non-CO2 GHGs (1.4Wym2) equals that of CO2. Moreover, in comp due to different activities, we must note that fuels producing most of the CO2 are also the main source of

aerosols; especially sulfates, black carbon, and organic aerosols (4, 13).As shown in fig (6) Fossil fuels contribute only a minor part of the non-CO2 GHG growth via emissions that are not essential to energy production forcings.



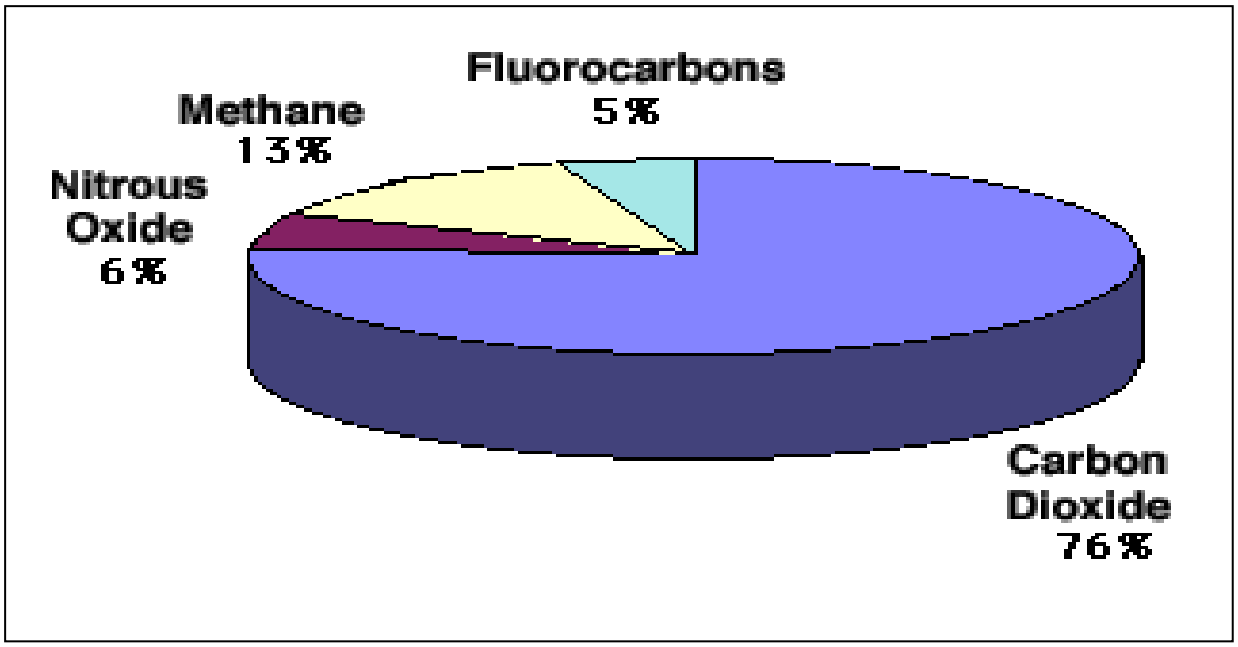


Figure 6 shows the distribution of GHG in Earth's atmosphere

We know that According to a paper published in Nature takes on the ambitious task of connecting micro- and macro-level estimates of climate costs. The study finds that climate

change can reshape the global economy by reducing average global incomes roughly 23 percent by the year 2100. This study presents the first evidence that economic activity in all regions is coupled in some way to global climate. The study also sets up a new empirical diagram for modeling economic loss in response to climate change.as we seen in fig. (7) &fig. (8) The main sources of GHGs are produced by some countries where they produced a progress at technology all over the world also they give us the pollution too .

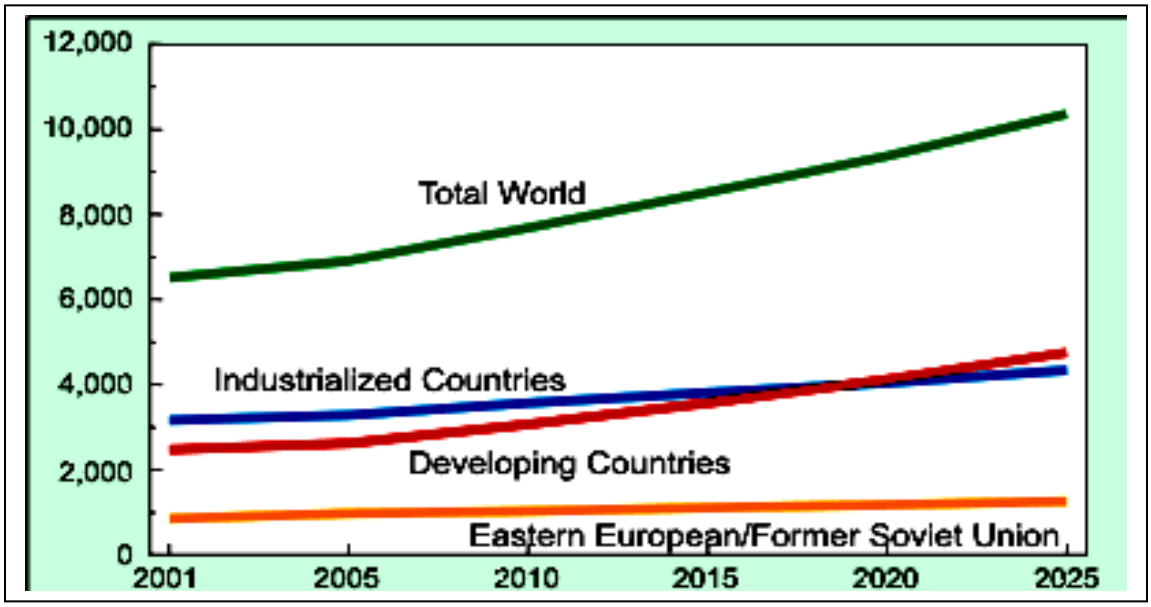


Figure (7) show the World Carbon Dioxide Emissions by Region, 2001-2025
(Million Metric Tons of Carbon Equivalent)

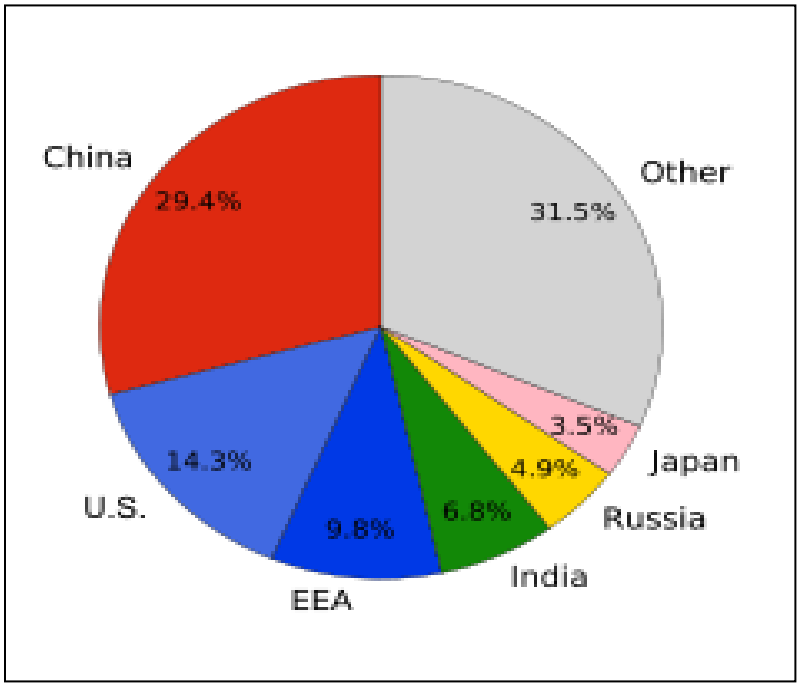
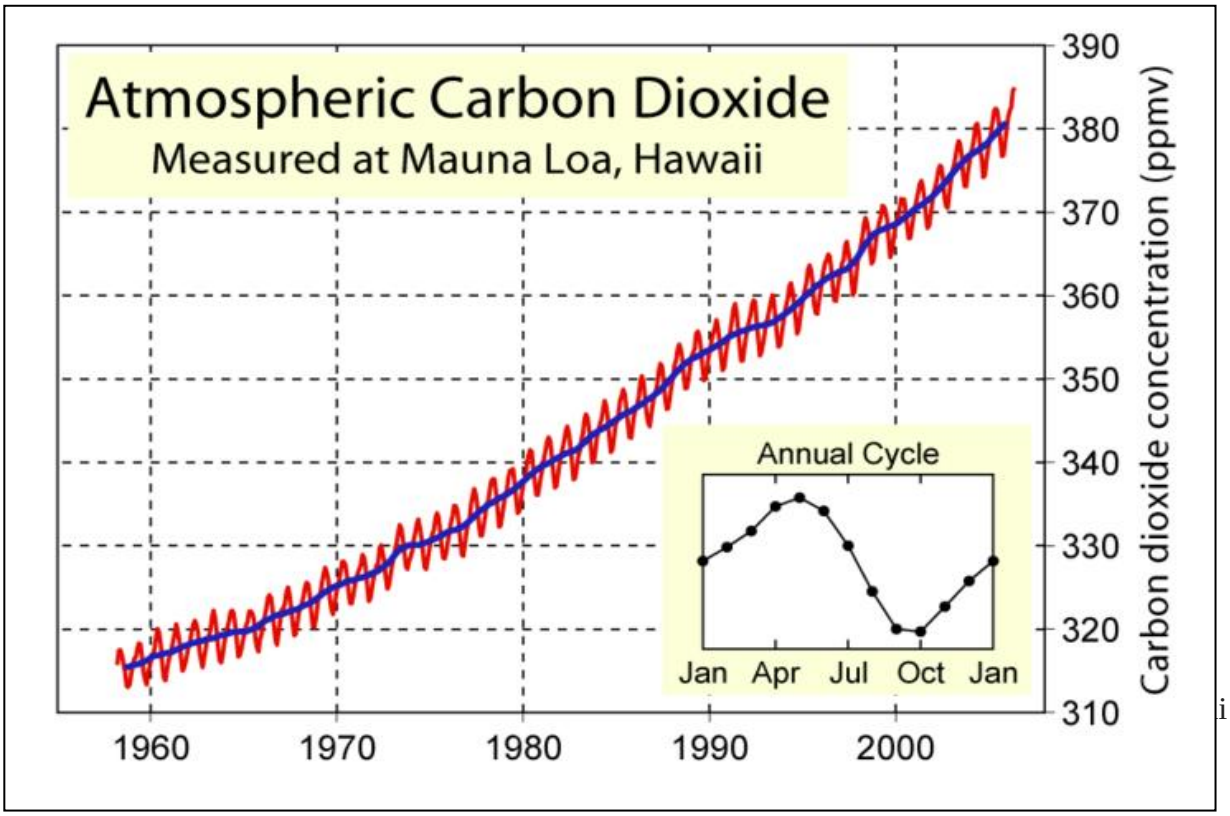


figure (8) show the statistical drawing of the carbon dioxide produced all over the world

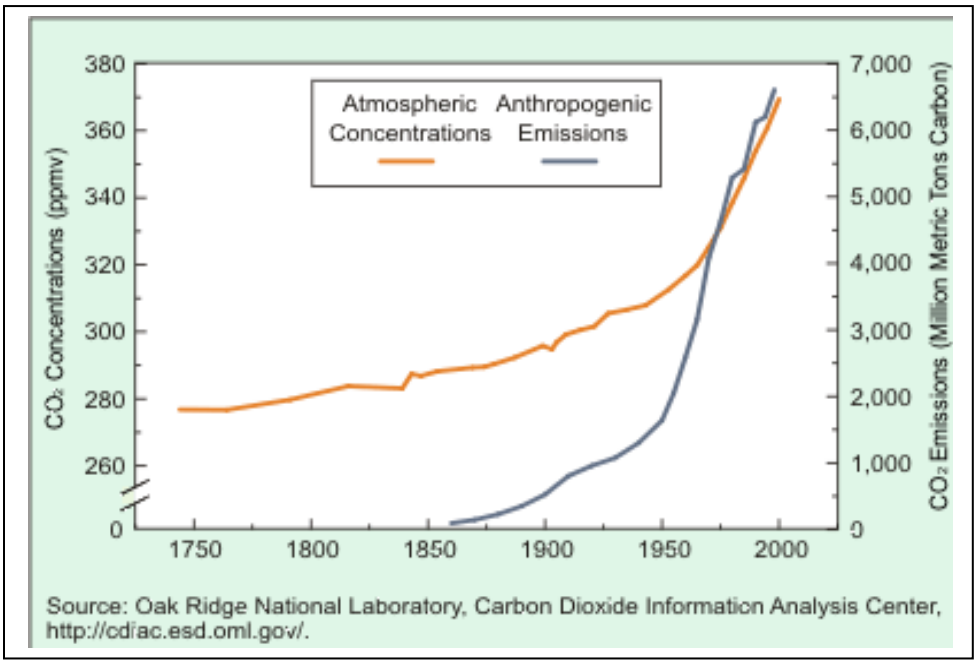
Also the Public reactions of global warming and concern about its effects are also increasing. A global 2015 Pew Research Center report showed that a median of 54% of all respondents asked consider it "a very serious problem". Significant regional differences exist, with Americans and Chinese (whose economies are responsible for the greatest annual CO_2 emissions) among the least concerned.[23] as shown in figure (9) the increasing of carbon dioxide concentration as measured at Mauna ,Hawaii .we can see the rapid increasing of carbon dioxide every decades



i

The main older source of global warming was the mean CO2 concentration . Which growth rate in the next 50 years to be about the same as in the past two decades. The additional forcing in 50 years is about 1 Wym2 for
An average annual CO2 increment of 1.5 ppm.
Is such a CO2 growth rate scared us? We note that the CO2 growth rate increased little in the past 20 years, while much of the developing world had rapid economic growth. The United States also had strong growth with little emphasis on energy efficiency, indeed with increasing use of energy-inefficient sports
utility machines . This fact suggests that there are necessaries to achieve reduced emissions consistent with strong economic growth. Limiting CO2 growth to 75 ppm in the next 50 years

probably requires a moderate decrease in CO2 emission rates, as continuation of high terrestrial sequestration of CO2 is uncertain.as we shown in figure (10) according to the carbon dioxide analysis center



In the near term (2000–2025) this state can be achieved by improved energy efficiency and a continued trend toward decarburization of energy sources, e.g., increased use of gas instead of coal.

Technologies for improved efficiency exist (25), and implementation can be driven by economic self-interest, but governments need to remove barriers that discourage buying of energy efficiency (15). Business- as-usual cases often understate a long-term trend toward decarburization of the energy supply (figure 8 in ref. 4), but the IPCC Special Report on Emission state (9) includes a subset that is consistent with our CO2 cases.

Many studies show that the temperature of the periods between 2010 to 2018 was hotter than any other decade in at least the past 1,300 years. This warming is altering the earth's climate system, including its land, atmosphere, oceans, and ice, in far-reaching ways. So we have to be clear to solve this case to preventing any any progressing of the pavilion or global warming phenomena

In 2013, the Intergovernmental Panel on Climate Change(1) (IPCC) Fifth Assessment Report concluded, "It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century."[5] The largest human influence has been the emission of greenhouse gases such as carbon dioxide, methane, and nitrous oxide.

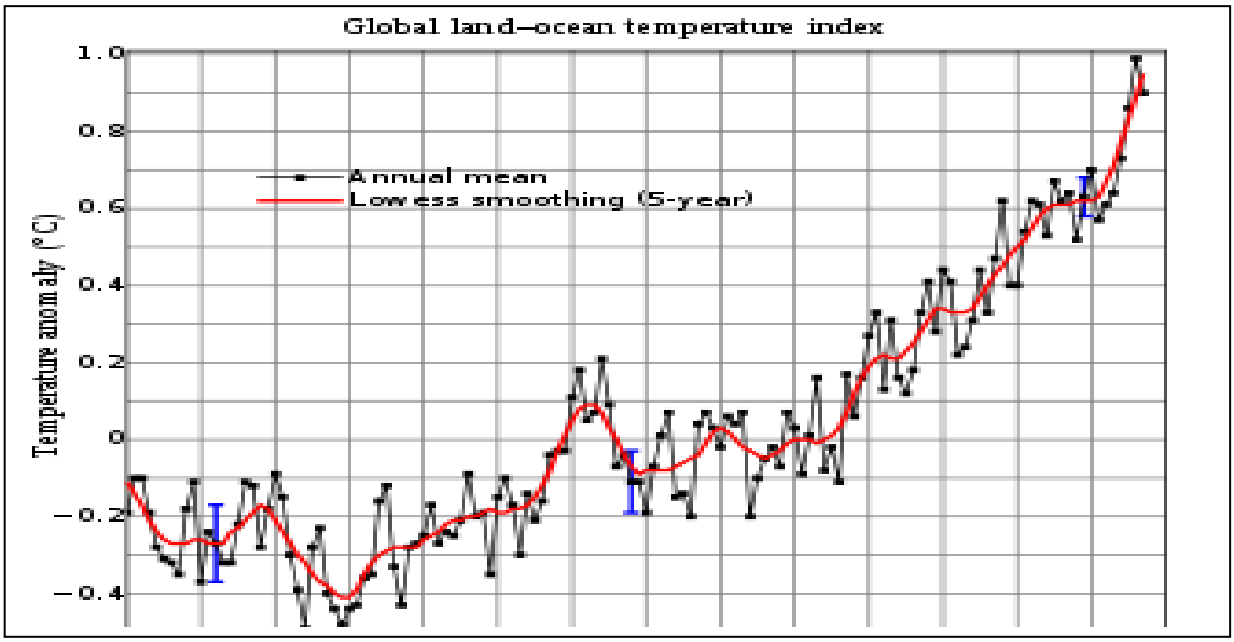
Climate model projections summarized in the report indicated that during the 21st century, the global surface temperature is likely to rise a further 0.3 to 1.7 °C (0.5 to 3.1 °F) in the lowest emissions scenario, and 2.6 to 4.8 °C (4.7 to 8.6 °F) in the highest emissions

scenario.[6] These findings have been recognized by the national science academies of the major industrialized nations (17) and are not disputed by any scientific body of national or international standing.[9][10]

Future climate change and associated impacts will differ from region to region(11,12) Anticipated effects include increasing global temperatures, rising sea levels, changing precipitation, and expansion of deserts in the subtropics.[13] Warming is expected to be greater over land than over the oceans and greatest in the Arctic, with the continuing retreat of glaciers, permafrost, and sea ice. Other likely changes include more frequent extreme weather events such as heat waves, droughts, heavy rainfall with floods, and heavy snowfall;[14] ocean acidification; and species extinctions due to shifting temperature regimes.

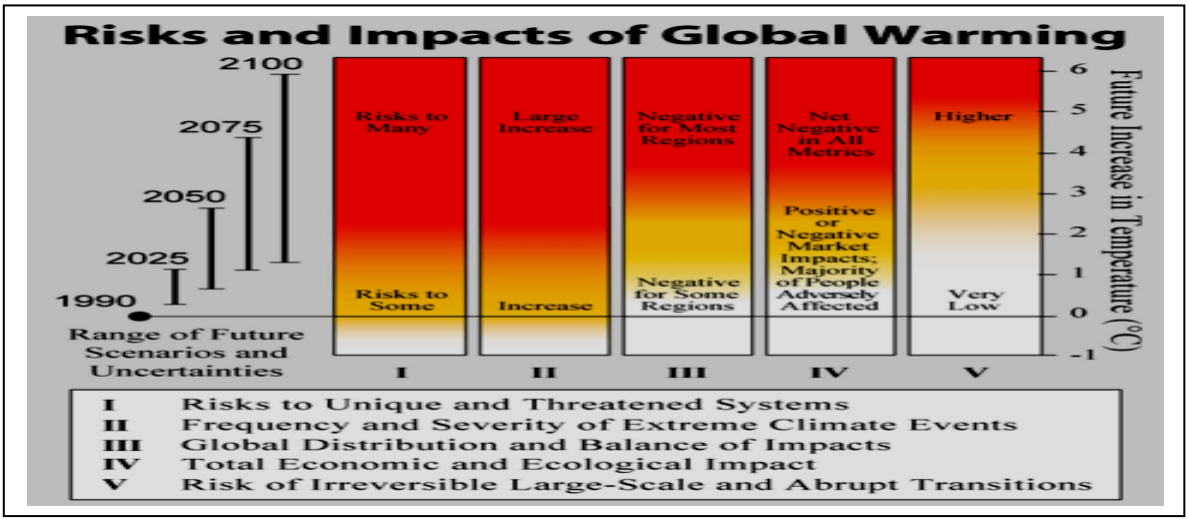
Effects significant to humans include the threat to food security from decreasing crop yields and the abandonment of populated areas due to rising sea levels(15,16) Because the climate system has a large "inertia" and greenhouse gases will remain in the atmosphere for a long time, many of these effects will persist for not only decades or centuries, but for tens of thousands of years (20)to come as we see at figure (11) the annual mean increasing in temperature or Global mean surface-temperature change from 1880 to 2017.

It's clear that the mean temperature is rise and still rise until this moment.



At this research we try to explain the way that we could do to prevent the global warming from expanded and increasing rapidly later.

After we explain this phenomena where we called it as a phenomena, because it's touch our lives on this planet , so we show the risk of it as shown in figure (12) the future increasing in temperature due to the global warming case since (1990) until (2100) .



The way we thought that could prevent or reduced the global warming are:

1. Use a large amount of the solar energy that causes the global warming, all over the globe, so the received solar ray is equal to that emission and trapped at the atmospheric air.

2: Reduce the green house gases by agricultural much land with trees and plants that give large amounts of oxygen and absorbed many tons of $CO_{2,\ to}$ give balance of the environment.

3. Use the clean Energy for the industrial, or use the renewable energy.

4. Use the renewable energy for transport also like produced cars or vehicle working with water or using solar energy.

5. Use the energy of natural phenomena like volcano, storms, and Hurricanes to produced useful energy to use at many sector of life at all countries.

Recommends: Apply and study the solutions in this paper rapidly and apply the solutions all over the world to solve this problem, and find another solutions to this phenomena, finally use the power of the global warming to help the humanity.

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FULL PAPER

Evaluating the Total Antioxidant Activity and Free Radicles Scavenger of Ziziphus Leaves, Bark Ethanoic Extracts, and the Aqueous Extract Of Ficus Leaves In Basrah

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Abstract

Ziziphus spina christi and Ficus carica are known for their activities and use in traditional medicine in treating many diseases besides being nutritious and healthy for eating. This study evaluated antioxidant activity in the bark and leaves, ethanoic extracts of Ziziphus spina Christi (L.) and the aqueous extract of Ficus carica. The extract's antioxidant activity was measured based on the scavenging activities of the established 1,1-diphenyl-2-picrylhydrazyl free radical scavenging method. The total antioxidant activity was measured using Total Antioxidant Capacity Reagent (TCA), using a UV-spectrophotometer against a blank, At the same time, the standard was a series of Ascorbic Acid solutions. The results revealed that the leaves extract of sider and f. carica has total antioxidant activity less than the sidr bark extract which was 300, 40 and 700 respectively. IC50 of fig leaves extract was 260.228 µg/ml and of sider leaves and bark extract were 124.433 & 1.7924 µg/ml respectively while it was 50.558 µg/ml for ascorbic acid. The low concentration of sider park has more antioxidants activity comparing with leaves from both sides and fig.

Keywords

leaves extract; free radical scavenger; Antioxidant Activity; Sider Bark properties; Ficus carica extract

1. Introduction

Plants are considered a supply of unique chemical compounds, that have capacity effects in medicine and different applications. Glycosides, steroids, alkaloids, tannins, volatile oils, fixed oils, resins, flavonoids, and phenols were active composites in plants, which are deposited in their specific parts such as leaves, flowers, bark, seeds, fruits, root, etc. Different parts of the plant are utilized traditionally to treat numerous types of ailments. The fig fruits are used to cure headache, chewed for toothache and cold, whereas powdered root and leaves of the plant has been applied externally to wounds and sores[1].

Ziziphus spina-christi (L.), or Sidr (common name) is a deciduous shrub several purpose tree that belongs to the Rhamnaceae [2]. These species natural to the warmer and subtropical regions, including North Africa, South Europe, the Mediterranean, Australia, Tropical America, Asia (South and East) and the Middle East [3]. Fruits are usually used in old medication for curing of a variety of diseases, for example, they are applied to cuts and ulcers[4]. The bark of *Ziziphus* was reported to have antipyretic, sedative-hypnotic, and pain killing purposes [5]. While the Figs (*Ficus carica* L.) are an infructescences tree, a deciduous plant belonging to the Moraceae family, Fig fruit is an important crop consumed world-wide [6], where it is grown commercial, native in the Western Asia and Middle East, it has been cultivated since ancient times and is now commonly grown all over the world, both for its fruit and leaves rich with oil, the species has become naturalized in scat treed locations in Asia and North America.

Antioxidants are substances that play vital roles in stopping the pathogenic procedures associated with cancer, cardiovascular disease, macular degeneration, cataracts, and asthma, and they could beautify immune function, except that antioxidant defences shield the frame from the damaging outcomes of loose radicals generated as by-merchandise of everyday metabolism [7]. They are sometimes called the free-radical scavengers and the source can be naturally or artificially, certain plant-based food is thought to be rich in antioxidants and these are considered as a type of phytonutrient, or plant-based nutrients, the body also produces antioxidants known as endogenous while those come from the outside of the body are known as exogenous.Modern lifestyle conduct has caused many human beings to expand abnormally high levels of oxidative stress, which has been caused mainly by free radicals [8]. Reactive oxygen species (ROS), consist of free radicals such as hydroxyl (OH^-), superoxide (O^-_2), nitric oxide (NO), peroxyl (RO^-_2), lipid peroxyl (LOO^-) radical and non-free radical species like hydrogen peroxide (H_2O_2), singlet oxygen (O^{-1}_2), ozone (O_3) and lipid peroxide (LOOH) are different forms of activated oxygen [9].

ROS are produced by aerobic organisms and might without difficulty react with many organic molecules along with proteins, lipids, lipoproteins and DNA. This ROS can generate oxidative stress and produce many pathophysiological disorders such as arthritis, diabetes, inflammation, cancer and genotoxicity [10]. For protection against free radicals, organisms are endowed with endogenous (antioxidant enzymes) and exogenous defense systems. These systems are unable to protect tissues when the generation of free radicals is significantly increased[11].

The research aimed to detect the active components in both leaves and bark of *Ziziphus spina-christi (L.)* and leaves of *F. caica* , then estimated the antioxidant activities and calculated the concentration of sample required to scavenge 50% of free radicals (IC_{50}) of both extracts.

2. Experimental

2.1. Plant collection:

Fresh *Z. spina-christi (L.)* Leaves and bark were collected from trees growing in an Al - Zubair area (Basra, Iraq) between August and October of 2022. While the leaves of *Ficus carica* "figs leaves" were collected from two different cities (Karbala and Basra) then we dried those fig leaves and grounded them into fine powder.

2.2. Plant extraction:

First, the plant leaves and root bark were washed with distilled water and dried at room temperature (25^{o} C). The dried leaves and bark were grounded into powder using an electric blender. The ethanol extracts were done by adding Ten grams (10 g) of both leaves and bark powder, with 100 ml of ethanol-distilled water (8 : 2 w/v) prepared separately and placed on the magnetic sitter device without heat (DAIHAN LAB Tech. Co. LTD) for 24 h. Thereafter, it was filtered by filter papers (Qualitative filter papers No102). A ratio of 1:20 was used in forming the extract using fig leaves powder and distilled water placed on the magnetic sitter device without heat, then letting it dry. The filtered extracts were left to dry in sterilized Petri dishes in the hood. The dried extracts of leaves and bark were collected in separator glass containers and were kept in the refrigerator until the time of use in the biological experiment.

2.3. Antioxidant Activity Test

For the antioxidant activity test, 300 µL of the solution was dissolved in 3 ml of Total Antioxidant Capacity Reagent (TCA), which was prepared by mixing 7.5 ml of sulfuric acid, 0.99 gram of anhydrous sodium sulfate, and 1.24 gram of ammonium molybdate in 250 ml of distilled water. Using a UV-V spectrophotometer, absorbance was measured at 695 nm against a blank of distilled water and a series of Ascorbic Acid solutions of known concentrations as standard which were started with 0, 200,400, 600, 800 and 1000 mg/ml [12].

2.4. 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radical scavenging activity

Based on the scavenging activities of the established 1,1-diphenyl-2-picrylhydrazyl (DPPH, Sigma-Aldrich, St. Louis, MO), the antioxidant activity of all extracts was calculated. Three milliliters of a 0.004% (w/v) methanol solution of DPPH were added to 1000 ml of various concentrations (20,40,60,80 and 100 µg/ml) of the test substances. The absorbance at 517 nm was measured in comparison to a blank after 30 minutes of storage at room temperature in a dark area. Inhibition of free radical DPPH in percent (%) was counted by the formula:

Percentage inhibition of DPPH (%) = [(A blank – A sample) / A blank)] * 100

The absorbance A blank represented the control reaction (holding all reagents excluding the test extracts), and A sample represented the absorbance of each extract. IC_{50} values (concentration of sample required to scavenge 50% of free radicals) were counted from the recession equation, prepared from the concentration of the sample, and percentage inhibition of free radical formation/ percentage inhibition DPPH. Synthetic antioxidant reagent L-ascorbic acid (Sigma-Aldrich, St. Louis, MO), was used as positive control and duplicate were prepared in all tests [13].

2.5. GC-MS analysis:

The samples of the two dried ethanolic extracts of Sider leaves, bark and fig leaves were subjected to GC-MS Analysis in Agriculture College – University of Basrah to chemical compounds detected. By using the NIST Mass Spectral Library and the Retention Index Database, the identification of compounds was by their mass spectra and maintenance indices**.**

3. Results and discussion

3. Results

The results revealed that the 5 mg/ml leaves have a total antioxidant equal to 300 while the same concentration from sidr bark has 700, while the fig leaves extract has a total antioxidant of about 40 which detects that the 5 mg/ml (Figure. 1)

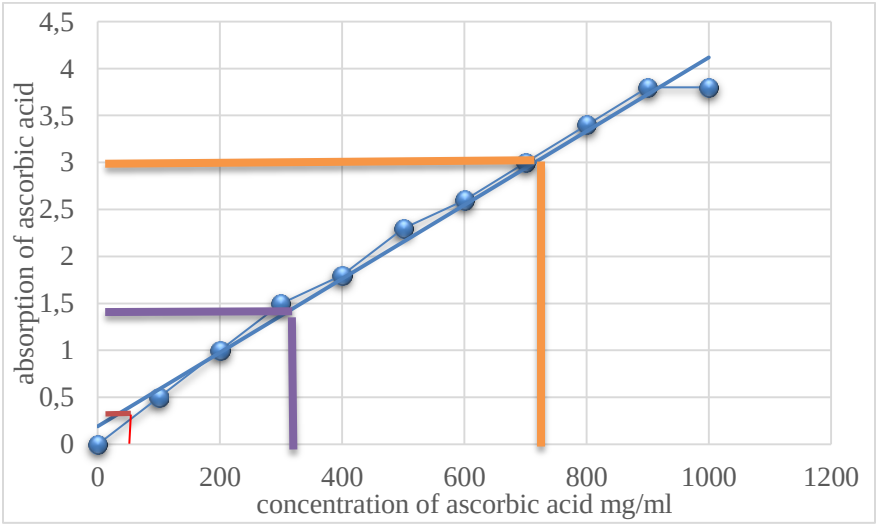

Figure 1. The total antioxidant of Fig leaves (red), Sidr leaves (orang), and bark (green) extracts.

The free radical inhibition by DPPH was high percentage sider leaves and bark extract as well as of the fig leaves extract and are shown in Figure 2. The bark extract revealed a high

activity at a low concentration. When the concentration of the fig leaf extract was rising, its activity was increased. In addition, the results revealed that IC_{50} of sider leaves and bark extract were 124.433 & 1.7924 µg/ml respectively and IC_{50} of fig leaves extract was 260.228 µg/ml while it was 50.558 µg/ml for ascorbic acid (Figure3).

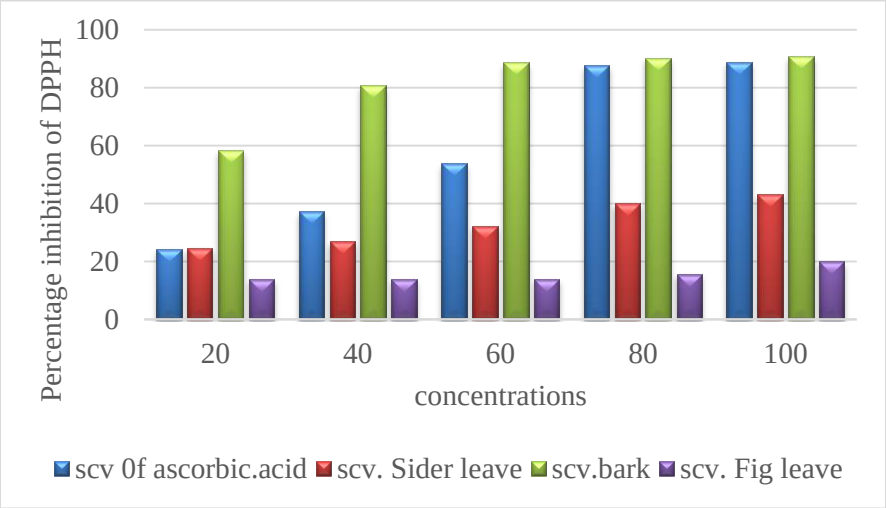

Figure 2. The inhibition percentage of free radical DPPH for fig leaves, sider leaves, and bark extracts.

The GC-MS chromatogram contained 25 peaks corresponding to 25 diverse compounds from sider bark extract while 14 different components were detected in sider leave extract (Figs. 4, 5.) Tables 1, 2 and 3 contain the concentration and identity of the detected compounds in experiment extract respectively. The GC-MS chromatogram revealed 25 peaks equivalent to 25 different compounds, as shown in Figure 6. Table 3 contains the identity and concentration of these compounds.

The concentration of identifying combinations ranged between 18.07% n-Hexadecanoic acid, 4.53 % Phenol, 2,2'-methylenebis [6-(1,1-dimethylethyl) -4- Methyl and 11.58 % Cyclopentadecanone, 2-hydroxy. Octadecanoic acid and its derivatives are communal saturated fatty acids that made up 3.40 % of the extracts.

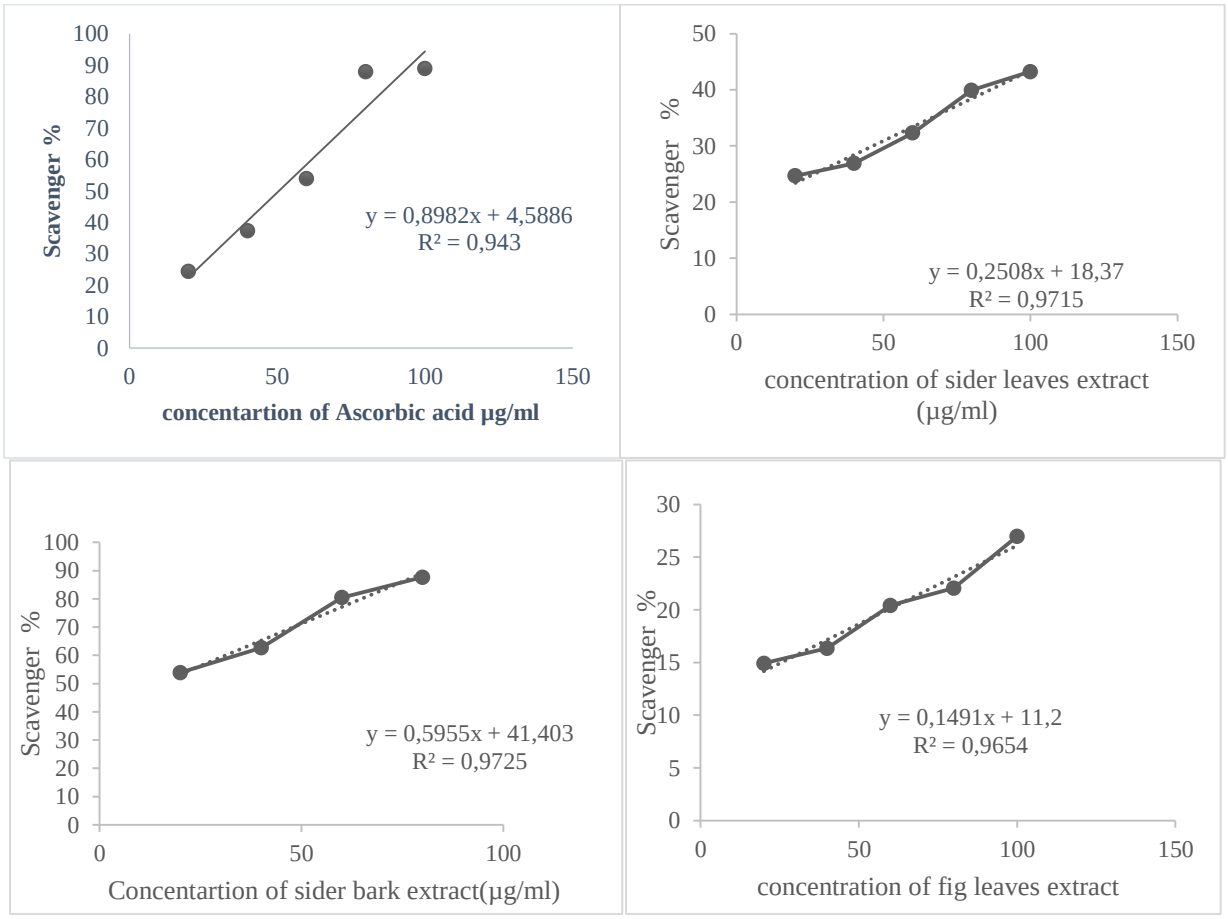

Figure (3) IC50 calculated in ascorbic acid, fig leaves, sider leaves and bark extractions.

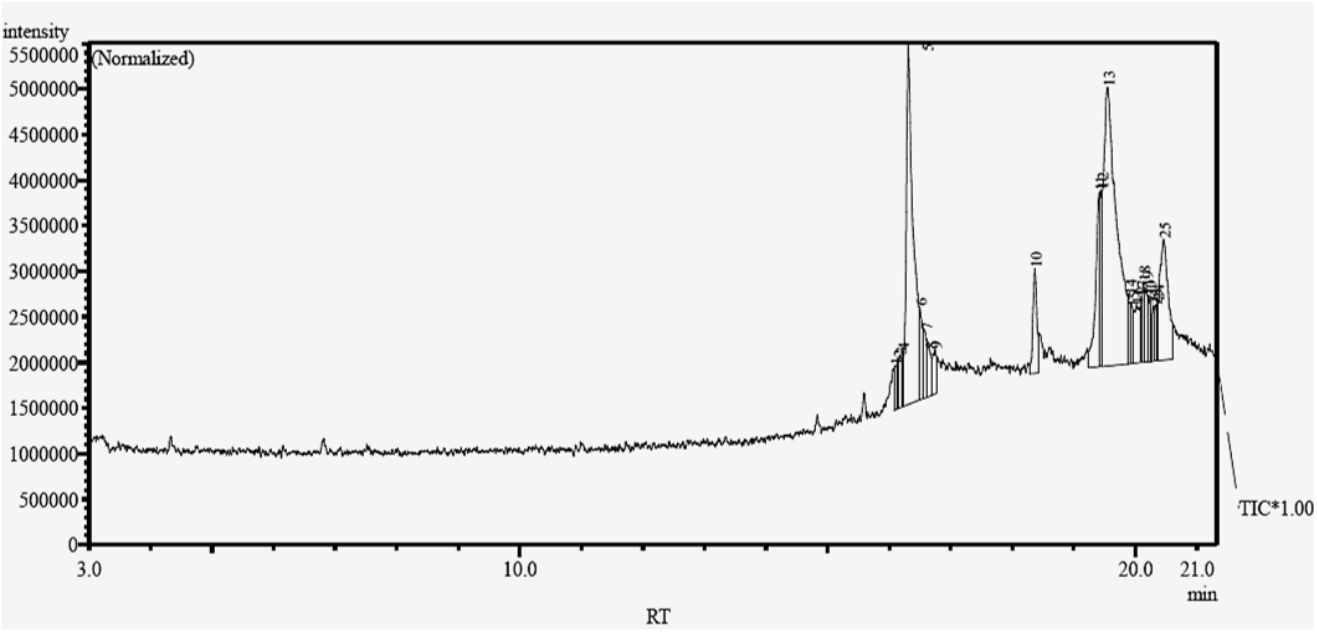

Figure 4. Chromatogram Scan by GC-MS for the sider bark extract

Table 1. Identity and retention time of compounds identified with GC-MS of sider bark extract.

Peak#	Ret. Time	Area%	Name
1	16.093	0.80	2H-9a-Methano-1benzoxepin-4,5,6,7,9,10-hexol, 5a-[(acetyloxy) methyl] octahydro-2,2,9-trimethyl-, 4,6,7,10-tetraactetate-5- benz
2	16.140	0.75	4-[3-(2,5-Dioxo-pyrrolidin-1yloxycarbonyl)-propionyl]-piperazine-1carboxylic acid, ethyl ester
3	16.173	1.09	Acetic acid, 17-(1,5-dimethyl-hexyl)-4,4,10,13,14-pentamethyl-2,3,4,5,8,10,12,13,14, 15, 16,17-dodecahydro-1H-cayclopenta [a] phenan
4	16.213	0.85	Pregnan-20-one,3,2,1,bis[(trimethylsilyl)oxy]-,O-methyloxime,(3,alpha,5,beta)
5	16.312	21.50	Pentadecanoic acid
6	16.493	2.50	Tridecanoic acid
7	16.580	1.61	Hexa-t-butylselenatrisiletane
8	16.653	1.89	Pentacosanoic acid, 2-[(trimethylsilyl)oxyl]-, methyl ester
9	16.747	1.58	Nonanoic acid
10	18.368	3.61	Heptadecyl trifluoroacetate
11	19.413	6.77	E-2-Hydroxymethylcylopentanol, bistrifluoroacetate (ester)
12	19.447	3.25	Picoolinyl 13-cyclopent-2-enyltridec-4-enoate
13	19.547	31.12	cis-Vaccenic acid
14	19.900	1.43	4-Amino-6-morpholine-5-nitropyrimidine
15	19.953	1.23	10,13,-Eicosadienoic acid, methyl ester
16	20.013	2.69	Na-(3,5-dinitrobenzoyl)tyrosine N'-[4-(dimethylamine) benzylidene) hydrazide
17	20.087	0.79	15—Methylheptatriacontane
18	20.129	1.82	Cyclododecanone, 2-pyridylcarbonylhydrazone
19	20.175	1.53	Docosyl trifluoroacetate
20	20.220	0.98	Hexacosane ,13-dodecyl-
21	20.247	0.81	Crystalline Antibiotic
22	20.293	1.13	2-Idohiistidine
23	20.327	0.83	Dichloroacetate acid, 3-tridecyl ester
24	20.360	0.73	Isopropyl stearate
25	20.461	8.71	Phenol, 2,2'-methylenebis[6-(dimethylethyl)-4-methyl-

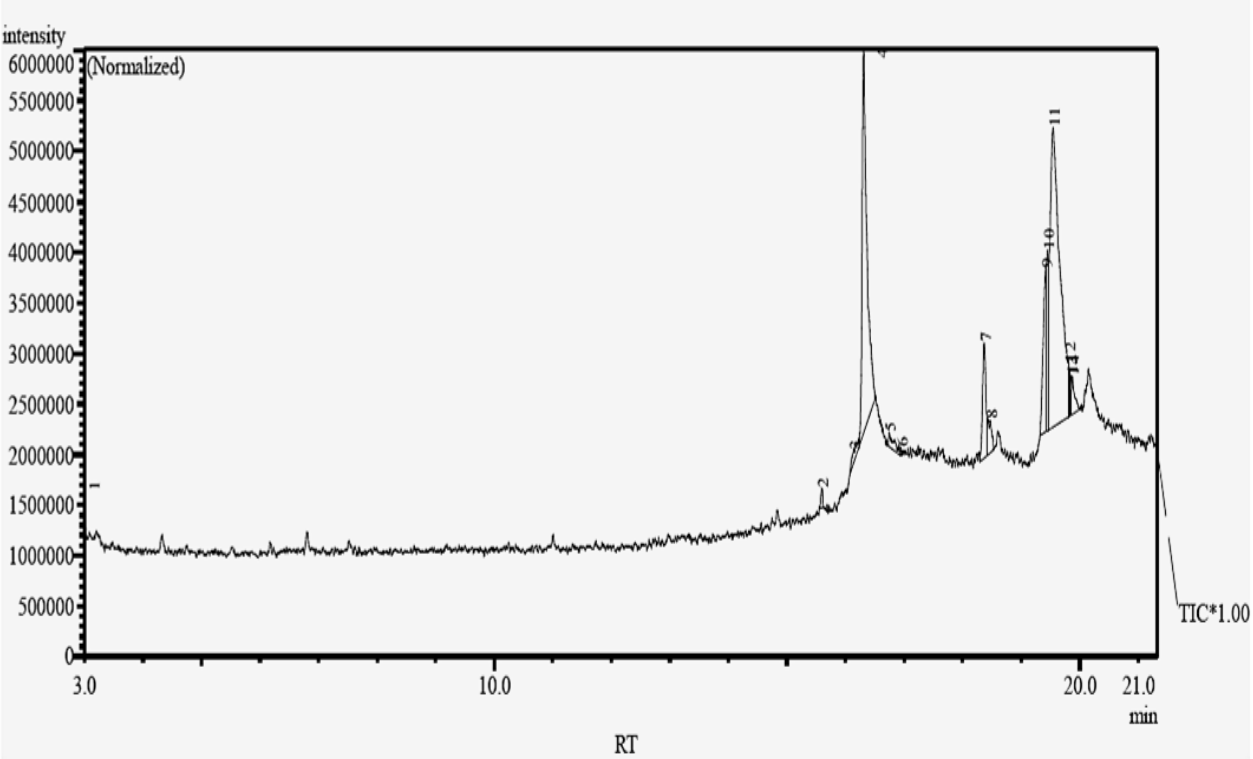

Figure 5. Chromatogram Scan by GC-MS for the sider leaves extract

Table 2. Identity and retention time of compounds identified with GC-MS of sider leaves extract.

Peak#	Ret. Time	Area%	Name
1	3.020	0.46	Serverogenin acetate
2	15.596	0.52	Hexadecanoic acid. Methyl ester
3	16.133	1.24	Methyl 23-hydroxycholate tetrakis(trimethylsiyl)-
4	16.309	27.48	Pentadecanoic acid
5	16.740	1.19	2-Hexyldecanoic acid
6	16.947	0.09	n-Octadecyl-N'-6-[N-azirdyl]hexylthiourea
7	18.336	5.87	1-Heneicosyl formate
8	18.473	1.94	13-Oxabicyclo[10,1,0]tridecane
9	19.413	8.64	9-Octadecenoic acid(Z), 2-hydroxy-1-(hydroxymethyl)ethyl ester
10	19.447	4.46	Methyl 9,12-heptadecadienoate
11	19.543	44.61	cis-9-Hexadecenal
12	19.813	1.23	Hexacosanoic acid, propyl ester
13	19.847	0.70	Eicos-9-ene-1,20-diacetate
14	19.873	1.57	Hexadecanoic acid, dodecyl ester

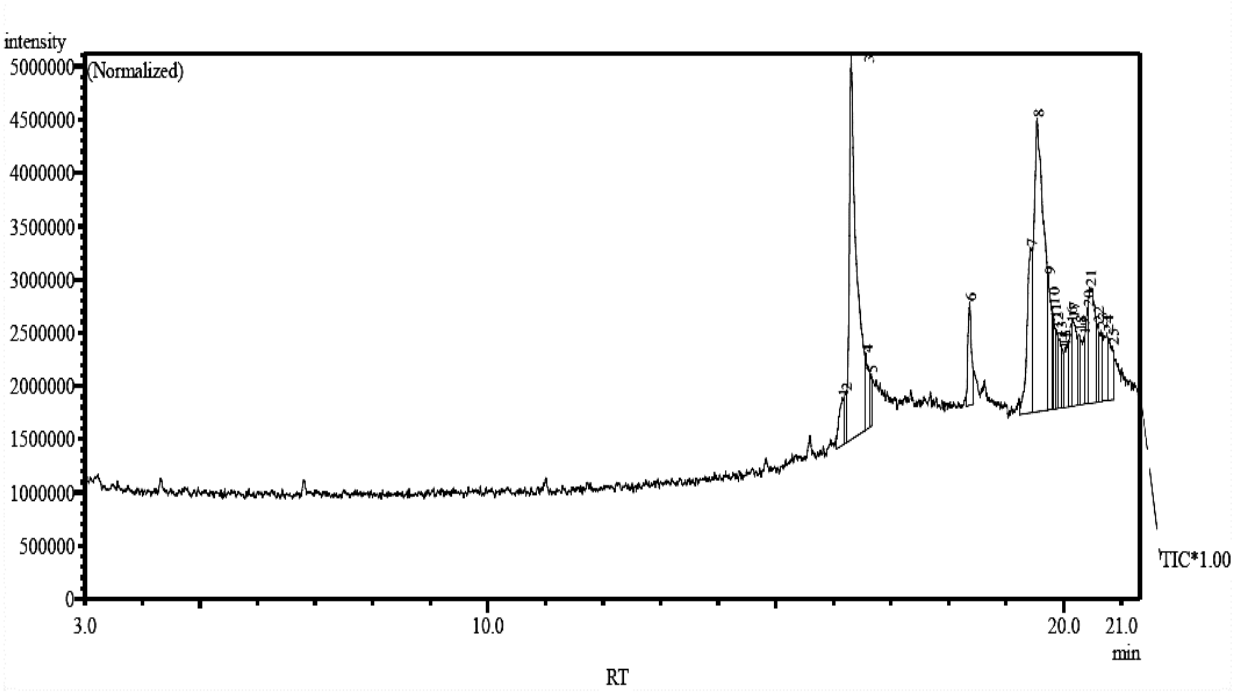

Figure 6. Chromatogram Scan by GC-MS for the fig leaves extract**.**

Table 3. Peak No., Identity, percentage and retention time of compounds identified with GC-MS for the fig leaves extract.

Peak#	Ret.Time	Area%	Name
1	16.153	2.07	Ethyl3,4-dichloro-5-[4-chloro-5-[4-(2,2,2-trichloroethoxycarbonyloxy) phenyl]oxazol
2	16.207	0.85	Propanoic acid, 2-(3-chlorobenzoylamino)-2-(5,6-dihydro-3-cyano-4H-cyclopenta[b]thien-2-ylamino)-3,3,,3-trifluoro-, ethyl ester
3	16.309	23.00	N Hexadecanoic acid
4	16.567	2.47	N Hexadecanoic acid
5	16.656	0.81	Fumaric acid, 3,3-dimethylbut-2-yl nonadecyl ester
6	18.367	3.25	n-Nonadecanol-1
7	19.420	7.49	Phosphine, 9-methyl-3-hexyn-2-yl)diphenyl-
8	19.539	23.65	Cyclopentadecanone,2-hydroxy-
9	19.733	3.17	Chloromethyl 5-chloroundecanoate
10	19.805	1.33	Thiocyanic acid, 4 alpha-methyl-5-alpha.-cholestan-3.alpha-yl ester
11	19.833	1.36	Fumaric acid, cis-non-3-enyl hexyl ester

12	19.880	0.85	1-Dimethyl(pentafluorophenyl)silyloxytridecane
13	19.933	1.69	Urea, 1,3-bis(tricycle[5,2,1,0)]dec-2-yl)-
14	19.987	1.11	E,E-10,12-hexadecadienal
15	20.013	2.34	Solasodine benzoate
16	20.120	1.51	17,21-octacosadienoic acid, pyrrolidide
17	20.155	3.07	Octadecanoic acid, 2-(2-hydroxyethoxy)ethyl ester
18	20.273	1.71	Phosphonochloridous acid (1-methylethyl)-, 5-methyl-2-(1-methylethyl)cyclohexyl ester
19	20.342	1.77	Pentadecanoic acid, 15-bromo
20	20.407	2.08	Hexaco1-mMethyl-1-octadecyloxy-1-silacytopentane
21	20.454	6.56	Phenol, 2,2-methylenbis[6-(1,1,dimethylethlen)-4-methyl-
22	20.587	1.01	Cyclopropane, 1 bromo-1-(3-dimethyl-1-pentenylidene)-2,2,3,3-tetramethyl-
23	20.652	1.66	1-Cyclohexano[2,3-b]Cholestan-1-‘one
24	20.753	2.69	Triacontane
25	20.840	2.48	5-Cholesten-3beta-yl isobutyl carbonate

4. Discussion .

The antioxidant activity was thought to arise from the presence of flavonoids and steroids in the extracts that were taken from fig leaves in addition to that, it is considered to be a rich source of polyphenolic compounds.

Phytochemical surveys on *Z. spina-christi* have revealed it has many biologically essential phytochemicals composed. Several studies have revealed that some alkaloids, isoquinoline, cyclopeptide, flavonoid terpenes and their glycosides have been detected in different volumes in most species of *Ziziphus* [14], [15]. The results showed that both leave and bark have similarities in their components with some differences in quantity and quality. Most plant leaves contain ceanothic and betulinic acids, numerous flavonoids, peptide, saponins, erols, and Polyphenols (as tannins and triterpenes) [16]. From the several *Ziziphus* species, the cyclopeptide alkaloids, tannins, betulinic acid flavonoids and triterpenoids saponin glycosides have been isolated and chemically recognized [17]. Steroids, β-sitosterol, β-D-glucoside, reduced tannins, and 4 saponin glycosides had been isolated from the leaves as well as glucose, fructose, sucrose, raffinose, galactose, and rhamnose had been extracted from various parts of the plants [18]. The extract of *Z. spina-christi* contained cyclopeptides ceanothic acid (a ring-A homolog

of betulinic acid), butic acid, similar as saponin, glycoside , flavonoids, protein, lipids, free sugar, and mucilage [13, 14]. Polyphenols (such as tannins) and glycosides are also extracted from the leaves.

The antioxidant activity of several flavonoids, consider scavenging because of scavenger free radicals, even higher than vitamin E, vitamin C, or glutathione [21].

The major components detected in leave and bark sider extract were Pentadecanoic acid (21.50 %), cis-Vaccenic acid, Phenol, 2,2'-methylenebis[6-(dimethyl ethyl)-4-methyl-, E-2-Hydroxymethylcylopentanol, bistrifluoroacetate (ester) and Na-(3,5-dinitrobenzoyl)tyrosine N'-[4-(dimethylamine) benzylidene)hydrazide. Comparing with the major compounds detected by Al-Rlrahman 7-methyl-6-oxo-1,2,34-tetrahydro-6hpyr, n-hexadecanoic acid, ethyl formate, gamma-sitosterol, D-liomone, the ethyl ester of hexadecanoic acid, octadecanoic acid, and ethyl ester due to the highly contents of phenol and flavonoids compounds [22]. The phytochemical analytic and GC-MS reading conducted by the ethyl acetate extract from stem bark of Ziziphus spina growing in Saudi Arabia showed both the stem bark and the roots gave positive results for more secondary metabolites, included 11 components. These variances might be due to geographical and environmental factors as well as the time of harvest and age of the plant which were recognized as key influences the chemical composition. Secondary metabolites have kindly antioxidant possessions, the resulted as well as Abdl- Rlrahman, 2018 demonstrated the possible antioxidant action of *Z. spina* roots extracts which can be used as an obtainable source of natural antioxidants to reduce oxidative stress with resulting health benefits [22] .

In the current study, *F. carica* L. leaves, sider stembark, and leaves extracts were subjected to valuation of total antioxidant contented as well as, DPPH through the IC_{50} values which was less in leave than bark, that capable with a remarkable antioxidant activity. The antioxidant activity differences observed among different species of *Ziziphus* may be attributed to phenolic compounds, which depend on the area [20 , 21], species [25], genotype [26] and/or the extraction technique [24 , 25]. These data extend to approve the presence of substantial amounts of phenolics in Tunisian *Ziziphus* extracts indicating that they are a significant source of antioxidants that may provide health-promoting advantages to consumers and they are also highly nutritious and rich in vitamin C [29] also in Oman [30]

The presence of free radicals causes some changes and damages to the structure of cells, which cause them to fail to do the desired task that they are made for or that will even start attacking the body and causing harm. Free radicals damage all components of cells, including DNA, proteins, and lipids and the destruction of cells in the normal reduced state can cause toxic effects through the production of peroxides [31]. There has been a growing interest in the use of strong antioxidants for medicinal purposes, particularly for oxidative stress-related metabolic disorders [32]. The high antioxidant activity of the different bioactive compounds in *F. carica* fruit ethanoic extract also proved it to be a potential source of free radical scavenging antioxidants

Total phenolic compounds, flavonoids, condensed tannin substances and antioxidant activity of methanolic extracts of different *Ziziphus* species parts. Plant polyphenols are a wide

group of secondary metabolites that can variety from simple molecules, like phenolic acids to highly polymerized constituents such as tannins [27, 29]. As well as the phenolic compounds founded in fig tree parts [34], [35]. There are composites with a large number of derivatives in the plant kingdom. All the phenolic compounds, but especially flavonoids, have been reported to have numerous biological properties such as antioxidant activity, which can terminate or retard the oxidation process by scavenging free radicals. These antioxidants are considered possible, protection agents for reducing oxidative damage to the human body from ROS[36]. Also, they act as anti-inflammatory mediators [37], antimicrobial activity [38] and inhibition of platelet accumulation [39].

5. Conclusions

The results conclude the leaves extract from both sidr and fig has total antioxidant less than the sidr bark extract also the capacity of free radical's activity of sider bark extract more than leave extract which detected by DPPH. These abilities resulted from the extract components, mainly unsaturated fatty acid, phenols and flavonoids.

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FULL PAPER

Assessment of Maternal Satisfaction Regarding Nursing Care after Caesarean Delivery at Nasser Medical Complex

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Abstract

Maternal satisfaction plays a crucial role in assessing the quality of healthcare services provided, especially in the context of cesarean sections (CS). With the increasing prevalence of CS, it is essential to evaluate the level of maternal satisfaction with postoperative management. This study aimed to assess the level of mothers' satisfaction with Nursing care after cesarean sections at Nasser Medical Complex.A cross-sectional, descriptive, and analytical study design was employed. Data were collected through a self-conducted questionnaire administered to a sample of 126 mothers who delivered at Nasser Medical Complex in June 2023. The questionnaire assessed various dimensions of nursing care and satisfaction levels . The findings revealed that the mean score in the general scale of maternal satisfaction with nursing care post cesarean delivery was 3.97, with a standard deviation of 0.61. Moreover, the weighted mean score indicated an overall satisfaction level of 79.4%, signifying an above-moderate degree of satisfaction . Furthermore, a positive relationship was observed between mothers' perceptions of nursing care and their satisfaction levels post cesarean delivery with statistical significance at a level of $\alpha = 0.5$. However, no statistical differences were found in mothers' perceptions of nursing care and satisfaction concerning previous cesarean deliveries, numbers of abortions, or numbers of pregnancies .Significant statistical differences were identified in mothers' perceptions of nursing care and satisfaction post cesarean delivery due to the number of deaths. Additionally, a statistical difference was observed in mothers' perceptions of nursing care post cesarean related to age, with higher satisfaction levels observed among younger patients (less than 31 years old) compared to older age groups.Post hoc LSD (Least Significant Difference) testing revealed that mothers with three children exhibited higher satisfaction levels with nursing care in general. However, no statistical differences were observed in mothers' perceptions of nursing care and satisfaction post cesarean delivery based on educational levels.In conclusion, this study provides valuable insights into maternal satisfaction with postoperative cesarean sections at Nasser Medical Complex. The findings emphasize the importance of addressing maternal satisfaction in healthcare delivery, particularly regarding nursing care. Understanding the factors influencing maternal satisfaction can contribute to improving the quality of care provided to post-cesarean mothers and optimizing their overall healthcare experience. The research recommends improving of the nursing care post cesarean sections provided, providing a safe and sound environment, increasing the number of nurses , and the need to prepare educational programs to raise awareness about service recipients and their evaluation .

Keywords: Maternal, satisfaction, cesarean sections, nursing care, postoperative, management,

1.1 Research background :

Cesarean section (CS) is a major abdominal surgery, and the morbidity and mortality rates are greater for women who undergo a cesarean delivery versus those who deliver vaginally. Childbirth can be regarded as a developmental crisis that engenders considerable stress for most women. Stress is increased when the birth occurs by cesarean section because major surgery is an additional life crisis event. Patient satisfaction is a very vaguely defined, yet definite term used in the evaluation of results. With growing emphasis on consumerism and competition in the health care system, patient satisfaction is the single most important criterion that needs to be addressed, irrespective of the nature of practice **(Azari S.,etal2013)**. Patient satisfaction with nursing services gains even more importance, since owing to the nature of nursing practice, patients may judge the overall quality of hospital services on the basis of their perceptions of the nursing care received. Satisfaction with care is a composite and subjective concept with still undefined boundaries and multiple interacting variables, according to which patient satisfaction with nursing care is the degree of convergence between the expectations patients have of ideal care and their perception of the care they really get..

Quality maternal care is defined as an appropriate, satisfactory, low-cost, and accessible service that makes women capable of choosing a healthy life. Health care organizations are operating in an extremely competitive environment, and patient satisfaction has become a key to gaining and maintaining market share. Hospital care services have been categorized as private and public hospitals , The public ones are controlled by the government and people are not required to pay much money. In a public hospital, patient satisfaction is dependent on several factors in addition to surgical results. It is the way you talk to the patient, the degree of importance that is given to his or her problem, the amount of time you spend with them, the amount that you handle personally rather than delegating it to your juniors, and the way you handle the relatives. Other peculiar factors are also seen from time to time. Patients' evaluation of care has become a prominent method of assessing the quality of health care services **(Azari S.,etal2013).** In this study to assess Maternal Satisfaction Regarding Nursing Care Post caesarean Delivery At Nasser Medical Complex.

1.2 Research problem

The prevalence of caesarean section is generally agreed to be higher than needed in many countries, and physicians are encouraged to actively lower the rate, as a caesarean rate higher than 10–15% is not associated with reductions in maternal or infant mortality rates **(WHO 2015).** Although adverse outcomes in low-risk pregnancies occur in 8.6% of vaginal deliveries and 9.2% of caesarean section deliveries (**Caughey A. etal 2022)**.

A caesarean section delivery has become a regular practice around the world when an obstetrical complication is envisaged. The concern is, however, the pain and immobility associated with the surgery postoperatively as well as the impact it might have on the caring of the neonate. mothers breastfeed as soon as they deliver, take care of the neonates and are also expected to visit and feed the neonates if they are admitted to a neonatal unit. However, mothers who had a caesarean section delivery can only start mobilising freely after 24h .This immobility is associated with insufficient pain control or excessive sedation. (**Sharma R.**

etal. 2012) It is assumed to be difficult for them to adopt a comfortable sitting position to breastfeed or even to express breast milk to feed the neonate because of postoperative pain. when mothers cannot breastfeed and move well, it will cause health problems for them, so they need more nursing care. **(Jikijela T. etal 2018)**

1.3 Justification of the study

As far as we know as researchers There are several reasons why this research is justified: Maternal satisfaction is a key indicator of the quality of healthcare services provided. By assessing maternal satisfaction with nursing care, healthcare providers can gain insights into the effectiveness of their practices and identify areas for improvement. This study will contribute to enhancing patient-centered care and ensuring that the needs and expectations of mothers are met. Caesarean delivery is a major surgical procedure that requires appropriate postoperative care to ensure optimal recovery for the mother. Nursing care plays a crucial role in managing pain, promoting wound healing, preventing infections, and providing emotional support during this critical phase. Understanding the level of satisfaction with nursing care can help identify any gaps in postoperative management and guide improvements in care delivery. Maternal satisfaction has been associated with improved patient outcomes, including better compliance with postoperative instructions, reduced anxiety, and enhanced overall well-being. By investigating the factors that contribute to maternal satisfaction, healthcare providers can tailor their interventions to better meet the needs of mothers and potentially improve their postoperative outcomes.

Evaluating maternal satisfaction with nursing care can provide valuable feedback to healthcare providers and administrators. Identifying areas of strength and areas for improvement can lead to targeted quality improvement initiatives, ensuring that the services provided at Nasser Medical Complex align with the expectations and preferences of the mothers who undergo caesarean deliveries. In conclusion, conducting a study to evaluate maternal satisfaction regarding nursing care after caesarean delivery at Nasser Medical Complex is justified as it has the potential to enhance patient-centered care, improve postoperative recovery, optimize patient outcomes, and drive quality improvement efforts.

1.4 General Objective

The aim of this study is to evaluate the maternal satisfaction regarding nursing care after undergoing a caesarean delivery at Nasser Medical Complex.

1.5 Specific objectives

1.5.1 To assess the level of maternal satisfaction with nursing care received after undergoing a caesarean delivery at Nasser Medical Complex.

1.5.2 To identify the specific aspects of nursing care that contribute to maternal satisfaction, such as pain management, wound care, emotional support, breastfeeding support, and communication with healthcare providers.

1.5.3 To explore any factors that may influence maternal satisfaction, including demographic variables (such as age, education, and socioeconomic status), previous healthcare experiences, and expectations regarding nursing care.

1.5.4 To examine the relationship between maternal satisfaction with nursing care and postoperative outcomes, including pain levels, wound healing, postpartum depression, and breastfeeding success.
1.5.5 To provide recommendations for improving nursing care practices based on the findings, with the aim of enhancing maternal satisfaction and optimizing postoperative recovery after caesarean delivery.

1.6 Research Questions

1.6.1 What is the level of maternal satisfaction with nursing care after undergoing a caesarean delivery at Nasser Medical Complex?
1.6.2 What are the factors that influence maternal satisfaction with nursing care, including demographic variables, previous healthcare experiences, and expectations regarding nursing care?
1.6.3 Is there a relationship between maternal satisfaction with nursing care and postoperative outcomes, including pain levels, wound healing, postpartum depression, and breastfeeding success?
1.6.4 Is there a relationship between maternal satisfaction with nursing care and mother sociodemographics ?
1.6.5 What recommendations can be made to improve nursing care practices and enhance maternal satisfaction in the postoperative period after caesarean delivery at Nasser Medical Complex?

1.7 Palestinian Health Care System

1.7 Palestinian Health Care System

The Palestinian Health Care System (PHCS) is consisting of four major providers: Ministry of Health (MoH), United Nation Relief and Work Agency (UNRWA), Non-Governmental Organizations (NGOs) and for-profit private sector (WHO, 2008). The main provider MoH is operating 13 hospitals and 52 PHC facilities, in Gaza Strip (MoH, 2020). Another main component UNRWA is operating 22 PHC facilities(MoH, 2020)

1.8. Nasser Medical Complex (NMC)

The hospital was set up in 1958, and it was officially opened in 1960 and is under Egyptian administration in the Gaza Strip. The hospital capacity was 120 beds with four main departments: surgery, dermatology, as well as having a laboratory room and one operating room. After the beginning of 1966, successive years showed a new boom in the development of new departments and expansion of hospital buildings, especially external departments since the end of the Israeli occupation of the Gaza Strip in 1994. In addition, the hospital administration has a number of established medical centers, outpatient clinics and new buildings that It is set to provide high-quality medical services to residents of the southern region and other areas of the General Service category (Ministry of Health, 2020). According to the annual report of Nasser Medical

Hospital (NMC) (2020), it includes three hospitals (Nasser Hospital, Tahrir Hospital and Yasser Hospital) in the hospital (347) beds, and the total number of employees and

about 991 divided as follows: Doctor 240 (24.2%), Nursing 350 (35.3%), 401 Medical Technical Administrators and Support.

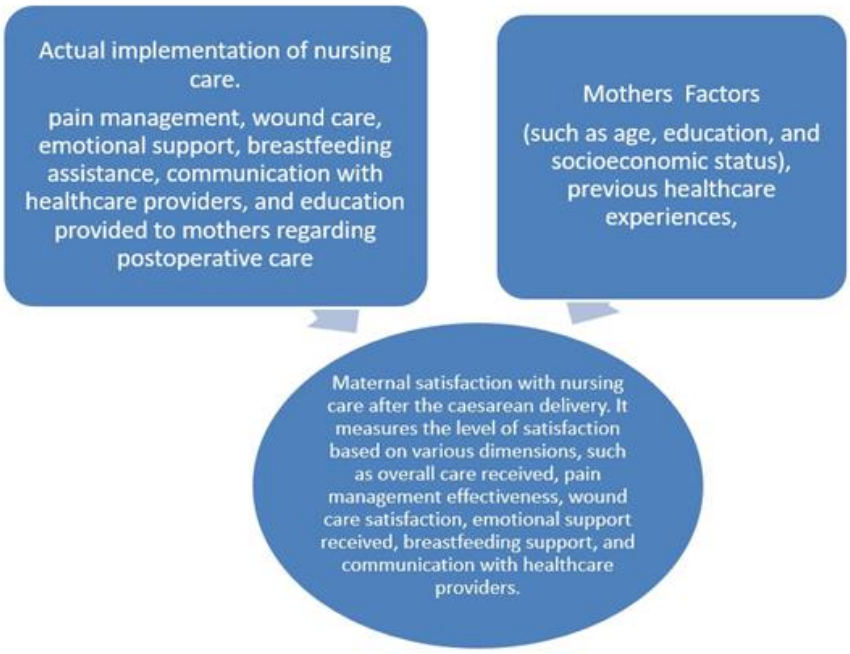


Figure (2.1): Conceptual framework

2.2 Operational definitions

2.2.1 Satisfaction

is individuals' feelings of pleasure or disappointment resulting from comparing their perceptions of a product or service's performance to their expectation levels. (**Santhanamery T.etal.2018)**

2.2.2 Maternal satisfaction

defined as positive evaluation of distinct dimensions of childbirth .) Gejea T. etal 2020) . Maternal satisfaction: it is the satisfaction of the mothers towards delivery care/service) Shiferaw Z. etal 2022)

2.2.3 Caesarean delivery

is the surgical procedure by which one or more babies are delivered through an incision in the mother's abdomen, often performed because vaginal delivery would put the baby or mother at risk **(Tshililo Mashamba 2021)**

2.2.4 Nursing Care

Nursing encompasses autonomous and collaborative care of individuals of all ages, families, groups and communities, sick or well and in all settings. Nursing includes the promotion of health, prevention of illness, and the care of ill, disabled and dying people. Advocacy, promotion of a safe environment, research, participation in shaping health policy and in patient and health systems management, and education are also key nursing roles.(ICN, 2002)

2.2.5 Post op care

or Postoperative care: Care given after surgery until the patient is discharged from the hospital surgicenter and, in some cases, continuing on an ambulatory basis. Postoperative care is) . aimed at meeting the patient's physical and psychological needs directly after surgery DavisCh.2021)

2.3 Patient Satisfaction

Many hospitals make measuring patient satisfaction a top priority, but how should they go about doing it. Of the questions, Frederick Reichsold states, only one question should be asked to clients that really matters (how likely you are to recommend this nursing or nursing service to a friend or colleague) (**Kotler 2016).** Patients' expectations about the value and their satisfaction with the various nursing services on the basis of which satisfaction and acceptance will be given accordingly, and they tell others about their good experiences. Dissatisfied patients will turn into critics and detractors of service to others. Therefore, nurses must be careful to set the appropriate level of expectations, and if they set expectations too low, they may satisfy those who receive the service, and if they set expectations too high, they will disappoint patients. Patient value and satisfaction are the basic building blocks for developing and managing patient relationships **(Kotler, 2012).**

2.4 Caesarean section

CS is a procedure to deliver the baby though the incision made on the uterus. Ideally this is to deliver a viable fetus which is of 22 weeks or fetal weight of 500 g. Contrary to repeated use of caesarean section referring to the laparotomy to have access to perform a hysterotomy. The objective of caesarean section is to save the life of the mother and fetus. **(Tshililo Mashamba 2021) .**A C-section, short for Cesarean section, is a surgical procedure in which a baby is delivered through an incision made in the mother's abdomen and uterus. This procedure is typically done when a vaginal delivery poses a risk to the mother or the baby, or when a vaginal delivery is not possible. (Basaran 2023)

Material and Methods

3.1 Study design

The researcher used descriptive, analytical and cross-sectional design. This design is appropriate for describing the status of phenomena or for describing relationships among variables. It involves the collection of data once during a single period of data collection .

3.2 Study population

The population of study was included hospitalization patient with CS women who admitted to Nasser Medical Complex for evulate level satisfaction nursing care during period of study . The number of study population 176 women's .as shown in the table (1)

Table (3.1): monthly report of cesarean deliveries in MOH hospitals in May 2023.

No.	Hospitals	Planned	Emergency	Total
1	Al-Shifa Complex	133	257	**390**
2	Nasser Complex	87	89	**176**
3	Al-Aqsa Hospital	63	75	**138**
4	Emirati Hospital	53	70	**123**
5	Kamal Adwan Hospital	52	35	**87**
6	**Total .**	**388**	**526**	**914**

3.3 Setting of the study

The study was conducted cesarean section departments at Nasser Medical Complex at Gaza strip.

3.4 Period of the study

The study conducted at the mid of year 2021. After obtaining approval for the study proposal from MOH in 2023 to offer facilitation for conducting the study in MOH hospitals. Data collected in June 2023.

3.5 Sample and sampling Technique

The sample of the study is non-probability, censuse sampling method was applied on cesarean delivery women At Nasser Hospital during the data collection period .The sample was the total population. The total number of them is 130 mother

3.6 Data collection and study instrument

We was using a structured questionnaire with Women cesarean delivery for the quality of care in the health services provided in the Department of Cesarean section at Nasser Medical Complex.

Study tool

The evaluation questionnaire was adopted as a study tool, where the questionnaire was designed and its questions were formulated in line with the objectives of the study and the variables to be used in the previous study in this field, in order to obtain accurate and useful information that can be built upon and completed in order to develop this field ,Is this questionnaire based on Demographic data And two domines.

1**. Section One**: This section includes first: Personal information

2**. Section Two**: It consists of two domines about the quality of care at Nasser Hospital in Khan Yunis . The evaluation was approved for the second section of 5 marks for each statement as in the table (2).

Table (3.2): for the degree scale of the second section of the questionnaire according to (Likart five-point scale) .

Strongly agree	Agree	Uncertain	disagree	Strongly
5 degrees	4 degrees	3 degrees	2 degrees	1 degree

3.7 Eligibility criteria .

3.7.1 Inclusion criteria for mothers :

1. All postpartum women who delivered inNasser hospital and stay in the postpartum department for 1 - 6 hours.
2. Had cesarean section without any complications

3.7.2 Exclusion criteria

1. Women who had any postpartum complications
2. lWomen admitted to postpartum department for other medical or gynecologica problems.

3.8 Ethical and administrative considerations

An official letter will be obtained from University College of Applied Sciences of Gaza.

An approval letter will be obtained from Ministry of Health Committee to access the hospitals and collect data from mothers . The informed consent will be attached to the questionnaire; respondents will be assured that the data will only be used for research purpose, and confidentiality will be maintained. Participants will have the right to refuse to participate or withdraw from the study at any time.

3.9 Limitation

- The study's findings may be limited by the sample size, A smaller sample size could limit the generalizability of the results.
- maternal satisfaction may be influenced by external factors that are beyond the control of nursing care, such as overall hospital environment, interactions with other healthcare professionals, and personal circumstances. 3.9.3 These factors could confound the relationship between nursing care and maternal satisfaction .
- The study focuses on evaluating maternal satisfaction at Nasser Medical Complex, which may limit the generalizability of the findings to other healthcare settings or institutions.
- The study's cross-sectional design provides a snapshot of maternal satisfaction at a specific point in time.
- Despite these limitations, the study will still provide valuable insights into maternal satisfaction with nursing care after caesarean delivery at Nasser Medical Complex and serve as a foundation for further research in this area.
-

Results and Discussion

. 4. 1 Demographic characteristics of study sample

Personal data was collected according to the study sample. The study sample consisted of 126 mothers with post caesarean delivery at Nasser medical complex. We used the frequencies and percentage of demographic data to detect distribution of participants according to demographic data.

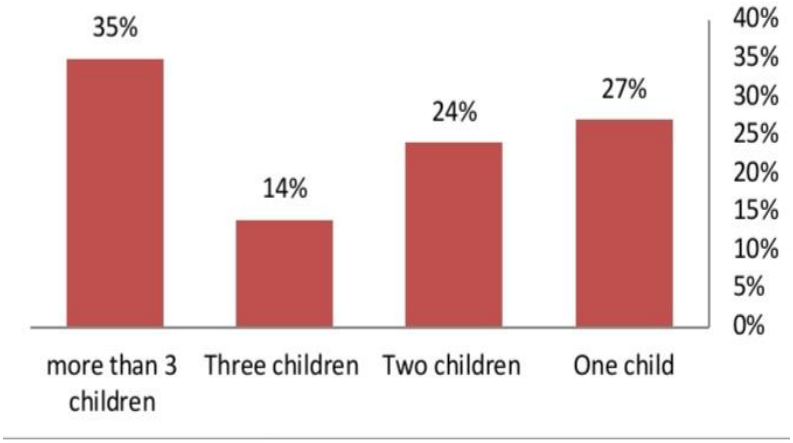
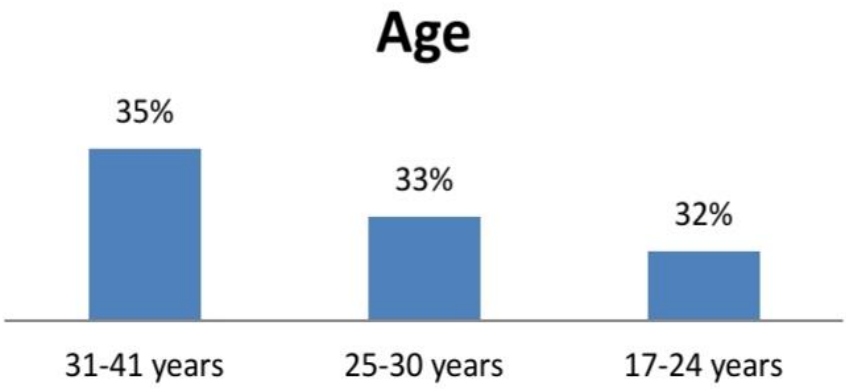


Figure 4.1 : Distribution of participant according to age

Figure 4.1 Shows 35% of participants age was between 31-41 years old, and 33% of



participants age was between 25-30 years old while 32% of participants age was between 17-24 years old

4.2. Distribution of numbers of children including this birth

Figure 4.2 : distribution of numbers of children including this birth

Figure 4.2 Shows 35% of participants had more than 3 children, and 27% of participants had more than 3 children one child while 24% of participants had two children and 14% had 3 children.

4.3 Distribution cesarean delivery according to cause.

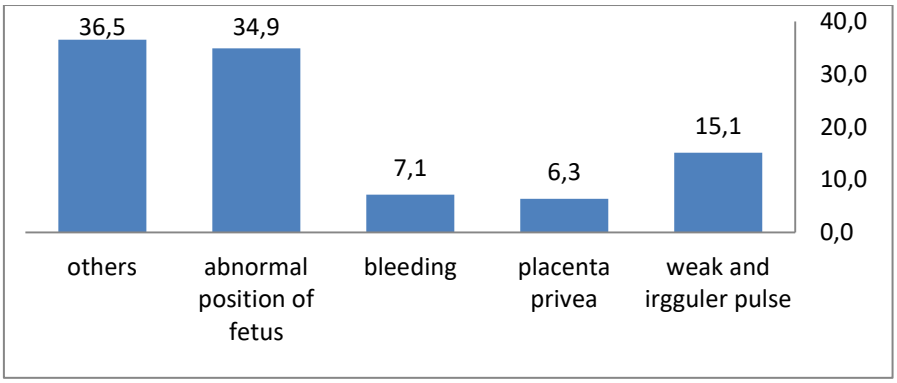


Figure 4. 3 Distribution cesarean delivery according to cause.

Figure 4. 3 Shows 36.5% of participants had other causes related cesarean delivery such as " eclampsia, narrowing in cervix", and 34.9% of participants complain of abnormal position of fetus, while 7.1% of participants complain of bleeding, 6.3% suffered from placenta previa and 15.1% were weak and irregular pulse of fetus.

4.4 Distribution other demographic data

Table (4.4) shows the frequencies and percentage of demographic data. The study sample consisted of 126 mothers with post caesarean delivery at Nasser medical complex.

Table 4.4 : Distribution of study participants according to demographic variables (n=126)

Items	Frequency	%
Education		
secondary school and below	64	50.8
university	57	45.2
post graduate	5	4.0
Types of cesarean delivery		
Planned	87	69.0
urgent	39	31.0
Previous cesarean delivery		
Yes	66	52.4
No	60	47.6
Number of abortion		
no	95	75.4
one time	23	18.3
Two and more time	8	6.3
Number of pregnancy		
one time	32	25.4
two time	30	23.8
three time or more	64	50.8
Number of deaths		
No	104	82.5
0ne	13	10.3
Two or more	9	7.1
Total	**126**	**100.0**

Above in table (4.4). Shows the majority of respondents 50.8% were below secondary school while (45.2%) of participants were "university" degree and 4% were postgraduate. The distribution of participants' according of types of cesarean delivery were 69% were planned

to cesarean delivery and 31% were urgent. On other hand 52.4% of participants were Previous cesarean delivery while 47.6% were not.

Furthermore 75.45 from participants were not exposed to abortion while 18.8% exposed to two time of abortion, and 6.3% were two and more time of abortion. Moreover, 50.8% of participants got three time or more of pregnancy and 25.4% got one time of pregnancy while 23.8% of participants got two time. About number of deaths, 82.5% of participants had no deaths in children while 10.3% had one and 7.1% had two or more. That mean most of participants had no deaths in children.

4.5. Criteria for measurements of variables

Table 4.5 Criteria for measurements of variables

score	Cell length	Weighted percent	Interpretation
1	1.0 – 1.80	20% - 36%	Very low
2	1.81 – 2.60	>36% - 52%	Low
3	2.61 – 3.40	>52% - 68%	Moderate
4	3.41 – 4.20	>68% - 84%	Above moderate
5	4.21 – 5.0	>84% - 100%	High

4.6. Descriptive data

4.6.1. First section : nursing care

We used Mean, Standard deviation, Weight mean, and degree of nursing care from mothers' perceptions.

Table. 4.6.1 Mean, Standard deviation, Weight mean, and degree of nursing care from mothers perceptions post cesarean delivery.

N	Questions	Mean	Standard deviation	Weight mean%	degree
1.	I received enough information before the caesarean section	4.1508	0.88605	83.02	Above moderate
2.	Are you experienced any complications during your hospital stay.	2.3413	1.16043	46.83	low
3.	Pain management needs were handled appropriately.	4.1032	1.11592	82.06	Above moderate
4.	The general cleanliness and cleanliness of the hospital and its facilities were good.	4.0556	0.76216	81.11	Above moderate
5.	The hospital provided adequate follow-up care after you were discharged.	3.8968	0.97840	77.94	Above moderate
6.	The medical staff explained the post operative instructions to you clearly.	3.8175	1.03847	76.35	Above moderate
7.	I received adequate pain treatment	4.0794	0.74408	81.59	Above

	after cesarean section.				moderate
8.	There is nothing you think could have been done to improve your experience at NMC	4.0556	0.77259	81.11	Above moderate
9.	The medical staff provided clear and detailed instructions on how to take care of yourself and your baby after a C-section.	3.5952	1.16741	71.90	Above moderate
10.	I received enough information about the recovery process after surgery.	3.6667	1.02762	73.33	Above moderate
11.	Problems and complications were appropriately addressed by the hospital staff.	3.9762	0.76382	79.52	Above moderate
12.	The nurse's response in responding to your call was swift.	4.1905	0.71234	83.81	Above moderate
13.	The nursing team strictly considers your specific or personal needs.	3.9365	0.90108	78.73	Above moderate
14.	The nurse regularly assessed vital signs and pain levels.	4.4365	0.55851	88.73	High
15.	The nurse asked you and monitored the input and output	4.0079	0.83423	80.16	Above moderate
16.	The nurse evaluated and documented the appearance of the wound and drainage.	4.2222	0.61824	84.44	High
17.	The nurse monitored the signs and symptoms of infection or other complications.	3.9841	0.74816	79.68	Above moderate
18.	The nurse assessed and documente your emotional state.	3.8333	1.12960	76.67	Above moderate
19.	The nurse gave painkillers on demand and documented the effectiveness.	4.1667	0.78740	83.33	Above moderate
20.	The nurse has encouraged and helped you with non- medication pain relief measures.	3.8651	0.99078	77.30	Above moderate
21.	The nurse encouraged you to move around as soon as possible after surgery.	3.7540	0.99347	75.08	Above moderate
22.	The nurse helped you getup, get out of bed, walk and move.	3.5159	0.96112	70.32	Above moderate
23.	The nurse examined you for signs of dizziness or weakness while walking.	3.4960	1.00502	69.92	Above moderate
24.	The nurse provided support and assistance as needed.	4.3095	1.58446	86.19	High
25.	The nurse evaluated and documented the appearance of the incision and dressing .	4.0873	0.65751	81.75	Above moderate
26.	The nurse contributed to your awareness of proper wound care and signs of infection.	3.9683	0.78929	79.37	Above moderate
27.	The nurse provided with appropriate dressing changes as requested.	3.6560	1.04035	73.12	Above moderate

28.	The nurse assessed you and documented your breastfeeding experience and support needs.	3.8333	1.82757	76.67	Above moderate
29.	The nurse contributed to providing education and assistance in breastfeeding techniques.	3.5952	1.07464	71.90	Above moderate
30.	The nurse watched for signs and complications of breastfeeding, such as congestion or nipple inflammation.	3.6320	1.94495	72.64	Above moderate
31.	The nurse contributed by providing education on post-operative care and wound care.	3.9603	1.86076	79.21	Above moderate
	Total	3.8792	0.65225	77.58	Above moderate

Table 4.6.1 Shows the highest score in (q,13, q16, q24) whereas mean equal (4.43, 4.22, 4.3095) respectively and standard deviation equal (0.55, 0.61, 1.58) with weight mean equal (88.73%, 84.44%, 86.19%) respectively. That's mean the participants were high satisfied to nursing care related to privacy, assessment, documentation, and providing helping as needed.

The other questions were in above moderate scores degree, additionally in general domain mean score was 3.65 with standard deviation equal 1.04 and weight mean equal 73.12%. that's mean mother perceptions toward nursing care was above moderate degree equal 73.12%. The current results disagree with the study conducted by Kurian (2020), 50% of the postnatal mothers were moderately and fully satisfied with the nursing care received. And agree with study conducted by Al Harazi (2021), (83.3%) were satisfied regarding nursing care.

The researchers believe the high positive perception of nursing care after cesarean delivery is attributed to several factors. Nursing care plays role in ensuring the well-being and comfort of post-cesarean mothers, providing support in pain management, wound care, breastfeeding support, and emotional support. The competency and professionalism of nursing staff, such as skilled and knowledgeable nurses, contribute to positive experiences. Clear explanations, regular monitoring, and timely interventions enhance the perception of quality care received.

Effective communication and empathy are essential in establishing a trusting and comforting environment for mothers. Nurses listen attentively to mothers' concerns, validate their emotions, and involve them in decision-making processes, fostering a sense of being cared for and understood. The overall healthcare facility environment, including cleanliness, accessibility to amenities, and resource availability, also influences the perception of care (Abdelati., 2019).

In addition, The researchers believe individual experiences and expectations can influence perceptions of nursing care. Positive experiences from previous encounters with healthcare providers and a positive attitude towards childbirth and recovery contribute to higher satisfaction levels. Overall, the above-moderate degree of positive perceptions towards nursing care after cesarean delivery can be attributed to factors such as skilled and competent

nursing staff, effective communication and empathy, a supportive healthcare facility environment, and individual experiences and expectations.

4.6.2. second section: patients satisfaction

We used Mean, Standard deviation, Weight mean, and degree of maternal satisfaction toward nursing care

Table 4.6.2 Mean, Standard deviation, Weight mean, and degree of maternal

Satisfaction toward nursing care post cesarean delivery

N	Questions	Mean	Standard deviation	Weight mean%	degree
1.	Medical staff responded quickly and appropriately to your needs and concerns during your hospital stay.	4.2778	0.56056	85.56	High
2.	The time the nurses spend with me is enough.	4.0635	0.72383	81.27	Above moderate
3.	The waiting time for the results of the tests and examinations is acceptable.	4.1349	0.61127	82.70	Above moderate
4.	Nursing explains my condition and treatment plan adequately and well	3.8571	1.03316	77.14	Above moderate
5.	Hospital staff deal with crowds and noise effectively	3.9048	1.11304	78.10	Above moderate
6.	There is a high level of system within the hospital.	3.9524	1.01868	79.05	Above moderate
7.	I feel that I have received the appropriate treatment for my illness and there is no need to rely on external transfers.	4.1984	0.71576	83.97	Above moderate
8.	The hospital administration adheres to its promise tome in providing health and treatment servicesand providing the appropriate environment as I expect.	4.2143	0.58797	84.29	High
9.	In general I am satisfied with the services of this hospital.	4.0635	0.89215	81.27	Above moderate
10	I would like to continue receiving service at the same hospital.	4.0476	0.88415	80.95	Above moderate
11	I trust the services provided by the hospital.	3.9444	0.98229	78.89	Above moderate
12	NMC is recommended for other women who need a C-section.	4.1270	0.83890	82.54	Above moderate
13	Were you satisfied with the level of attention and care provided to your newborn by the medical staff?	3.9365	0.96950	78.73	Above moderate
14	Are you generally satisfied with the care you received at NMC during	4.0238	0.93350	80.48	Above moderate

	your stay after a C-section?				
15	Nursing has been respectful and courteous to you and your family members during your stay.	4.3333	0.72664	86.67	High
16	The hospital staff provided you with adequate support to help you care for your newborn.	3.8413	1.02304	76.83	Above moderate
17	You felt comfortable asking questions or expressing your concerns to medical staff.	4.1270	0.97967	82.54	Above moderate
18	The comprehensive care you received during your hospital stay is good	4.1680	0.76975	83.36	Above moderate
19	I was satisfied with the pain management provided by the hospital staff.	4.1667	0.75631	83.33	Above moderate
	Total	4.0731	0.63564	81.46	Above moderate

Table 4.6.2 Shows the highest score in (q1, q8, q15) whereas mean equal (4.2778, 4.21, 4.33) respectively and standard deviation equal (0.56, 0.58, 0.72) with weight mean equal (85.56%, 84.29%, 86.67%) respectively. That's mean the participants were high satisfaction to nursing response to patients need, trust towered health care providers and administrators, and health care providers were providing respect to patients and family.

The other questions were in above moderate scores degree, additionally in general domain mean score was 4.0731with standard deviation equal 0.63564and weight mean equal 81.46%. the level of mother's satisfaction equal 81.46% that's mean mother perceptions toward nursing care was above moderate degree. This result agree with The study conducted by Abdelati (2019), the higher percentage of studied women were satisfied. The study conducted by Korkmaz (2023), The satisfaction level of the mothers in cesarean section was high.

The researchers believe this satisfaction can be attributed to several factors, including the well-being and comfort of mothers, skilled and competent nursing staff, effective communication and empathy, a supportive healthcare facility environment, and individual experiences and expectations.

Nurses play a crucial role in addressing the physical, emotional, and informational needs of mothers, ensuring their satisfaction (Abdelati (2019). The researchers believe Skilled and competent nursing staff, with expertise in pain management, wound care, breastfeeding support, and post-operative care, can significantly impact the overall experience for mothers. Effective communication and empathy are also vital, as nurses actively listen to mothers' concerns, provide clear explanations, and involve them in decision-making.

The quality of the healthcare facility and its amenities also influence satisfaction. A clean, comfortable, and well-equipped facility can make mothers feel more satisfied during the post-operative period. Additionally, individual experiences and expectations, such as previous positive experiences with healthcare providers, positive attitudes towards childbirth and recovery, and realistic expectations, also contribute to higher satisfaction levels.

The researchers believe the high level of mother's satisfaction after cesarean delivery is attributed to the importance of nursing care, skilled and competent staff, effective communication and empathy, a supportive healthcare facility environment, and individual experiences and expectations.

4.7 what is the level of mother satisfaction with nursing care post caesarean delivery at Nasser Medical complex ? We used Mean, Standard deviation, Weight mean, and degree of mother satisfaction toward nursing care

Table 4.7 Mean, Standard deviation, Weight mean, and degree of mother satisfaction toward nursing care

N	Questions	Mean	Standard deviation	Weight mean%	degree
1	Mothers perception towered nursing care	3.8792	0.65225	77.58	Above moderate
2	mother satisfaction toward nursing care	4.0731	0.63564	81.46	Above moderate
	Total	3.9761	0.61734	79.4	Above moderate

The table no. 4.7 Shows the mean scores in general scale was 3.9761 and standard deviation equal 0.61734 and weight mean equal 79.4%. that's mean the level of mother satisfaction with nursing care post caesarean delivery at Nasser Medical complex equal 79.4% in above moderate degree. Ozkan& Bal, (2019). the women who had caesarean has satisfaction toward nursing care in scores equal (81.3%).

The study conducted by Guadie & Demelash., (2023). the women who had caesarean has satisfaction toward nursing care in scores equal 57.7%. Kurian (2020) found 50% postnatal mothers satisfied with nursing care, while Abdelati (2019) found a higher percentage satisfied. The researchers think the majority of mothers who received nursing care after their caesarean delivery at Nasser Medical complex expressed high satisfaction with the services provided. Factors contributing to this satisfaction level include competent nursing staff, effective communication between nurses and mothers, a clean, comfortable, and well-equipped facility, and individual experiences and expectations. Nurses who manage pain, assist with wound care, provide breastfeeding support, and offer emotional support greatly contribute to positive experiences and higher satisfaction levels among mothers .The researchers think the physical environment and amenities at Nasser Medical complex also contribute to the high satisfaction level. A clean, comfortable, and well-equipped facility is conducive to recovery and provides necessary resources, making mothers more likely to express higher satisfaction levels. Additionally, individual experiences and expectations, such as positive experiences with healthcare providers, prior knowledge of the hospital's reputation, and realistic expectations, also influence the level of satisfaction reported by mothers .The researchers believe the satisfaction level among mothers at Nasser Medical complex is above a moderate degree, indicating the importance of competent nursing staff,

effective communication, a favorable hospital environment, and individual experiences and expectations.

4.8 Is there the relationship between mothers' perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex ?

To test the question, we use the Pearson correlation between mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex ,

Table 4. 8 Correlation between mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex

Domain	statistic	Nursing care
Satisfaction	Pearson coloration	0.841
	p-value	0.000*
	N	126

* significant at < 0.05

results shown in table No.(4.8) which illustrate that the p-value equal 0.000 which is less than 0.05, and the value of Pearson correlation is equal 0.818 which is greater than the critical value which is equal 0.246 that means there is a positive relationship between mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex at significant level α =0.5.

This means that as mothers' perceptions of the nursing care they received increase, their level of satisfaction with the care also tends to increase. The study conducted by Abdelati (2019), there was a positive association of quality of nursing care with the level of women's satisfaction. The researchers think when mothers have positive perceptions of nursing care, such as perceiving the nurses as skilled, attentive, and empathetic, it contributes to their overall satisfaction. If mothers feel that their needs were effectively addressed, they received appropriate support and guidance, and experienced clear and respectful communication from the nursing staff, it can significantly impact their satisfaction levels.

On other hand, Positive perceptions of nursing care can also be influenced by factors such as the cleanliness and comfort of the hospital environment, the availability of necessary resources, and the efficiency of the care provided. When these factors align with mothers' expectations and needs, it enhances their perception of the care received and subsequently increases their satisfaction.

Additionally, Conversely, if mothers perceive shortcomings or gaps in nursing care, such as inadequate pain management, poor communication, or a lack of support, it can negatively impact their satisfaction levels. Therefore, maintaining a high standard of nursing care that aligns with the expectations and needs of mothers is crucial for ensuring their satisfaction.

Furthermore, there is a positive relationship between mothers' perceptions toward nursing care and their satisfaction post-caesarean delivery at the Nasser Medical complex . Positive perceptions of nursing care, including aspects such as nursing staff competence, empathy,

effective communication, and a supportive hospital environment, contribute to higher levels of satisfaction among mothers.

4.9. Is there the relationship between mothers' perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to age?

To test the question we use the one way ANOVA and the result illustrated in table no.(4.9)

Table 4.9 One-way ANOVA test for difference in mothers' perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to age

Field	Source	Sum of Squares	df	Mean Square	F value	Sig.(P-Value)
Nursing care	Between Groups	4.168	2	2.084	5.230**	0.007
	Within Groups	49.011	123	.398		
	Total	53.178	125			
Satisfaction	Between Groups	1.468	2	.734	1.841	0.163
	Within Groups	49.038	123	.399		
	Total	50.506	125			
Total	Between Groups	2.644	2	1.322	3.608*	0.030
	Within Groups	45.074	123	.366		
	Total	47.718	125			

* significant at < 0.05

Table no 4.9 shows which in mother perception toward nursing care that the p-value equal 0.007 which is less than 0.05 and the value of F test equal 5.230 which is greater than the value of critical value which is equal 3.07, that's means there are a statistical differences about in mothers perceptions toward nursing care post caesarean delivery at Nasser Medical complex due to age at significant level $\alpha = 0.05$.

On other hand the p-value equal 0.163 which is greater than 0.05 and the value of F test equal 1.841 which is less than the value of critical value which is equal 3.07, that's means there are no statistical differences about mothers satisfaction post caesarean delivery at Nasser Medical complex due to age. And the p-value equal 0.03 which is less than 0.05 and the value of F test equal 3.608 which is greater than the value of critical value which is equal 3.07, that's means there are a statistical differences about mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex according to age.

Table (4.9.1): Multiple comparisons Post hoc for age

Variable	Age		Mean	P value
Nursing care	31-41 years	17-24 years	0.44309	0.002*
		25-30 years	0.21886	0.113
Total	31-41 years	17-24 years	0.35297	0.008*
		25-30 years	0.16903	0.007*

* significant at < 0.05

table (4.9.1), Post hoc LSD test indicated that mothers from the age group betwwen 31-41 years old was higher satisfaction with overall scale , and higher with in domain nursing care from mothers percption compared to older age patients and less 31 years.

This means that the age of the mothers is a factor that influences their perceptions and satisfaction levels regarding nursing care after their caesarean delivery. The current study agree with study conducted by Celik ., (2019). Scores of satisfactions of mother toward nursing care had significant differences due to age at significant level 0.05.

The age of mothers significantly influences their perceptions and satisfaction levels with nursing care post-caesarean delivery. Research at the Nasser Medical complex has revealed significant variations in perceptions and satisfaction levels among different age groups of mothers. Younger mothers may have different expectations, preferences, and unique needs and concerns related to their age and life circumstances. On the other hand, older mothers may have different experiences and perspectives and comorbidity with disease that shape their perceptions and satisfaction levels. Healthcare providers at the Nasser Medical complex must consider these age-related differences to tailor nursing care appropriately.

4.10. Is there the relationship between mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to number of children ? To test the question we use the one way ANOVA and the result illustrated in table no.(4.10) .

Table 4.10 One way ANOVA test for difference in mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to number of children

Domain	Source	Sum of Squares	df	Mean Square	F value	Sig.(P-Value)
Nursing care	Between Groups	5.983	3	1.994	5.156**	0.002
	Within Groups	47.195	122	.387		
	Total	53.178	125			
Satisfaction	Between Groups	2.913	3	.971	2.489	0.064
	Within Groups	47.592	122	.390		
	Total	50.506	125			
Total	Between Groups	4.163	3	1.388	3.887*	0.011

	Within Groups	43.555	122	.357		
	Total	47.718	125			

*At Significant level less than 0.05

Table no 4.10 shows which in mother perception toward nursing care that the p-value equal 0.002 which is less than 0.05 and the value of F test equal 5.156 which is greater than the value of critical value which is equal 3.07, that's means there are a statistical differences about in mothers perceptions toward nursing care post caesarean delivery at Nasser Medical complex due to number of children at significant level

And the p-value equal 0.01 which is less than 0.05 and the value of F test equal 3.608 which is greater than the value of critical value which is equal 3.07, that's means there are a statistical differences about mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to number of children.

On other hand the p-value equal 0.064 which is greater than 0.05 and the value of F test equal 2.489 which is less than the value of critical value which is equal 3.07, that's means there are no statistical differences about mothers satisfaction post caesarean delivery at Nasser Medical complex due to number of children.

Table (4.10.1): Multiple comparisons Post hoc for number of children

Variable	number of children		Mean	P value
Nursing care	3 children	One child	0.49873	0.007*
		Two children	0.31183	0.095
		More than 3	-0.00559	0.974
Total	3 children	One child	0.45353	0.010*
		Two children	0.34129	0.058
		More than 3	0.06897	0.681

* significant at 0.05

table (4.10.1), shows Post hoc LSD test indicated to mothers with 3 children more satisifed towerd nursing care and in general scale. The current study agree with study conducted by Celik ., (2019). Scores of satisfaction of mother toward nursing care had significant differences due to number of children at significant level 0.05.

the researchers think mothers with multiple children who have undergone a cesarean delivery tend to be more satisfied with nursing care and express higher levels of satisfaction on a general scale. This is due to their prior experiences with post-cesarean care, understanding of the challenges and demands of caring for a newborn and recovering from a cesarean section, and established support systems. These factors can contribute to a more positive perception of the nursing care provided. However, each individual's experience and perception can vary, and personal circumstances, individual expectations, and the quality of care provided by nursing staff all play significant roles in shaping satisfaction levels. In summary, mothers with multiple children who have undergone a cesarean delivery generally display higher levels of satisfaction with nursing care and express greater overall satisfaction. It is essential to

consider each mother's unique circumstances and experiences when assessing satisfaction levels.

4.11. Is there the relationship between mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to educational level? To test the question we use the one way ANOVA and the result illustrated in table no.(4.11)

Table 4.11 One way ANOVA test for difference in mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to educational level

Field	Source	Sum of Squares	df	Mean Square	F value	Sig.(P-Value)
Nursing care	Between Groups	2.154	2	1.077	2.596	0.079
	Within Groups	51.025	123	.415		
	Total	53.178	125			
Satisfaction	Between Groups	2.078	2	1.039	2.639	0.076
	Within Groups	48.428	123	.394		
	Total	50.506	125			
Total	Between Groups	2.088	2	1.044	2.814	0.064
	Within Groups	45.630	123	.371		
	Total	47.718	125	1.077		

table no.(4.11). which shows that the p- is greater than 0.05 and the value of F test is less than the value of critical value which is equal 3.07 for each domain and in general scale, that's means there are not statistical differences about in mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to educational level at significant level $\alpha = 0.05$. That's mean educational level aren't affected factor in mother satisfaction toward nursing care . The current study disagree with study conducted by Celik ., (2019), and Imtithal Adnan., (2020), Scores of satisfactions of mother toward nursing care had significant differences due to educational level at significant level 0.05.

The researchers think healthcare providers at the Nasser Medical complex had programs encourage education and follow up patients need, by recognizing the specific needs, expectations, and preferences of different educational groups, healthcare providers can better address and meet the requirements of each group, ultimately improving their perceptions and satisfaction levels.

4.12. Is there the relationship between mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to types of cesarean

delivery? To test the question, we use the independent samples test and the result illustrated in in table no.(4.12)

Table 4. 12 Independent Samples Test for mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to types of cesarean delivery

Field	types of cesarean delivery	N	Mean	Std. Deviation	T	P-value
Nursing care	Planned	87	3.8472	0.69897	-0.820	0.414
	urgent	39	3.9504	0.53498		
Satisfaction	Planned	87	4.0321	0.67015	-0.082	0.324
	urgent	39	4.1645	0.54798		
Total	Planned	87	3.9396	0.65860	-0.989	0.281
	urgent	39	4.0574	0.51406		

table no.(4.12) which shows that the p-value which is greater than 0.05 and the absolute value of T test which is less than the value of critical value which is equal 2.0, that's means there are no statistical differences about between mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to types of cesarean delivery. That's mean types of cesarean delivery aren't affected factor in mother satisfaction toward nursing care. The current study disagrees with Celik, E. (2020). mean types of cesarean delivery are affected factor in mother satisfaction toward nursing care

The types of cesarean delivery, whether planned or urgent, do not significantly affect mother satisfaction toward nursing care. Regardless of whether the cesarean delivery was planned or performed as an emergency, the level of satisfaction with nursing care remains relatively consistent.

The researchers think Mothers' satisfaction with nursing care post-cesarean delivery is influenced by factors like nursing staff competence, professionalism, communication, empathy, hospital environment, and individual experiences. Nursing care aims to provide optimal support and assistance to mothers, regardless of the type of delivery. Nurses focus on pain management, wound care, breastfeeding support, emotional support, and other essential aspects of post-operative care. The type of cesarean delivery is not a significant factor in influencing mother satisfaction, but the quality of nursing care, communication, and support received during the post-cesarean period are key determinants.

4.13. Is there the relationship between mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to previous of cesarean delivery? To test the question we use the independent samples test and the result illustrated in table no.(4.13)

Table 4. 13 Independent Samples Test for mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to previous of cesarean delivery

Domain	types of cesarean delivery	N	Mean	Std. Deviation	T	P-value
Nursing care	Yes	66	3.8788	0.66280	-0.007	0.995
	No	60	3.8796	0.64603		
Satisfaction	Yes	66	3.9809	0.63907	1.721-	0.088
	No	60	4.1745	0.62138		
Total	Yes	66	3.9298	0.62325	0.881	0.380
	No	60	4.0270	0.61303		

table no.(4.13) which shows that the p-value which is greater than 0.05 and the absolute value of T test which is less than the value of critical value which is equal 2.0, that's means there are no statistical differences about between mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to previous of cesarean delivery. That's mean previous of cesarean delivery aren't affected factors in mother satisfaction toward nursing care. The current study disagrees with Celik, E. (2020). mean previous of cesarean delivery are not affected factor in mother satisfaction toward nursing care

Previous cesarean delivery is not a significant factor in mother satisfaction with nursing care. Whether a mother has had a previous cesarean delivery or not does not have a significant impact on their satisfaction levels with nursing care received after subsequent cesarean deliveries. The researchers think mother satisfaction with nursing care post-cesarean delivery is influenced by factors like nursing staff competence, professionalism, communication, empathy, hospital environment, and individual experiences. Nursing care aims to provide optimal support to all mothers, regardless of their previous cesarean delivery history. The focus is on ensuring the well-being, comfort, and recovery of all mothers, regardless of their previous delivery experiences. Previous cesarean delivery is not a major factor influencing mother satisfaction with nursing care. Key determinants of satisfaction remain the quality of nursing care, communication, and support received during the post-cesarean period, regardless of the mother's previous delivery history.

4.14. Is there the relationship between mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to numbers of abortion? To test the question we use the one way ANOVA and the result illustrated in table no.(4.14) .

Table 4. 14 One way ANOVA test for difference in mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to numbers of abortion

Field	Source	Sum of Squares	df	Mean Square	F value	Sig.(P-Value)
Nursing care	Between Groups	.066	2	.033	0.076	0.927
	Within Groups	53.113	123	.432		
	Total	53.178	125			
Satisfaction	Between Groups	1.133	2	.567	1.412	0.248
	Within Groups	49.372	123	.401		
	Total	50.506	125			
Total	Between Groups	.192	2	.096	0.249	0.780
	Within Groups	47.526	123	.386		
	Total	47.718	125			

table no.(4.14) which shows that the p-value equal which is greater than 0.05 and the value of F test equal which is less than the value of critical value which is equal 3.07, that's means there are not statistical differences about in mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to numbers of abortion at significant level $\alpha = 0.05$. That's mean numbers of abortion aren't affected factors in mother satisfaction toward nursing care. The current study agree with study conducted by Ozkan& Bal, (2019). Whereas no significant deference's in satisfaction scores due to numbers of abortion aren't affected factors in mother satisfaction toward nursing care.

The researchers think the number of previous abortions a mother has had does not have a significant impact on her satisfaction with nursing care following a cesarean delivery. Factors such as the competency and professionalism of the nursing staff, effective communication, empathy, the hospital environment, and individual experiences and expectations play a more substantial role in determining mother satisfaction. Nursing care aims to provide comprehensive support to all mothers, irrespective of their reproductive history. The nursing staff consistently addresses pain management, wound care, breastfeeding support, and emotional assistance. While a mother's reproductive history may have implications for her overall medical background or specific considerations during pregnancy, it does not significantly influence her satisfaction with nursing care after a cesarean delivery. The primary focus of nursing care remains the well-being, comfort, and recovery of all mothers,

regardless of their previous abortions. Consequently, the number of previous abortions a mother has undergone is not a major factor that affects her satisfaction with nursing care.

4.15. Is there the relationship between mothers' perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to numbers of pregnancy? To test the question, we use the one way ANOVA and the result illustrated in table no 4.15

Table 4.15 One way ANOVA test for difference in mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to numbers of pregnancy

Field	Source	Sum of Squares	df	Mean Square	F value	Sig.(P-Value)
Nursing care	Between Groups	3.521	2	1.761	4.361	0.015
	Within Groups	49.657	123	0.404		
	Total	53.178	125			
Satisfaction	Between Groups	.762	2	0.381	.942	0.393
	Within Groups	49.743	123	0.404		
	Total	50.506	125			
Total	Between Groups	1.858	2	0.929	2.491	0.087
	Within Groups	45.861	123	0.373		
	Total	47.718	125			

table no.(4.15) which shows that the p-value is greater than 0.05 and the value of F test is less than the value of critical value which is equal 3.07, that's means there are not statistical differences about in mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to numbers of pregnancy at significant level $\alpha = 0.05$.In perception of mothers towed nursing care the p-value is 0.015 which is greater than 0.05 and the value of F test is greater than the value of critical value which is equal 3.07, that's means there are a statistical differences about in mothers perceptions toward nursing care post caesarean delivery at Nasser Medical complex due to numbers of pregnancy at significant level .**Table (4.15.1): Multiple comparisons Post hoc for number of pregnancy**

Variable	number of pregnancies		Mean difference	P value
Nursing care	Three time or more	One time	0.38204	0.006*
		Two time	0.26087	0.066

* significant at 0.05

table (7.1), shows Post hoc LSD test indicated to mothers with three time or more pregnancy more satisifed towerd nursing at signifecant lvel 0.05. That's mean number of pregnancy are affected factors in mother satisfaction toward nursing care. The current study agree with study

conducted by Ozkan& Bal, (2019). the women who had caesarean has satisfaction toward nursing care in scors equal (81.3%). And agree with study conducted by Celik ., (2019), there are a statistical differences about in mothers perceptions toward nursing care post caesarean delivery due to numbers of pregnancy.

The researchers think The number of pregnancies a mother has experienced can impact her satisfaction with nursing care. Multiple pregnancies may have different needs, concerns, and expectations compared to first-time mothers. They may have more experience and knowledge about the birthing process and postnatal care, which can shape their perceptions and satisfaction levels. Additionally, they may have unique physical and emotional challenges, requiring additional support and specialized care. Adequate pain management, attentive monitoring, personalized guidance, and effective communication can enhance satisfaction among mothers with multiple pregnancies**.**

On other hand, First-time mothers may have different expectations and experiences, requiring more education and support in adjusting to motherhood, breastfeeding, and postnatal recovery. Healthcare providers should recognize the impact of the number of pregnancies on mother satisfaction with nursing care and tailor care to meet these specific needs and concerns. This can lead to higher satisfaction levels and improved overall experiences for all mothers.

4.16. Is there the relationship between mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to number of deaths? To test the question we use the one way ANOVA and the result illustrated in table no.(4.16) .

Table 4. 16 One way ANOVA test for difference in mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to number of deaths

Field	Source	Sum of Squares	df	Mean Square	F value	Sig.(P-Value)
Nursing care	Between Groups	2.694	2	1.347	3.282	0.401
	Within Groups	50.484	123	0.410		
	Total	53.178	125			
Satisfaction	Between Groups	2.393	2	1.197	3.060	0.050
	Within Groups	48.112	123	0.391		
	Total	50.506	125			
Total	Between Groups	2.024	2	1.012	2.725	0.070
	Within Groups	45.694	123	0.371		
	Total	47.718	125			

table no.(4.16) which shows that the p-value equal which is greater than 0.05 and the value of F test equal which is less than the value of critical value which is equal 3.07, that's means there are not statistical differences about in mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to number of deaths at significant level $\alpha = 0.05$. That's mean number of deaths of children are not affected factors in mother satisfaction toward nursing care. Ozkan& Bal, (2019). the women who had caesarean has satisfaction toward nursing care in scores equal (81.3%).

The researchers think there are some factors that support this result such as nursing skills and training, policy of organization toward continuous education and training in all human field. These factors play a significant role in supporting mothers during their journey, irrespective of their personal experiences with childbirth. By ensuring that the nursing staff is competent and professional, able to communicate effectively, and display empathy towards the mothers, a positive hospital environment can be fostered. This allows for individual experiences and expectations to be acknowledged and addressed, ultimately leading to comprehensive support for all mothers in their childbirth experience.

4.17. Is there the relationship between mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to causes of cesarean delivery? To test the question we use the one way ANOVA and the result illustrated in table no.(4.17) .

Table 4.17 One way ANOVA test for difference in mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to causes of cesarean delivery

Field	Source	Sum of Squares	df	Mean Square	F value	Sig.(P-Value)
Nursing care	6.273	4	1.568	6.273	4.045	0.004
	46.906	121	.388	46.906		
	53.178	125		53.178		
Satisfaction	8.521	4	2.130	8.521	6.139	0.000
	41.985	121	.347	41.985		
	50.506	125		50.506		
Total	7.304	4	1.826	7.304	5.467	0.000
	40.414	121	.334	40.414		
	47.718	125		47.718		

table no.(4.17) which shows that the p-value equal 0.000 which is greater than 0.05 and the value of F test is less than the value of critical value which is equal 3.07, that's means there are a statistical differences about in mothers perceptions toward nursing care and satisfaction post caesarean delivery at Nasser Medical complex due to number of deaths at significant level $\alpha = 0.05$.

Table (4.17.1): Multiple comparisons Post hoc for number of children

Variable	Causes		Mean	P value
Nursing care	abnormal position of fetus	weak and irregular pulse	0.48300	0.006
		placenta previa	-0.25406	0.291
		bleeding	.141550	0.535
		others	.368840	.0060
Mothers satisfaction	placenta previa	weak and irregular pulse	0.45353	0.001
		bleeding	0.34129	0.029
		abnormal position of fetus	.068970	0.147
		others	0.77558	.0010
Total	placenta previa	weak and irregular pulse	0.79025	0.002
		bleeding	0.51396	0.070
		abnormal position of fetus	0.29233	0.191
		others	.699240	.0020

* significant at 0.05

table (4.17.1), shows Post hoc LSD test indicated to Multiple comparisons Post hoc for number of children. In nursing care domain mothers with abnormal position of fetus more satisfied towered nursing care compered others cuases. In satisfaction domain mothers with placenta previa exhipeted higher satesfaction than mother with other causes. In general scale mothers with placenta previa exhipeted higher satesfaction towered nursing care than mother with other causes. Causes of cesearin delivery are affected factors in mother satisfaction toward nursing care in favor of abnormal position of fetus and placenta previa. The current studies agree with study conducted by Ozkan& Bal, (2019), Badu ET AL., (2022), and Guadie& Demelash., (2023), The causes of cesarean deliverymay affect maternal satisfaction towards nursing care. The reseachers think mothers who undergo cesarean delivery due to these specific causes may have unique needs, concerns, and experiences that can influence their satisfaction levels with nursing care**.** Abnormal position of the fetus, such as breech presentation, transverse lie, or other malpositions, can present challenges during labor and delivery. Mothers who require a cesarean delivery due to these abnormal positions may have additional anxiety or concerns about the process and outcome. Nursing care that addresses these specific needs, provides clear explanations, and offers emotional support can contribute to higher satisfaction levels among these mothers**.**

Similarly, placenta previa, a condition where the placenta partially or completely covers the cervix, often necessitates a cesarean delivery. Mothers with placenta previa may have heightened concerns about bleeding, complications, and the safety of both themselves and the baby. Nursing care that prioritizes monitoring, provides appropriate interventions, and offers reassurance can positively impact satisfaction levels**.**

Addressing the specific needs and concerns associated with these causes of cesarean delivery can help mothers feel supported and cared for during their post-operative recovery. This

includes pain management, wound care, breastfeeding support, emotional support, and providing accurate information about the condition and its management.
Nursing staff who demonstrate competence, empathy, effective communication, and a clear understanding of these unique circumstances can enhance mother satisfaction with the nursing care received. Tailoring the care to meet the specific needs of mothers with abnormal fetal position or placenta previa can contribute to higher satisfaction levels and improved overall experiences.

4.18. Conclusion

The satisfaction level of mothers with nursing care post-cesarean delivery at Nasser Medical complex was 79.4%, indicating a moderate degree of satisfaction. A positive relationship was found between mothers' perceptions and their satisfaction, with significant differences observed due to age, number of children, number of pregnancies, and number of deaths. These findings emphasize the importance of considering various factors when assessing mother satisfaction with nursing care post-cesarean delivery. Tailoring care to address the specific needs, concerns, and preferences of mothers within different age groups, with varying numbers of children, pregnancies, and experiences, can contribute to higher satisfaction levels and improved overall experiences. Further research and analysis may be necessary to explore the specific factors contributing to these statistical differences in mothers' perceptions and satisfaction levels. By identifying and understanding these differences, healthcare providers can continue to enhance the quality of nursing care provided to mothers at Nasser Medical complex .

Recommendations

Based on the relationship between mothers' perceptions toward nursing care and satisfaction post-caesarean delivery at Nasser Medical complex , the following recommendations can be made:

- Enhance effective communication between nursing staff and patients, including clear and concise explanations of procedures and treatment options.
- Ensure competent and skilled nursing staff: Continuously invest in training and development programs for nursing staff.
- Offer comprehensive post-operative education: Provide mothers with comprehensive information and education regarding post-cesarean care.
- Empathy and emotional support: Train nursing staff to demonstrate empathy and provide emotional support to mothers.
- Regular evaluation and feedback: Establish mechanisms for regular evaluation of nursing care and seek feedback from mothers.
- Ensure that nursing staff are competent and professional in their approach to patient care.
- Create a comfortable and supportive hospital environment for patients.
- Provide comprehensive support to all mothers, regardless of their reproductive history, including addressing pain management, wound care, breastfeeding support, and emotional support.

- Monitor the intensity of pain and satisfaction with pain management among postnatal mothers after cesarean section.
- Consider participating in clinical trials or research studies aimed at improving postpartum quality of recovery and maternal satisfaction after cesarean delivery.

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FULL PAPER

Information Security and Network Protection Measures

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Abstract

The Internet is one of the information and communication technologies in the current era, because of its great role in disseminating information among people all over the world, and with the diversity of the use of the Internet, new criminal patterns began to appear on this network, and these criminal patterns are viruses and theft of political and commercial secrets. In this article, we study information security concepts, network protection measures, virus prevention, and overcoming vulnerabilities.

key words : Information security, network protection, vulnerabilities, viruses

1- Introduction:

Despite the benefits that have been achieved and continue to be realized every day thanks to the tremendous development of the electronic field at all levels in various areas of contemporary life, so that all different sectors have become dependent in their work primarily on the use of the computer in the first place, the world has become a small village connected by information networks.

In this era, enterprises have relied on information technology, which has proved to contribute to the work being done with great speed and precision. Data and information are stored in information stores linked to the institution's computers through the communication network and are often available online to facilitate work processes and reduce time.

Therefore, data-processing methods for compatibility with the computer environment have evolved from manual to automated electronic workflow systems to the e-government concept. Thus, information technology has facilitated medical, engineering, industrial and banking work, library systems and the work of educational institutions and has even become a weapon in military establishments for use in hostilities.

These networks need protection to ensure the integrity of their content and the continuity of their work. It has been concluded that business in enterprises is interrupted if their information networks, such as airlines and large companies around the world, are disrupted. Indeed, the short interruption of such networks has taken a heavy toll on their owners or beneficiaries. The short interruption of government and national information networks has led to the disruption of their work, which is reflected in the low level of services provided to citizens and the confusion in State institutions related to broken-down networks. The suspension of business networks causes significant financial losses that may often lead to bankruptcy and business quality and success depend on the quality and functioning of communication networks and the continuity of databases.

The issue of network security has become the cornerstone of the building of any network system of any size, owing to the increasing and diverse new threats such as infection with viruses, malware, and attempts to penetrate for the purposes of stealing information, sabotage, modification and tampering, which we always find in a state of rapid development and progress. To confront these threats, we need sophisticated security solutions that are no longer available through traditional protection methods, which has been a fundamental challenge in securing the necessary protection of any network system.

2. The problem of study:

The proliferation of electronic information networks with all the positive features has led to new risks that were not previously known, including the security of the electronic information network linked to access to networks, the theft of secrets of companies, Governments and security and defence institutions, the promotion of sabotage, espionage and piracy programmes, the theft of sites and their vulnerability to viruses and harmful programmes.

Accordingly, the problem of studying can be summarized in the lack of adequate means and procedures to counter electronic penetration and protect networks.

3. Study hypotheses:

There are no statistically significant differences between the security gaps in information networks and the preventive actions taken to prevent them from being exploited.

There are no statistically significant differences between actions to avoid threats and actions taken.

4. The objective of the study is:

1. Identification of information security
2. Identification of risks, gaps and threats
3. Identification of viruses
4. Identification of weaknesses in the networks considered and measures to redress them
5. Identification of actions needed to achieve high protection of information networks.

5. Importance of the study:

The theoretical importance of the study stems from the importance of maintaining and protecting the security of corporate computer networks from the potential for hacking, piracy or sabotage, which has an impact on their future strategy and plans and thus their growth and development in their respective sectors.

6. Information and network security concepts:

Until the late 1970s, the field of information and network security was known as communications security (COMSEC) ,defined by the Information and Communication Systems Security Recommendations of the Agency United States national security:

Standards and precautions to prevent access to information by persons not authorized through communications and to ensure The authenticity and validity of these contacts included the specific activities of communications security in four areas:

1. Security encryption
2. Dispatch Security
3. Radiation Security Emission
4. Physical Security

The definition of telecommunication security has two characteristics:

1- Confidentiality [3] : This means ensuring that the information is not revealed or accessed by anyone else.

2- Risk: A concept that refers to negative and potential impacts on assets and valuable property that may result from a current process or future event. It began in the 1980s, with the steady growth of personal computers and their use, a new era of security, namely, COMPUSEC, Computer Security, defined by the United States National Security Agency (USNSA) Information and Communication System Security Recommendations:

Standards and procedures that ensure confidentiality and completeness and provide components of information systems, including hardware and software The integrated software and information is processed, stored and transported.

Computer security has two additional features:

Integrity and content integrity: it means ensuring that the content of the messages (information)

It has not been modified or tampered with. In particular, the content has not been destroyed, altered or tampered with at any stage. from processing or exchange stages, both in the internal handling of information and through intervention

Illegal during transmission.

2- Continued availability of information or service: ensuring the continued operation of the information system Networks and their continued ability to interact with information and users, not to stop or block service. The lack of access as a result of attack, destruction and sabotage.

Later in the 1990s, the concepts of telecommunication and computer security were combined to shape what became.

It's known as Information Systems Security (INFOSEC). It includes a concept of security.

Information systems are the four aforementioned features of the concepts of communications security and computer security, namely confidentiality.

And reliability, completeness and availability, as added to it is the new characteristic of combating denial or preventing denial of conduct. The purpose here is to ensure that the person who did the non-repudiation is not denied it. By acting in connection with the information or its location, it is he who has done so in such a way that this characteristic provides the ability to prove that the conduct of a person has taken place at a given time.

6.1. Risks, gaps and threats:

Security is known as protection from danger and loss. In general, the concept of security is similar to that of safety. Variance the precision between the two concepts is the additional focus of security on protection against the external risks of individuals and activities that violate protection and are directly responsible for breach of security. The term security is generally used.

As a synonym for safety, but technically, security means not just safety, but working to provide Safety too.

Specific concepts are recurrent in different areas of security, including:

1- Risk: the risk of a particular event having an impact on the achievement of objectives. In engineering science, the risk is known quantitatively as the probability of an accident and the loss of a single incident.

Risk is seen as an indicator of threats and depends on threats, gaps, impact on operations and uncertainty. There are many ways and means of assessing and measuring risk.

In information security and networks, the risk is determined using three variables (factors):

1. There could be a threat.
2. There may be gaps.
3. Potential impact of the threat.

If any of these variables become zero, the total hazard to the system or network is close to zero Also.

2- Gaps: (or lack of immunization) and generally known as sensitivity to harm or attack Physical or psychological. It also means that property and valuable assets are not adequately protected. In computer security. Networks use the term gaps to refer to the weaknesses of these systems that allow the attacker to attack. And it could cause gaps, short software, or design malfunctions, as a result of programmer neglect or designer, or the attacker's use of malignant programs like virus programs.

Computer and network security gaps can be classified into two categories:

1. Technical gaps: As a result of poor immunization resulting from systems and network techniques, a network attack is known as a technical attack.
2. Administrative gaps: They are the result of non-technical reasons and, in this case, the attack on the network or computer is known as a social engineering attack..

Gaps in terms of difficulty and ease can also be divided into two categories:

a- **High-level Gaps**, which are easy to exploit, and an example of his book

A program code to exploit that gap.

b. **Lower-level gaps,** in vulnerability and this type of gaps that are difficult to exploit and require a lot of effort and resources by the attacker.

3- Threats: Potential intrusion into assets and property (information) without the permission of the owner and forced and through a potential loophole in the system to steal or sabotage it, and in case of its occurrence, threats pose a danger to the system.

There are three essential components of the threat:

1. **Objective:** Represents in computer security and networks information stored or sent through networks for violation Her confidentiality, her safety, her presence.
2. **Client:** The programs and objects that are formed and created for the threat require access to the computer or networks, as well as information on their operating characteristics and the security mechanisms used in them, in order to search for a gap in access to the system or network.
3. **Event:** The quality of the impact represents the state of threat and is used in many ways, most importantly, authorized abuse and unauthorized to information or system. And he put on malignant blades, Like virus blades in systems.

Figure 1 illustrates the relationship between the components of the information security system and the networks and their impact on each other.

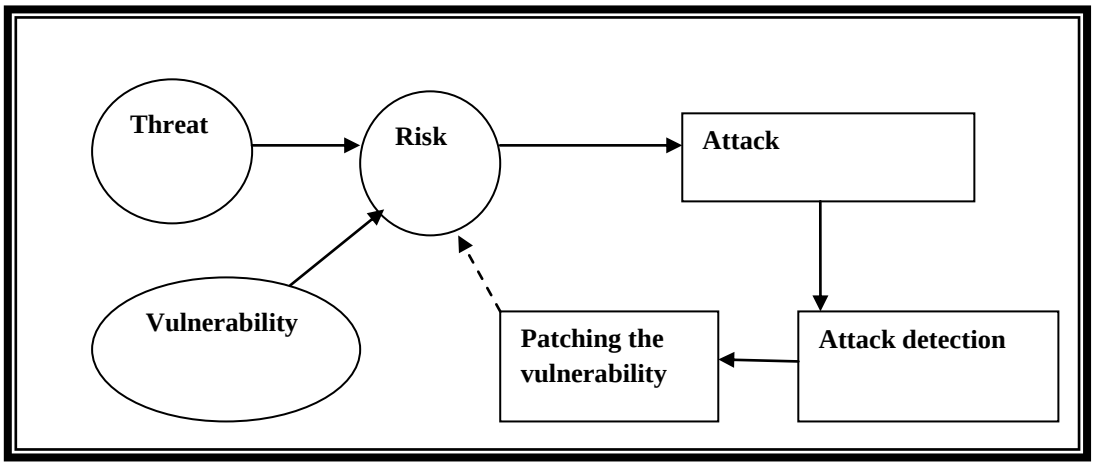

Figure 1 illustrates the relationship between the components of the information security system and the networks and their impact on each other.

6.2. Elements of information security:

The elements of information security are organized in several areas, including:

- **Security of data and information storage sites:** this area is concerned with many scientific and practical mechanisms. Related to data preservation sites and surrounding environment to ensure that information is in secure locations like data centres, which should be subject to strict control and physical security procedures. It's so high in access that it can only reach those who are authorized and through a secure gate that may be able to access the device.Sometimes it depends on advanced techniques, such as reading the fingerprint of the finger and the iris, (Printyee) or voice frequency or through serial numbers or magnetic cards,etc..
- **Security of data archiving:** this is done through the use of advanced information encryption techniques Saved (Encryption) with various types of symmetry or asymmetric encryption, whether internationally accredited Or a locally developed encryption method.
- **Data-conservation media security:** this axis is achieved through the most appropriate preservation of hard drives (HDD),memory cards (CASH), (CD) and other appropriate preservation media.
- **Information protection security:** various mechanisms are used, such as firewalls or firewalls. To protect against hacking network devices, use filters to ensure that unauthorized information is not transmitted, and use anti-Virus to protect against various viruses and copies.Backup to address the problem of missing non-written digital data that is more vulnerable than Others for damage, damage or loss are done with a number of mechanisms.
- **Information and data transfer security:** in the past, direct physical data transfer mechanisms were used and surrounded In confidence and protection of these mechanisms are relatively slow, and the current reflection is that this method has been safer than the roads. Modern e-networking. After technical advances, modern transport

mechanisms have become what they have been characterized by. The speed and accuracy of the transfer are best suited when taking the necessary security precautions in data transfers. We therefore believe that this area is concerned with the safe environments for the transmission of and access to data and information through networks.

- **Security of communications systems and transportation environments used:** when direct connection is by lines telephone or satellite on-line, and when data are relatively medium. The risk here lies in the presence of sniffing intruders on the lines of communication, highlighting the importance of robust and efficient data encryption and maintaining the integrity of the communication line from the presence of interceptors or spyers.
- **Security of applications used and protocols:** when communication is indirect and through an intermediary such as internet or data transfer to a high-security service site, such as expenses or direct purchase with electronic credit cards, spying and hacking are the most obvious security problems that can't be eliminated. It's completely on it, and it can be significantly reduced by using safe protocols on... the level of the application or network layer shows the importance of digital signatures and electronic certificates. To secure sites and other protections.
- **Searching for potential sources of danger for information to combat:** sources of danger and security threats data and networks are too many, and perhaps the most important of them is the risk of access to data by people who are not allowed to do so, and thus information is leaked, destroyed or altered.that connects them to the data or enables them to destroy it or change it in a number of ways.

7- Computer viruses:

7.1- Definition of Viruses:

Computer viruses spread widely and evolve rapidly due to the technological advancements we witness in our daily lives. Thousands of computer devices are infected daily by these viruses, causing significant financial and emotional losses to their users. Personal information is stolen, and users are often blackmailed for financial gain to regain access to their files.

A computer virus is an external program deliberately created to alter the properties of the files it infects [6], executing various commands such as deletion, modification, or sabotage. Computer viruses are programs written by skilled programmers with the intent to harm

another computer, take control of it, or steal important data. They are characterized by their ability to replicate and spread. The virus attaches itself to another program called the host; viruses cannot generate themselves. They can be transmitted from an infected computer to a healthy one.

The virus is a program designed to spread itself among files and integrate or attach itself to programs. When the infected program is executed, it may infect the other files present on the hard disk or floppy disk. Therefore, the virus requires intervention from the user to spread. Typically, this intervention involves executing it after being downloaded from email, downloaded from the internet, or through exchanging floppy disks.

7.2- Components of the virus: [6]

The virus program generally consists of four main parts:

1. **The Replication Mechanism:** This part allows the virus to copy itself.
2. **The Protection Mechanism:** This part hides the virus from detection.
3. **The Trigger Mechanism:** This part allows the virus to spread before its presence is known, such as using the computer's clock timing, as in the Michelangelo virus, which activates on March 6th of each year.
4. **The Payload Mechanism:** This part executes the virus when activated.

7.3- How Viruses Work:[6]

The creator of the virus programs it and directs its commands, determining when and how the virus becomes active. Typically, the virus is given enough time to spread freely without drawing attention to infect as many users as possible. Viruses vary in terms of when they become active; some start at a specific date or time, others activate after executing a certain command in the infected program, while some start their activity after replication and reaching a certain number of copies. After activation, the virus engages in various destructive activities depending on its purpose. Some may display messages mocking the user or issue warnings about memory overflow, while others may delete or modify files. Some viruses replicate and copy themselves to fully disable your device, while others are more devastating, wiping all data from the hard drive."

7.4- Reasons for the Spread of Computer Viruses:

The reasons for the spread of viruses on users' computers around the world vary, and among the most important are:

- Viruses spread through programs downloaded from the internet, especially when relying on sources of unknown origin. Once the user installs the program on their device, these viruses activate to damage the device.
- Some users resort to using what is called "cracks,"[6] a small tool used to activate paid software for free. However, these cracks often carry viruses that infiltrate the computer.
- Infected file exchange between users by connecting two devices, one of which is infected with viruses, naturally affects the healthy device, easily transferring the viruses to the other device.
- Clicking on links sent to the user without knowing the sender can result in downloading viruses directly to the device.
- Viruses spreading through email attachments, as today, viruses often find their way to personal computers through email attachments. Once you open the attached file, the virus infects your device and may replicate itself, spreading the infection to all email addresses in the Address Book.

7.5- The Major Damages Caused by Viruses:

With the diversity and continuous proliferation of viruses, the damages inflicted on your computer system vary. However, the damages caused by viruses can be summarized in several points:

Viruses that infiltrate your computer system work to completely destroy it by corrupting files on the hard disk, affecting random-access memory, and manipulating device settings, ultimately causing the system to slow down and eventually leading to its complete destruction. Additionally, viruses that infect installed programs on the computer cause malfunctions in the programs, preventing them from performing their essential functions.

Viruses that infect websites you browse steal your personal data and intercept what you send through various websites. These viruses target vulnerabilities in your device, preventing antivirus programs from detecting and combating them, thus making your device susceptible to viruses."

8- Results:

The research and preceding studies indicate that the following measures should be taken to protect the network from threats, risks, and vulnerabilities:

1. Installing a firewall [2].
2. Installing antivirus protection systems.
3. Installing internet usage monitoring software.
4. Using a password with a minimum length of 8 characters [5].
5. Updating operating systems.
6. Updating antivirus software.
7. Updating firewalls.
8. Conducting periodic tests to detect weaknesses within and outside the network.
9. Using a variety of techniques to assess vulnerabilities [1].
10. Implementing self-protection for programs [4].

9- Conclusion:

Some companies in practical reality have faced problems due to weaknesses in their electronic information security systems, leading to data breaches, fraud, or data destruction, resulting in significant financial losses. To compensate for this, some companies may struggle to provide the requirements for controlling the security of their information due to weaknesses in their internal control systems. Hence, this study aims to contribute to understanding this issue. It is hoped that this study will provide useful results and recommendations for companies or professionals in various security sectors, whether military or civilian, and those working in industrial, commercial, governmental, or non-governmental fields. This will help identify some weaknesses within the components of electronic information systems to preserve their information security."

10- Recommendations:

The internet has become massively utilized and relied upon, carrying millions of communications. It has become a serious threat to the safety of data flowing through networks. Knowing how to protect the privacy of your information and devices while using the internet reduces the likelihood of exposure to risks of unauthorized use, which can cause material or moral harm to you."

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FULL PAPER

A study of Silica Sand in the Abu Ghailan Region and its Suitability for Glass Industry

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Abstract

This study was conducted on the possibility of using the sands of the Abu Ghailan region in the glass industry. The study included a field visit to the region and taking samples from different sites based on their differences in size, shape and color. The samples were taken to the laboratory to conduct physical and chemical analyzes on them, including sieve analysis, mineral analysis and specific gravity test. The results showed that Abu-Ghailan sands are suitable for use in the glass industry. This study indicates the importance of exploiting local raw material sources in manufacturing industries

Keywords: silica, glass, sand, Abu Ghailan.

المستخلص

أجريت هذه الدراسة على إمكانية استخدام رمال منطقة أبو غيلان في صناعة الزجاج، وتضمنت الدراسة زيارة ميدانية للمنطقة وأخذ عينات من مواقع مختلفة بناءً على اختلافاتها في الحجم والشكل واللون، تم أخذ العينات إلى المعمل لإجراء التحاليل الفيزيائية والكيميائية عليها، بما في ذلك التحليل المنخلي والتحليل المعدني واختبار الوزن النوعي. أظهرت النتائج قابلية رمال منطقة أبوغيلان للاستخدام في صناعة الزجاج. تشير هذه الدراسة إلى أهمية استغلال مصادر المواد الخام المحلية في صناعات التصنيع.

الكلمات المفتاحية: السيليكا ، الزجاج، الرمل ، أبوغيلان.

المقدمة

رمال السيليكا عبارة عن ثاني أكسيد السيلكون (SiO_2) وهى مادة طبيعية واسعة الانتشار وتعتبر من أهم مكونات القشرة الأرضية وتتواجد في عدة أشكال بلورية غليظة التبلر مثل الكوارتز ، وأخرى مجهريه التبلر مثل الصوان كما تتواجد السيليكا أيضاً في هيئة لا بلورية مثل الدياتوميت أو نادراً في شكل زجاج السيليكا الطبيعي الناتج من انصهار رمال السيليكا بواسطة الصواعق والشهب والنيازك . ويمكن أن تكون السيليكا الطبيعية عالية النقاوة مما يجعلها صالحة للاستغلال الصناعي [9] .

وعادة يستخدم مصطلح رمال السيليكا لوصف حبيبات الكوارتز الصغيرة ، وتكون رمال الكوارتز النقية بيضاء اللون ،بينما يختلف لون الرمال باختلاف كمية ونوعية الشوائب بها [3]. وللأنواع المختلفة من رمال السيليكا تطبيقات متعددة ومتنوعة ، وذلك حسب خصائصها وبالذات ما يتعلق بتركيبها الكيميائي ، ونسبة ونوعية الشوائب بها ، وكيفية تواجد هذه الشوائب (من مكونات المادة الرابطة التي يمكن إزالتها عن طريق عمليات المعالجة المختلفة أو داخل حبيبات الكوارتز نفسها) وأيضاً التوزيع الحجمي لها ، وكذلك متطلبات واشتراطات كل من الصناعات المختلفة [7]. فمثلا تستخدم السيليكا لإنتاج الأنواع المختلفة من الزجاج ، وفي صناعة المسبوكات، وفي أغراض التكسير والتحطيم الهيدروليكي في صناعة النفط ، وكمصفيات لأغراض الترشيح لمعالجة المياه الصناعية [2].

الهدف من الدراسة

تقييم مبدئي لرمال السيليكا المتواجدة في منطقة أبو غيلان لمعرفة مدى ملامتها في الاستخدام الصناعي وذلك بدراسة خواصها الكيميائية والفيزيائية ومدي صلاحيتها لصناعة الزجاج .

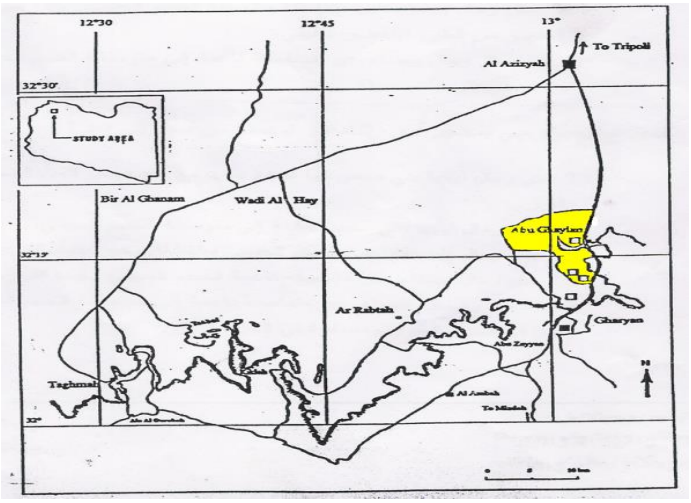
الدراسات السابقة :

تعتبر منطقة غريان من المناطق التي أجريت عليها دراسات جيولوجية وتعدينية . وقد تم دراسة تكوين أبو غيلان الذي يعتبر من ضمن المرتفعات الحجرية التي أشار لها (Christie.1955) وتتبع هذه الرمال تكوين أبو شيبه التابع للعصر الترياسي والمتكشف بعدة أماكن بالجبل الغربي [10]. وتقع رمال السيليكا في الجزء العلوي من تكوين أبو شيبه والذي يمثل في أغلبه رمال بيضاء غير متماسكة ويتراوح سمكها من 3 إلي 5 أمتار ومغطي بطبقة من الطين الأحمر [1].

ويقدر بحوالي 10 مليون طن في الموقع الأول والثاني حوالي 7.5 مليون طن من الاحتياطات المؤكدة. (مركز البحوث الصناعية)

موقع منطقة الدراسة

تقع منطقة أبو غيلان جنوب مدينة طرابلس وتبعد حوالي (80 كم) وشمال مدينة غريان وتبعد حوالي (12 كم، وبين خطي عرض ('9 32^0 و '10 32^0 شرقاً) وخطي طول ('01 13^0 و '02 13^0 شمالاً)



الشكل 1 : موقع منطقة الدراسة (مركز البحوث الصناعية)

جيولوجية منطقة الدراسة

تتبع منطقة الدراسة من الناحية الجيولوجية إلى عدة تكاوين جيولوجية منها :

تكوين العزيزية: يتألف تكوين العزيزية أساساً من أحجار جيرية دولوميتية رمادية اللون مع بعض التداخلات الرقيقة من المارل والطين وعدسات ودرنات من الصوان، كما لوحظ بالجزء العلوي من التكوين تداخلات فوسفاتية دقيقة تعلو تداخلات من الحجر الرملي وذلك بقبتي غريان والحزمات ويرجع عمر هذا التكوين إلى الفترة الواقعة بين الثلاثي الأوسط والعلوي.

تكوين ابوشيبة: يظهر هذا التكوين في وادي أبوشيبه شمال غريان ويتألف هذا التكوين من رمال قارية ورواسب صلصالية، كما يوجد بهذا التتابع أيضا طبقات من الكنجلومريت الناعمة ذات التوزيع الغير منتظم بالمنطقة، وكذلك تحتوي طبقات الحجر الرملي على حبيبات من الكوارتز.

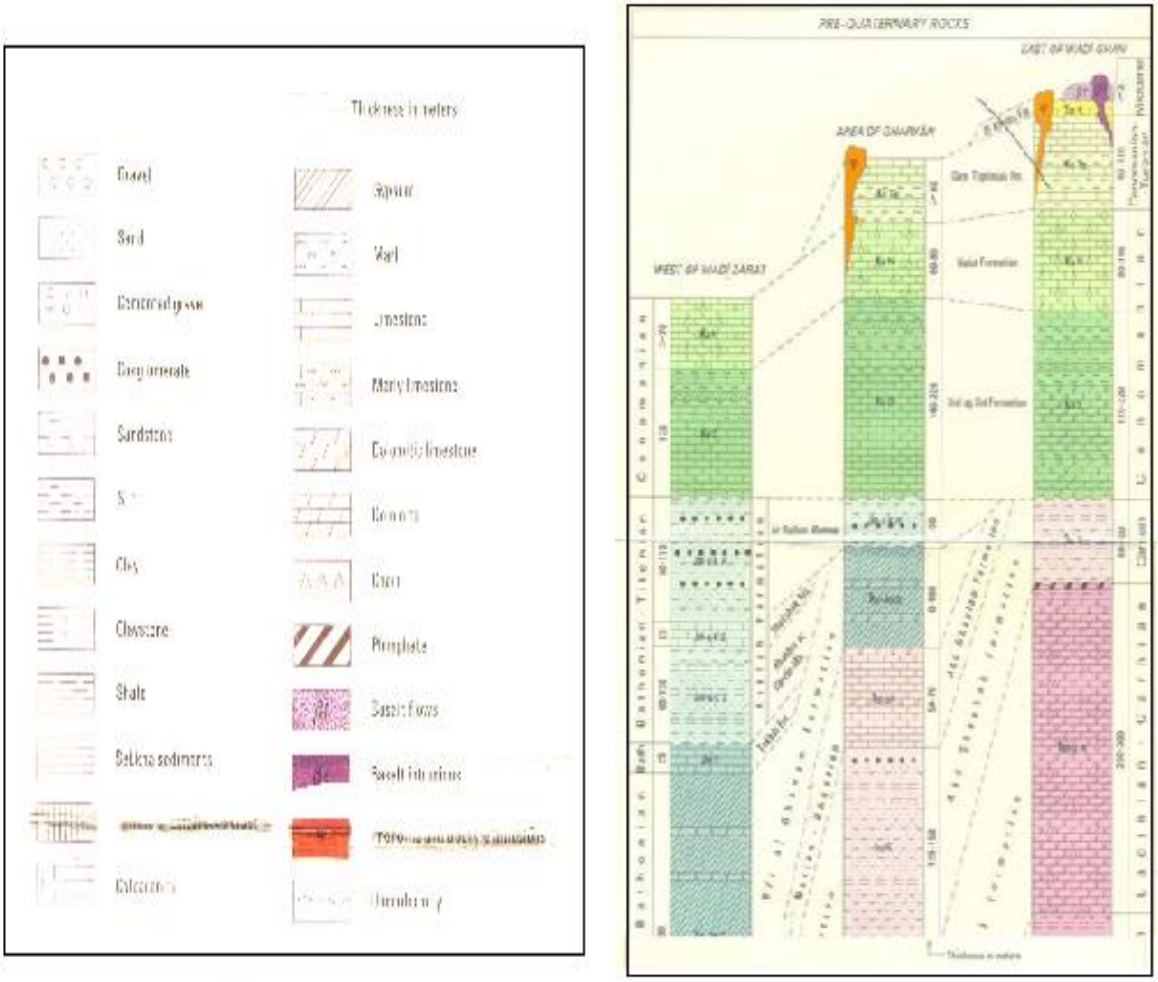
تكوين ابوغيلان: يتألف هذا التكوين من الحجر الجيري الطيني (المارل) ذو اللون الرمادي الفاتح إلى اللون الأصفر الفاتح ويتميز بوجود التموجات والتهشمات الصخرية.

تكوين ككلة: يوجد فوق صخور ابوغيلان بسطح عدم التوافق، حيث يتألف هذا التكوين من الحجر الرملي الكوارتزي الخشن الغير جيد الفرز مع وجود الكنجلوميرات والتداخلات الطينية والجيرية.

تكوين سيدي الصيد: يتكون من عضوين: عضو سفلي – عين طبي يتكون أساسا من طبقات سميكة صلبة من الدولومايت والحجر الجيري الدولوميتي، أما العضو العلوي فيسمى بعضو يفرن ويتكون أساسا من الحجر الجيري الطيني (المارل) مع تداخلات بسيطة من الجبس.

تكوين نالوت: يتواجد فوق تكوين سيدي الصيد (عضو يفرن) بسطح انتقالي ويتكون من حجر جيري دولوميتي و دولوميتي ذو لون اصفر وأحيانا رمادي اللون.

تكوين قصر تغرنة: من أحدث التكاوين التي تظهر في منطقة الدراسة ويتكون من الحجر الجيري الغني بالحفريات ويفصل بين تكوين تغرنة وتكوين نالوت سطح انتقالي [8] .



شكل 2 : قطاع طبقي عام يشمل تكوين منطقة الدراسة (لوحة طرابلس الجيولوجية)

الدراسة الحقلية

في هذه الدراسة ثم القيام بزيارة حقلية لمنطقة الدراسة وثم أخذ (6) عينات من أماكن مختلفة من المنطقة علي أساس الاختلاف في الحجم الحبيبي أو الاختلاف في الشكل واللون وذلك لأجراء التحاليل الكيمائية والفيزيائية عليها.

الدراسة المعملية

في المعمل تم اجراء بعض الاختبارات على العينات ، وتمثلت الآتي :

1- التحليل المنخلي لهذه العينات وذلك لدراسة الحجم الحبيبي وشكل الحبيبات الرملية [4].

2- إجراء التحليل الكيميائي لعينات الرمال المدروسة وذلك لتعيين بعض العناصر الأساسية بواسطة التحليل الكيميائي وتتمثل العناصر المدروسة في :

$Mn\ O_2$,K_2O , Na_2O , Al_2O_3 , Fe_2O_3 , MgO , CaO ,SiO_2

3- إجراء التحليل الفيزيائي لعينات الرمال وذلك لتعيين الوزن النوعي لها .

4 – تحليل العينات بواسطة جهاز حيود الأشعة السينية (XRD) وذلك لمعرفة التركيب المعدني لهذه الرمال.

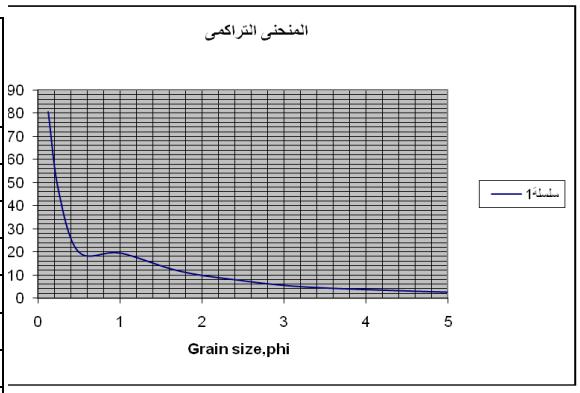
النتائج والمناقشة

1. نتائج التحـليل المنخـلي للعينات

جدول 1 : يبين نتائج التحليل الحجمى للعينة (A_1)

Sieve Size (mm)	Weight (gm)	Weight (%)	Cumulative (wt)	Cumulative (wt%)
5.66	8.78	1.75	8.78	1.75
3.35	15.43	3.09	24.21	4.48
2.36	17.39	3.48	41.6	8.32
1.7	17.88	3.58	59.48	11.9
1.00	37.83	7.58	97.31	19.48
0.50	2.78	0.55	100.09	20.03
0.25	130.96	26.24	231.05	46.27
0.125	170.55	34.17	401.6	80.44
pan	97.40	19.51	499	99.95

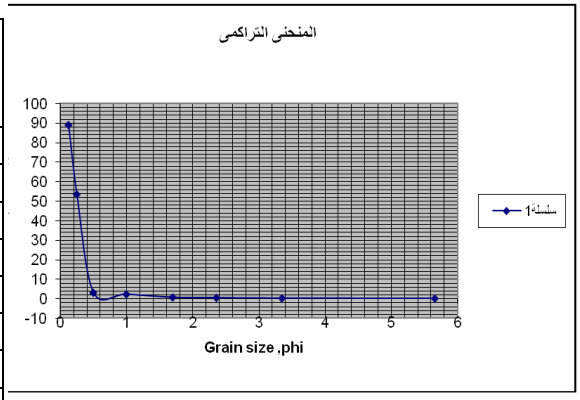
(A_1)



شكل 3 : يبين تمثيل التحليل الحجمى الحبيبي للعينة

جدول 2 : يبين نتائج التحليل الحجمى للعينة (A_2)

Sieve Size (mm)	Weight (gm)	Weight (%)	Cumulative (wt)	Cumulative (wt%)
5.66	0.38	0.076	0.38	0.076
3.35	0.69	0.13	1.07	0.20
2.36	1.24	0.24	2.31	0.44
1.7	1.12	0.22	3.43	0.66
1.00	7.80	1.56	11.23	2.22
0.50	4.10	0.82	15.33	3.04
0.25	250.98	50.29	266.31	53.33
0.125	177.10	35.49	443.41	88.82
pan	55.60	11.14	499.01	99.96



شكل 4 : يبين تمثيل التحليل الحجمى الحبيبي للعينة (A_2)

جدول 3 : يبين نتائج التحليل الحجمى للعينة (A_3)

Sieve Size (mm)	Weight (gm)	Weight (%)	Cumulative (wt)	Cumulative (wt%)
5.66	101.47	20.33	101.47	20.33
3.35	28.93	5.79	130.4	26.12
2.36	15.75	3.15	146.15	29.27
1.7	11.89	2.38	158.04	31.65
1.00	22.12	4.43	180.16	36.08
0.50	3.90	0.78	184.06	36.86
0.25	58.23	11.66	242.29	48.52
0.125	215.01	43.08	427.3	91.6
pan	41.73	8.36	499.03	99.96

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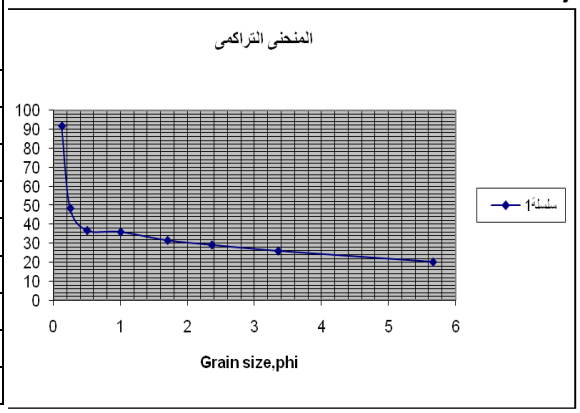
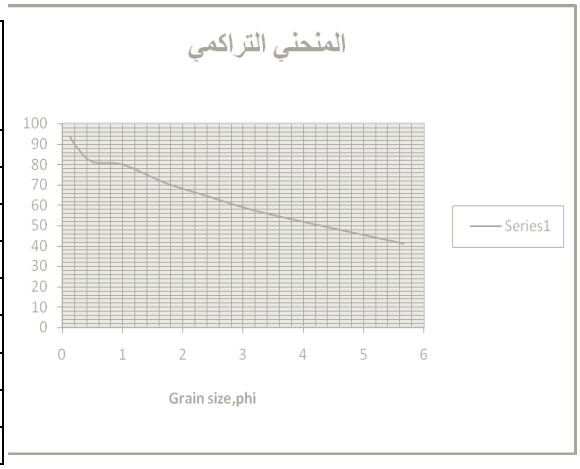


شكل 5 : يبين تمثيل التحليل الحجمى الحبيبي للعينة (A_3)

جدول 4 : يبين نتائج التحليل الحجمى للعينة (A_4)

Sieve Size (mm)	Weight (gm)	Weight (%)	Cumulative (wt)	Cumulative (wt%)
5.66	204.26	40.91	204.26	40.91
3.35	75.68	15.16	279.94	56.07
2.36	43.18	8.65	323.12	64.72
1.7	30.90	6.19	354.04	70.91
1.00	44.61	8.93	398.63	79.84
0.50	6.72	1.34	405.35	81.18
0.25	34.28	6.86	439.63	88.04
0.125	27.40	5.48	467.03	93.52
pan	32.16	6.44	499.19	99.96

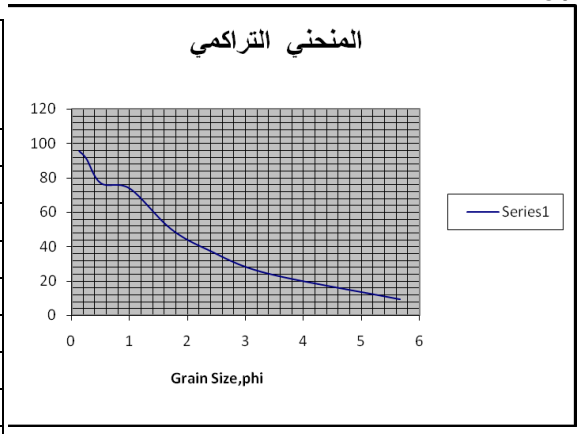


شكل 6 : يبين تمثيل التحليل الحجمى الحبيبي

للعينة (A_4)

جدول 5 : يبين نتائج التحليل الحجمى للعينة (A_5)

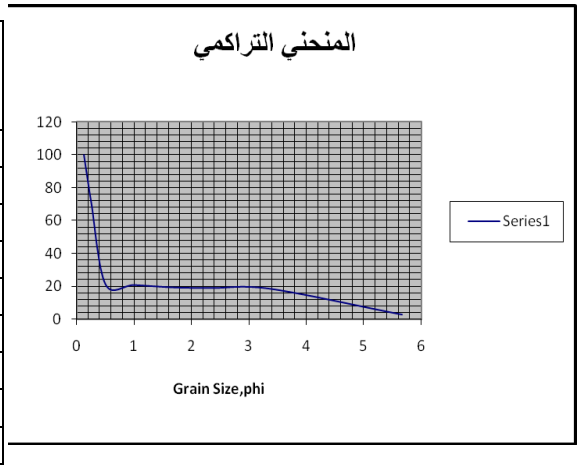
Sieve Size (mm)	Weight (gm)	Weight (%)	Cumulative (wt)	Cumulative (wt%)
5.66	46.09	9.23	46.09	9.23
3.35	76.18	15.25	122.27	24.48
2.36	66.43	13.30	188.7	37.78
1.7	62.61	12.54	251.31	50.32
1.00	115.78	23.19	367.09	73.51
0.50	15.51	3.10	382.6	76.61
0.25	71.40	14.30	454	90.91
0.125	22.24	4.45	476.24	95.36
pan	23.02	4.61	499.26	99.97



شكل 7 : يبين تمثيل التحليل الحجمى الحبيبي للعينة (A_5)

جدول 6 : يبين نتائج التحليل الحجمى للعينة (A_6)

Sieve Size (mm)	Weight (gm)	Weight (%)	Cumulative (wt)	Cumulative (wt%)
5.66	14	2.80	14	2.80
3.35	78.82	15.78	92.82	18.58
2.36	1.87	0.37	94.69	18.95
1.7	1.76	0.35	96.45	19.3
1.00	7.40	1.48	103.85	20.78
0.50	2.13	0.42	105.98	21.2
0.25	250.45	50.15	356.43	71.35
0.125	142.45	28.52	498.88	99.87
pan	0.51	0.10	499.39	99.97



شكل 8 : يبين تمثيل التحليل الحجمى الحبيبي للعينة (A_6)

2. نتائج التحليل الكيميائية

جدول 7 : نتائج التحليل الكيميائية لعينات الأحجار الرملية بمنطقة الدراسة

رقم العينة	$\%SiO_2$	%CaO	%MgO	$\%Fe_2O_3$	$\%Al_2O_3$	$\%Na_2O$	$\%K_2O$	$\%MnO_2$
A1	96.80	0.25	0.05	0.19	1.25	0.04	0.36	0.008
A2	96.91	0.23	0.04	0.11	1.10	0.02	0.18	00
A3	95.91	0.17	0.025	0.50	1.40	0.071	0.58	0.007
A4	97.20	0.07	0.02	0.09	0.45	0.02	0.03	00
A5	97.35	0.10	0.02	0.12	0.57	0.03	0.36	00
A6	97.22	1.003	0.24	0.133	1.528	0.043	0.011	0.008

3. نتائج التحليل الفيزيائية تعيين الوزن النوعي :

جدول 8 : نتائج التحليل الفيزيائي وفاقد في الحرق (L.O.I) للعينات

رقم العينة	الوزن النوعي	الفاقد في الحرق (L.O. I)%
A1	2.55	0.64
A2	2.56	0.62
A3	2.5	0.78
A4	2.6	0.39
A5	2.63	0.27
A6	2.55	0.35

4. نتائج التحليل المعدني

اظهرت نتائج حيود الأشعة السنية أن العينات جميعها تتكون من معدن الكوارتز، مع وجود بعض الشوائب ولكن العينة السادسة تعتبر أنقي مقارنة بباقي العينات .انظر الملحق.

يتضح مما تقدم أن خامات رمال السليكا التابعة إلي (تكوين أبو غيلان)، هي رمال صالحة لصناعة الزجاج مع العلم بأنها تحتوى على نسبة من أكاسيد الحديد التي غير مرتبطة بلوريا بحبيبات الكوارتِ [1]، وبذلك التخلص منه أمر هين ويسير ومن بين الطرق الغسيل .ومن خلال الدراسة التي توصلنا إليها بعد أجراء عدة تحاليل على العينات الرملية بمنطقة أبوغيلان أتثبت نتائج التحليل المنخلي إنا الجزء الأكبر من الرمال صالح للصناعة، أما بالنسبة لنتائج التحليل الفيزيائي للعينات التي قمت بدراستها لتعين الوزن النوعي بينت

أنه تتراوح بين (2.55 – 2.6) وهي مطابقة للمواصفات القياسية وبالتالي فتكون هذه الرمال نقية وصالحة لصناعة الزجاج، من خلال نتائج التحليل الحجمى يتضح ان الحجم الحبيبي كان (متوسط)هو مابين (0.1-0.5) مم وان متوسط التمثيل البياني كان (معتدل). ومن خلال النتائج المتحصل عليها في الجدول نلاحظ ارتفاع نسبة السليكا في جميع العينات لأتقل عن95% ، واعلي قيمة في العينات هي 97.35 % للعينة رقم **(A5)** وبذلك فان متوسط نسبة السليكا في العينات هي 96.89 % ، وهذا يسمح باستخدامها خاصة إن العينات لم تتعرض لعمليات معالجة مبدئية كالغسيل بالماء أو الأحماض أو إزالة وبعض الأكاسيد الأخرى[6]، وتبين من دراسة التركيب المعدني للعينات بواسطة جهاز حيود الأشعة السينية أن معظم العينات تحتوي على معدن الكوارتز (SiO2) وقد بينت نتائج التحاليل الكيميائية للعينات أن نسبة السيليكا للعينات كانت عالية ، وقمت بمقارنتها مع نتائج مركز البحوث الصناعية كانت كالأتي :

جدول9 : مقارنة بين نتائج التحاليل الكيميائية لعينات الرمال ونتائج مركز البحوث الصناعية.

العنصر	نتائج مركز البحوث الصناعية %		نتائج عينات الرمل%	
السيليكا	97.55	97.35	97.20	99.29
الالومنيا	0.57	0.45	0.35	0.89
اكسيد الحديديك	0.12	0.09	0.026	0.037
اكسيد الكالسيوم	0.10	0.07	0.012	0.004
اكسيد الصوديوم	0.03	0.02	0.007	0.004
اكسيد الماغنسيوم	0.02	0.02	0.006	0.009
اكسيد البوتاسيوم	0.36	0.03	0.014	0.027

الخلاصـة

أجريت الدراسة على رمال السليكا الواقعة بمنطقة أبو غيلان لغرض تقيمها صناعيا . حيث كان إجمالي العينات المأخوذة من منطقة الدراسة 6 عينات، وشملت الدراسة المعملية التحليل المنخلي للعينات وبينت النتائج بأن الشكل الحبيبي لمعظم العينات متوسط إلي ناعم، هذا وشملت الدراسة التحاليل الكيميائية للعينات

لمعرفة تركيز العناصر الأساسية . وأثبتت نتائج التحليل المعدني بجهاز حيود الأشعة السنية تواجد معدن الكوارتز مع كمية قليلة من الشوائب .

وبينت التحاليل الكيميائية إن نسبة السليكا في العينات تصل (97.35%) وبالتالي تعطى هذه النتائج قيمة صناعية جيدة لهذه الرمال. وخلصت كل هذه النتائج على إمكانية قيام صناعات على هذه الرمال مثل صناعة الزجاج المسطح .

التوصيات التالية

1. أوضحت هذه الدراسة بان معظم العينات ذات صلاحية جيدة لصناعة الزجاج ، نظرا لارتفاع نسب السليكا .
2. معالجة العينات (غسلها) وذلك لتقليل نسبة اكاسيد الحديد لكي تكون هذه الخامات صالحة لصناعة الزجاج.
3. التوسع في التجارب الدراسات الصناعية بحيث يتم توجيه كميات كافية لإجراء التجارب الصناعية المتخصصة وتحديد الأنواع التي يمكن استغلال الرمال فيها .

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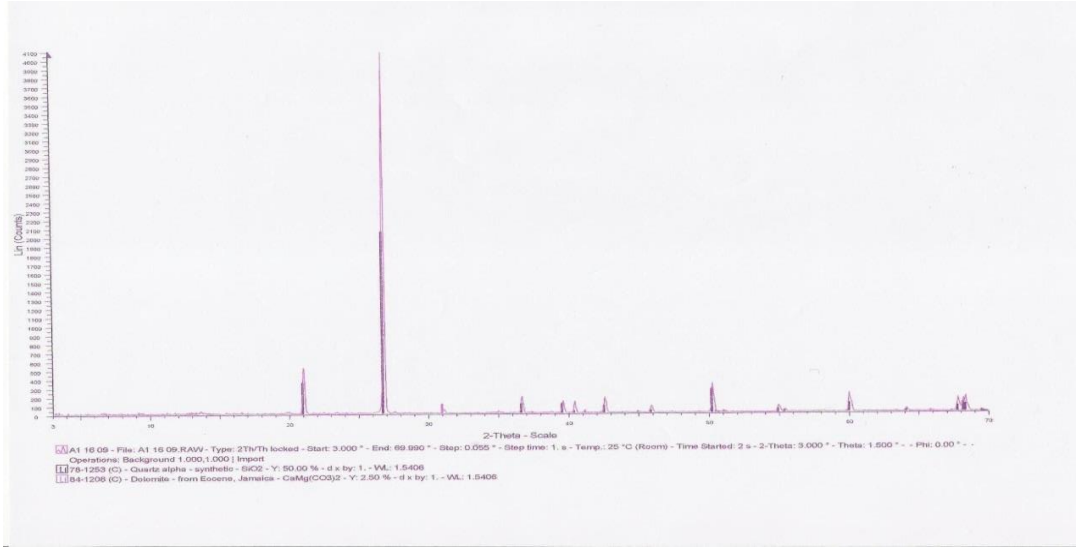
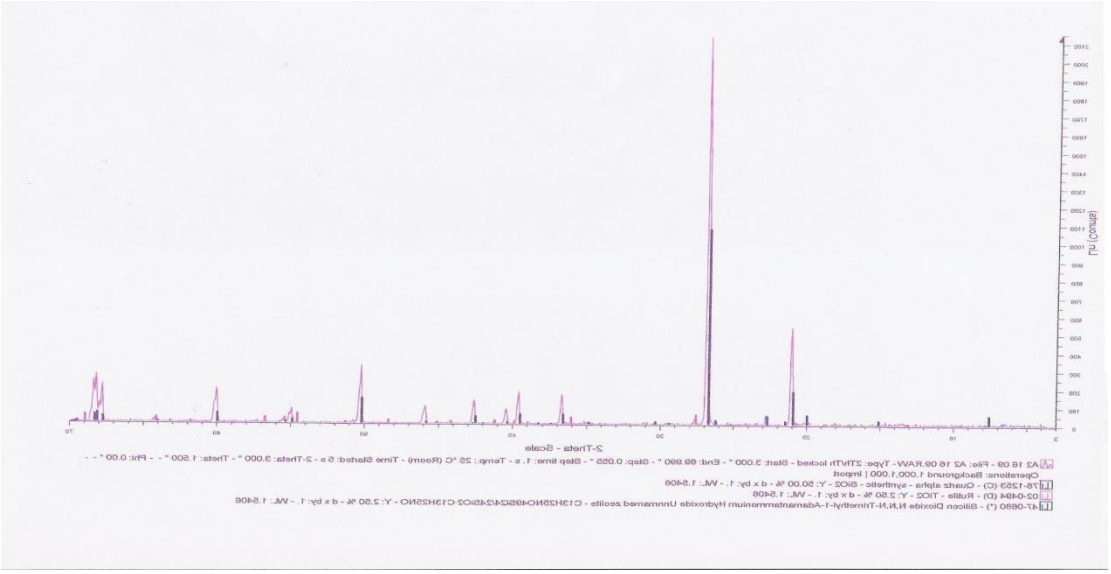
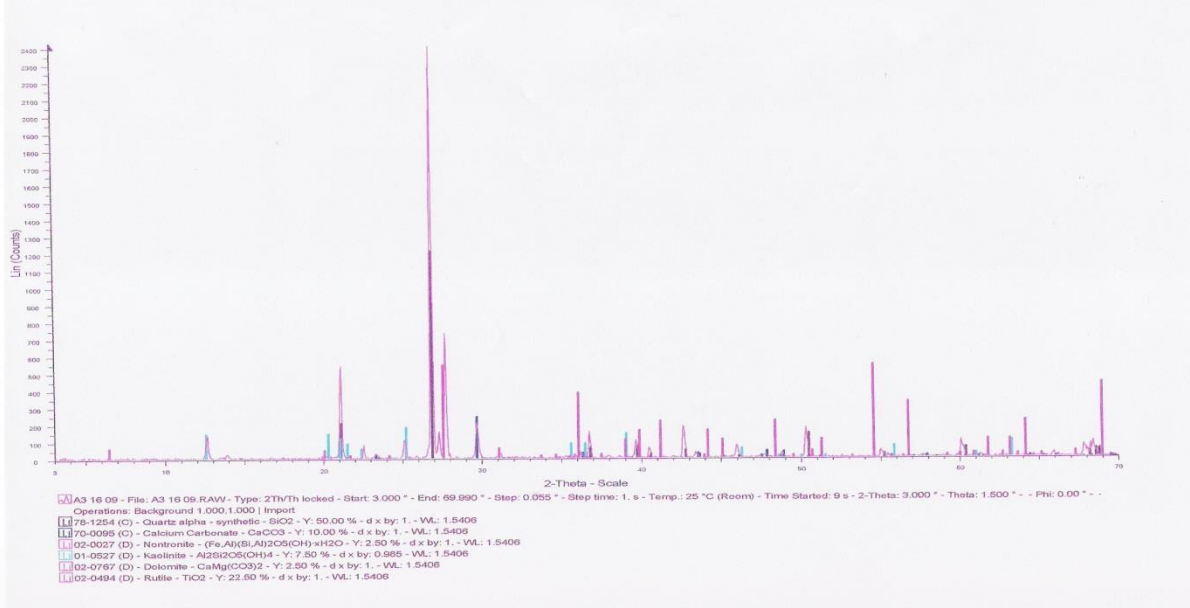
الملحق A



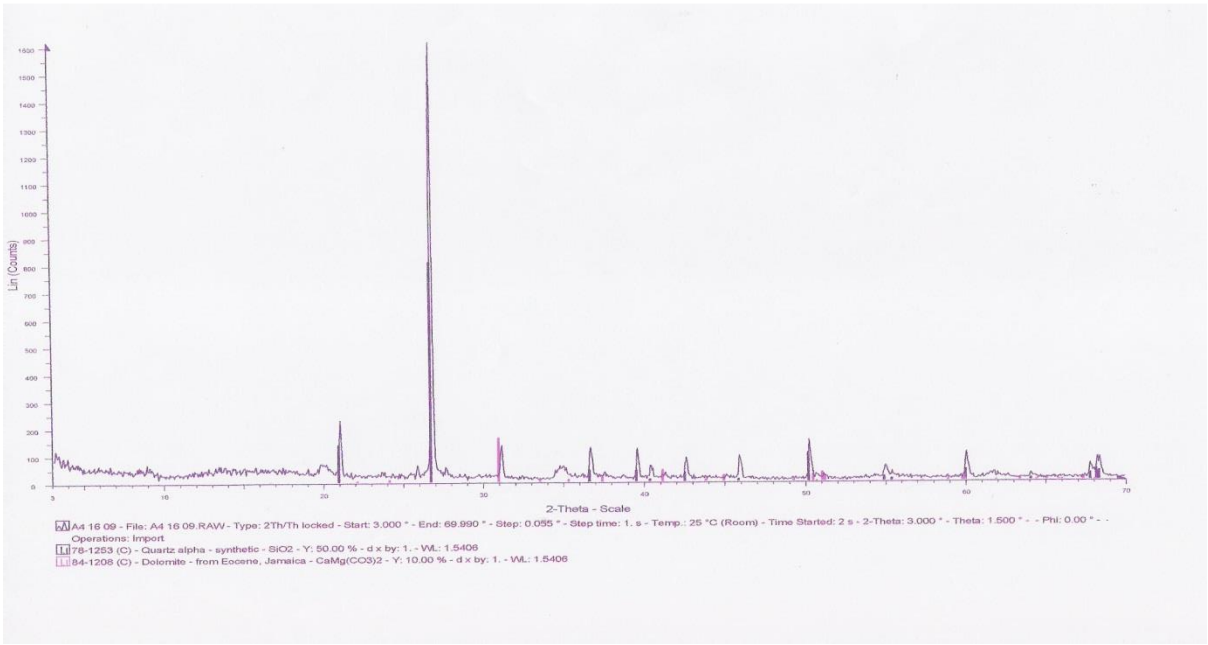
شكل (9)نموذج حيود الأشعة السينية للعينة A1



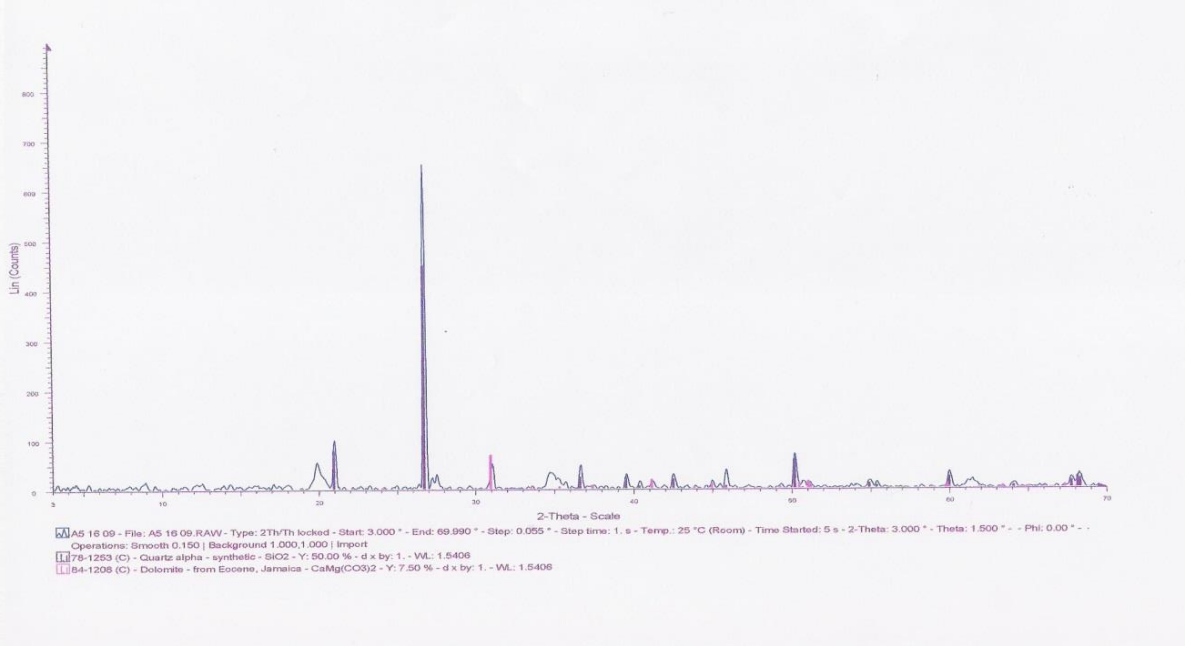
شكل (10)نموذج حيود الأشعة السينية للعينة A2



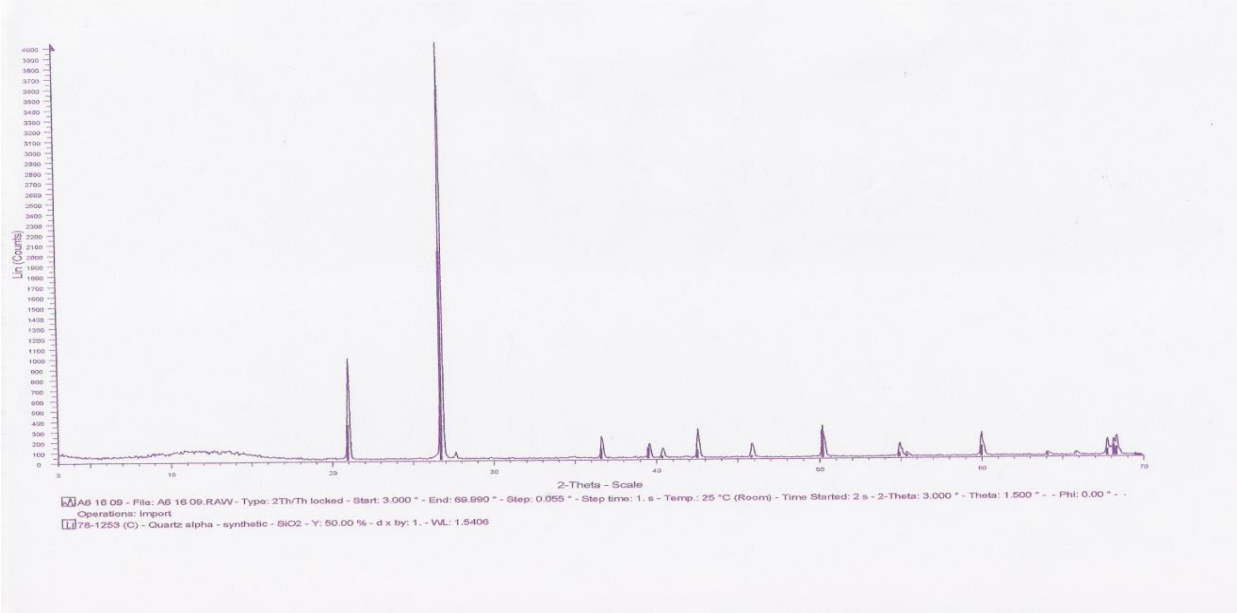
شكل (11)نموذج حيود الأشعة السينية للعينة A3



شكل (12)نموذج حيود الأشعة السينية للعينة A4



شكل (13)نموذج حيود الأشعة السينية للعينة A5



شكل (14)نموذج حيود الأشعة السينية للعينة A6

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FULL PAPER

Using the Developed Electro Thermal Centers for the Production of Electric Power and Desalinated Water

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Abstract

In this research, a mathematical model was created to study the performance of the development of basic design of dual electro thermal centers dedicated to the production of electric energy and desalinated water together. In the form of a measure of the effectiveness of the heat and maintaining the lowest level of pollution of the surrounding medium , for electricity and desalinated water together , in the proposed design compared to the independent production of electric power and desalinated water through a processing plant and reverse osmosis desalination unit .The effect of multi-effect evaporated desalination unit and the gas turbine unit , as well as the thermodynamic thermal properties of this unit , were compared with the basic design of the steam plant . The result of the study has been shown:
The effectiveness of using dual-pressure double –phase in the development of steam station to the centers of electro thermal. Where the minimum savings in the amount of fuel consumed **77.9 kg/hr to MW (Mega Watt) .**of electric energy produced in the basic design of the steam plant and the lower resulting pollution rates such as a nitrous oxide(0.26 **kg/MW.hr) ,** and carbon dioxide present in the air pressure supplied to the desalination unit from **0.3 bar ,(** as result of this improvement , the design number of the effects of desalination unit =8 ,and the water quantity produced **15.7 ton/MW.hr)** High pressure steam supplied to the desalination unit from **0.3 bar** to **0.38 bar,** and the high quantity of desalination water produced by **15.3 %, as** well as decrease in the electric power produced by the steam turbine unit ay rate of **2.9%**
Thermal and environment performance of the use of successive gas turbine unit in the development of steam turbine to the centers of electro thermal ,where the lowest level of increase by the amount of fuel consumed and environment indicators above **14.9% .**

Key words: desalination unit - thermal centers - steam station - electro thermal centers - turbine units

المستخلص

تم في هذا البحث لإنشاء نموذج رياضي لدراسة أداء تطوير التصميم الأساسي لمراكز كهروحرارية مزدوجة ثنائية الضغط مخصصة لإنتاج الطاقة الكهربائية ومياه التحلية معا. وبصورة مقياس لفاعلية الحرارة والحفاظ على أدنى مستوى من التلوث للوسط المحيط وتم "استخدام التوفير في كمية الوقود المستهلكة في الكهربائية المستخدمة نتيجة للإنتاج المشترك للطاقة الكهربائية ومياه التحلية معا في التصميم المقترح مقارنة مع عملية الإنتاج المستقل للطاقة الكهربائية ومياه التحلية عن طريق محطة تجهيز ووحدة تحلية من نوع التناضح العكسي كما تم دراسة تأثير وحدة التحلية التبخيرية ذات التأثير المتعدد والوحدة التوربينية الغازية وكذلك الخواص الحرارية (الثرموديناميكية) الأساسية لهذه الوحدة بالمقارنة مع التصميم الأساسي للمحطة البخارية . وقد بينت نتائج الدراسة :

. أن فاعلية إستخدام الدورة المزدوجة ثنائية الضغط في تطوير المحطات البخارية التكثيفية إلى مراكز كهروحرارية . حيث بلغ مقدار التوفير الأدنى في كمية الوقود المستهلكة **77.9 kg/hr** لكل(**MW**) ميغا واط من الطاقة الكهربائية المنتجة في التصميم الأساسي للمحطة البخارية ,وإنخفاض معدلات الملوثات الناتجة, مثل أوكسيد النيتروجين (**0.26 kg/MW.hr**) وثاني أوكسيد الكربون (**241.8 kg/MW.hr**) المطروحة للهواء الجوي , عندما يكون ضغط البخار المجهز لوحدة التحلية **0.3 bar** (ونتيجة لهذا التطوير فإن العدد التصميمي لتأثيرات وحدة التحلية = **8** وكمية مياه التحلية المنتجة **15.7 ton/MW.hr**).

. إرتفاع ضغط البخار المجهز لوحدة التحلية من **0.3 bar** إلى **0.38 bar** يؤدي إلى زيادة العدد التصميمي لتأثيرات وحدة التحلية من **8** إلى **10** و إرتفاع كمية مياه التحلية المنتجة بنسبة **15.3 %** وكذلك هبوط الطاقة الكهربائية المنتجة للوحدة التربينية البخارية بمعدل**2.9 %**"

. الأداء الحراري والبيئي لإستخدام الوحدات التوربينية الغازية ذات الإحتراق المتتالي في تطوير المحطات البخارية إلى مراكز كهروحرارية . حيث بلغ أقل مستوى من الارتفاع بمقدار التوفير في كمية الوقود المستهلكة والمؤشرات البيئية السابقة أعلاه **14.9 %**.

الكلمات المفتاحية : وحدة التحلية ـ المراكز الحرارية ـ المحطة البخارية ـ

1.1 المقدمة :

العديد من المناطق في العالم تعاني شحة في مصادر المياه الصالحة لأغراض الشرب والإستخدامات اليومية . وكان أحد الحلول العلمية لهذه المشكلة هو تحلية مياه البحر بالطريقة الحرارية [1] . وفي السنوات الاخيرة تميزت بارتفاع نسبة استعمال المراكز الكهروحرارية لتوليد مياه التحلية والطاقة الكهربائية اللازمة في تغطية متطلبات شبكة الكهرباء في العديد من دول العالم و خاصة في دول العالم الثالث النفطية [2 , 3] . وعلى الرغم من ان محطات الطاقة الكهربائية البخارية في معظم دول العالم مازالت تعتبر النسبة الاكبر في تلبية استهلاك الطاقة الكهربائية للشبكة. كما ان العديد من هذه المحطات أصبح من الناحية الفنية والتقنية غير اقتصادي ضمن المقاييس العالمية للرصانة ومعدلات استهلاك الوقود لإنتاج الطاقة الكهربائية [4] .

و"تشير نتائج الدراسات الحديثة إلى الفاعلية الاقتصادية لاستخدام وحدات التحلية التبخيرية المتعددة التأثير في المراكز الكهروحرارية البخارية المخصصة لإنتاج الطاقة الكهربائية ومياه التحلية [5]. ولكن في حالة البلدان التي تعتمد فيها شبكة إنتاج الطاقة الكهربائية بصورة رئيسية على المحطات البخارية التكثيفية يصبح من الضروري التفكير في تجهيز الطاقة الحرارية لوحدات التحلية المذكورة أعلاه عن طريق استنزاف البخار من التوربينات التكثيفية أو تطوير هذه التوربينات للعمل بنظام التوربينات البخارية ذات الضغط المقابل". وذلك عندما تكون وحدات التحلية هذه موجودة داخل المحطة الكهربائية أو بالقرب منها ." ومن الجدير بالذكر في هذه الحالة يجب أن يؤخذ بعين الاعتبار القدرة التصميمية وامكانية زيادة الطاقة المحملة على مراحل التوربين البخاري [6]. ونتيجة لاستمرارالبحوث العلمية لتقديم ما هو أكثر فاعلية اقتصادية في مجال إنتاج الطاقة الكهربائية اتجه الباحثون إلى تبني فكرة الدورة المزدوجة في تطوير وتوسيع المحطات البخارية القديمة "[7 , 8].

وبناء على ما تقدم سوف نقوم في هذا البحث " دراسة اداء تطوير التصميم الأساسي لمحطة بخارية تكثيفية إلى مركز كهروحراري مزدوج ثنائي الضغط يتم فيه إنتاج الطاقة الكهربائية والطاقة الحرارية اللازمة لوحدات التحلية التبخيرية المتعددة التأثير".

1.2 المحطة البخارية مادة البحث :

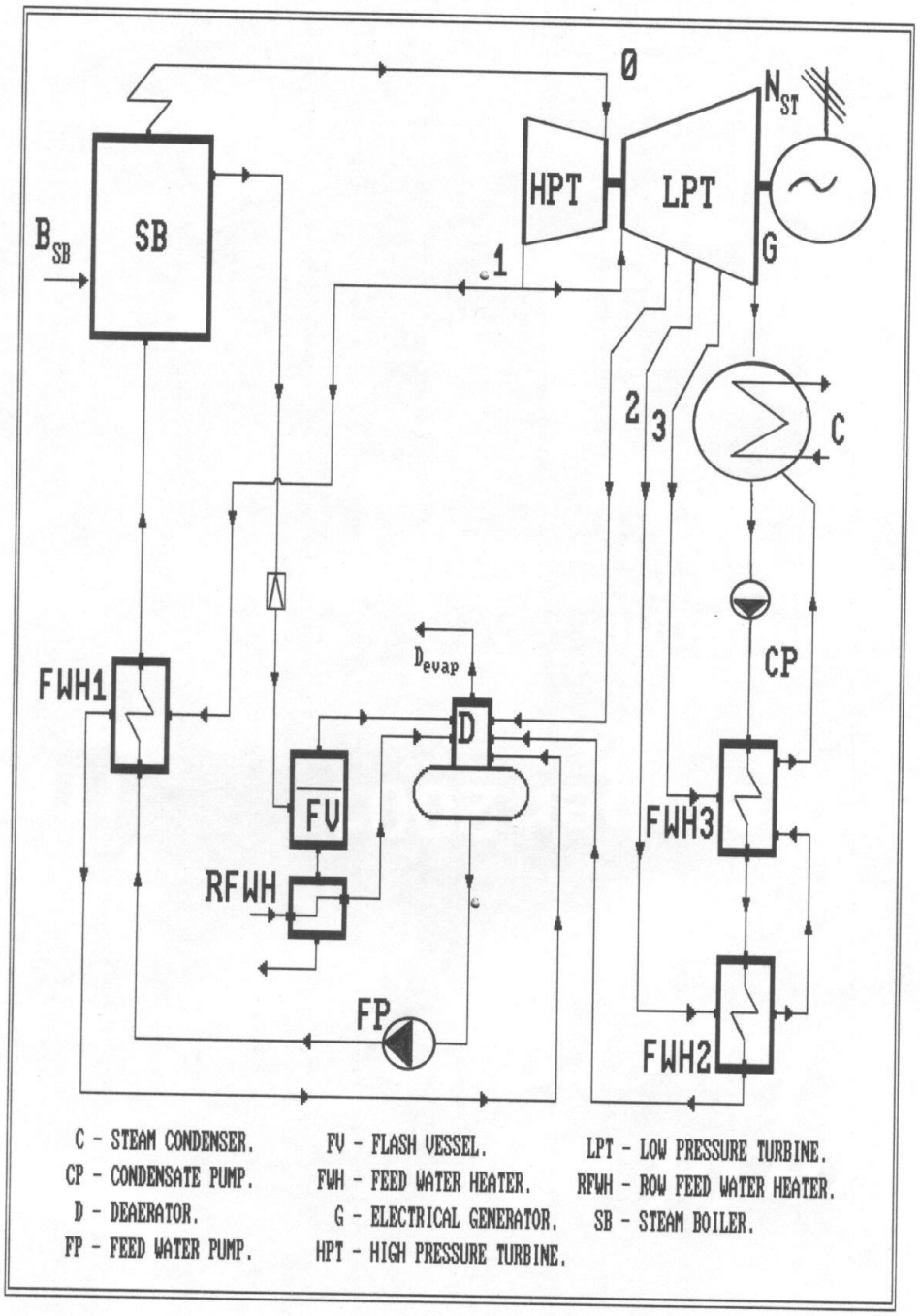
يتكون التصميم الأساسي للمحطة البخارية : (الشكل 1)) من مرجل بخاري (SB) بطاقة إنتاجية (320 ton/hr) ووحدة تربينية بخارية تكثيفية ذات محور واحد وقدرة تصميمية 84.65 MW . وتتكون التربينة البخارية من اسطوانتين (HPT , LPT) لتمدد البخار المجهز من المرجل(TSB= 510 C ; PSB= 92.2 bar) وتتضمن أربعة نقاط لاستنزاف البخار من اسطوانتي الضغط المرتفع والمنخفض لغرض التسخين الاسترجاعي لمياه التغذية (الجدول (1)).

الجدول (1) خواص البخار عند نقاط الاستنزاف المختلفة من التربينة البخارية .

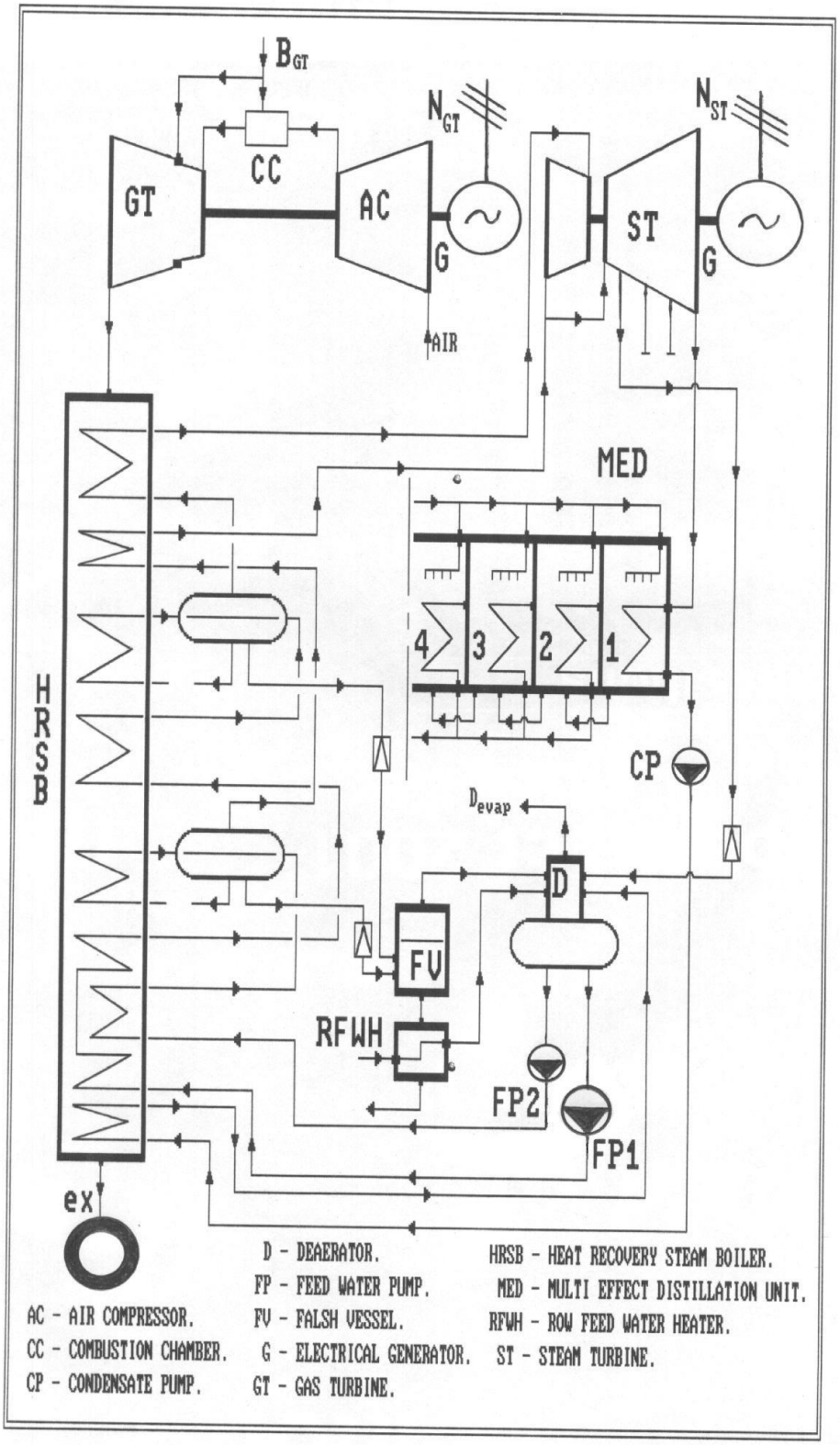
Poi	0	1	I			C
P	87.	24.	6.	1	0.1	0.(
T	50	33(	3	1	5(	38

ان التصميم المقترح لتطوير التصميم الأساسي للمحطة البخارية قيد البحث مبين في الشكل (2). حيث تم تعديل تصميم المحطة البخارية إلى مركز كهروحراري مزدوج يتم فيه استغلال الطاقة الحرارية لغازات العادم الخارجة من التوربين الغازي في مرجل بخاري ثنائي الضغط (HRSB) مخصص لإنتاج كمية البخار المطلوبة للتوربينالبخاري في التصميم الأساسي للمحطة في حالة نظام التشغيل الجديد . وبناء على ذلك فإن البخار المنتج في مرحلة الضغط المرتفع من المرجل بعد أن ينجز مقدار من الشغل داخل اسطوانة الضغط العالي للتوربين البخاري يتم خلطه بكمية البخار المنتجة في مرحلة الضغط المنخفض من المرجل. حيث تتمدد كمية البخار المنتجة في مرحلتي الضغط للمرجل داخل اسطوانة الضغط المنخفض لغاية ضغط تجهيز البخار لوحدة التحلية.

وقد تم في التصميم المقترح إلغاء المكثف والمبادلات الحرارية المخصصة للتسخين الاسترجاعي لمياه التغذية والمتكثف الأساسي. وتطوير تصميم التربينة البخارية التكثيفية للعمل بنظام التوربينات البخارية الحرارية ذات الضغط المقابل . حيث تم إلغاء المراحل الثلاثة الأخيرة لتمدد البخار من اسطوانة الضغط المنخفض بهدف تحقيق خواص البخار المطلوبة لوحدة التحلية في نهاية إجراء التمدد للبخار داخل التوربين والحفاظ على نقطة استنزاف البخار المخصصة لخزان نزع الهواء في التصميم الأساسي (الذي يعمل وفقا للتصميم المدروس عند ضغط (PD= 2.5 bar)). ولغرض التقليل من كمية البخار المستنزفة لخزان نزع الهواء يتم تسخين المتكثف الأساسي (إلى درجة حرارة أصغر من درجة حرارة التشبع المقابلة لضغط خزان نزع الهواء بمقدار 5 C) عن طريق وضع مبادل حراري مخصص لهذا الغرض في المرجل . وإضافة لما سبق فقد تم الأخذ بعين الاعتبار وجود خزان التمدد (FV). الذي يتم فيه إنتاج كمية من البخار الوميضي عن طريق كمية المياه المستنزفة من اسطوانتي مرحلتي المرجل. وكذلك مبادل حراري (RFWH) لتسخين المياه التعويضية للمركز الكهروحراري عن طريق الاستفادة القصوى من الطاقة الحرارية المتبقية في المياه المستنزفة من خزان التمدد .



الشكل (1) يوضح المحطة البخارية الاساسية.



الشكل (2) التصميم المقترح للمركز الكهروحراري المزدوج .

أما تصميم وحدة التحلية (**MED**) فيتكون من عدة مكثفات تبخيرية متتالية تشكل التأثيرات المتعددة لوحدة التحلية. ويتم تجهيز المحلول الملحي لهذه التأثيرات على التوازي بينما يستنزف المحلول الملحي المركز من تأثير إلى أخر بالتتابع (وفقا لتدرج الضغط داخل التأثيرات) حتى يتم إستنزافه من التأثير الأخير لوحدة التحلية عن طريق المضخة المخصصة لهذا الغرض . وكذلك يتضمن تصميم وحدة التحلية على مكثف منفصل لكمية البخار المنتجة في التأثير الأخير من وحدة التحلية . حيث يستخدم جزء من مياه التبريد لهذا المكثف في تجهيز كمية المحلول الملحي المطلوبة لوحدة التحلية .

وتم في هذا البحث استخدام نوعين من التصاميم للوحدة التوربيني الغازي :

. **التصميم الأول** (وحدة توربيني غازي مصممة بدورة بسيطة وتضم الأجزاء التالية : ضاغط هواء **AC** ،غرفة احتراق مفردة حلقية **CC**، توربين غازي**GT** ،مولد كهربائي **G**).

. **التصميم الثاني** (وحدة توربيني غازي مصممة بدورة بسيطة مع احتراق متتابع للوقود. وبذلك فإن تصميم وحدة التوربيني الغازي يضم إضافة إلى الأجزاء الأساسية السابقة للتصميم الأول غرفة احتراق حلقية بعد المرحلة الأولى من التوربين الغازي).

1.3 دراسة أداء التصميم :

لدراسة الأداء الحراري للمراكز الكهروحرارية المزدوجة الثنائية الضغط يستلزم الأمر حساب التصميم الحراري لعدة بدائل مختلفة للتصميم المدروس تتميز عن بعضها بتغير تصميم المستخدمة والخواص التصميمية قيد البحث بنظام متتالي لغرض حساب المؤشرات الاقتصادية الحرارية ,"لهذه الحلول في كل حالة كما إن الخواص التصميمية الأساسية المدروسة في هذه الحالة : درجة الحرارة الابتدائية للغازات قبل التربينة الغازية (**T3**) ، نسبة الضغط للهواء في الضاغط (**PRC**) ، ضغط البخار المجهز لوحدة التحلية (**PT**) وطبقا لذلك العدد التصميمي لتأثيرات وحدة التحلية (**N**). أما الاداء الحراري فيتم تحديده في هذه الحالة عن طريق مقدار التوفير في كمية الوقود المستهلكة في الشبكة الكهربائية نتيجة لعملية الإنتاج المشترك للطاقة الكهربائية ومياه التحلية مقارنة مع عملية الإنتاج المنفصل عن طريق محطة مزدوجة بديلة لإنتاج الطاقة الكهربائية ووحدة تحلية من نوع التناضح العكسي لإنتاج مياه التحلية. وبذلك فإن مقدار التوفير في كمية الوقود المستهلكة في الشبكة الكهربائية نتيجة لتطوير التصميم الأساسي للمحطة البخارية التكثيفية إلى مركز كهروحراري مزدوج مخصص للإنتاج"الطاقة الكهربائية ومياه التحلية :

$$DBST = \frac{3600^{*}[NST + NGT - (NEST)_O - NFP1 - NFP2]}{Qcv^{*} EST} + (BSB)_O + \frac{3600^{*} DDW^{*}[NRO - NMED]}{Qcv^{*} EST} - BGT \quad (1) \qquad \Rightarrow \max$$

حيث :

BGT, NGT . الطاقة الكهربائية المنتجة (MW) ومعدل استهلاك الوقود (ton/hr) للوحدة التربينية الغازية على الترتيب.

NST . الطاقة الكهربائية المنتجة (MW) للوحدة التوربين البخاري في حالة نظام التشغيل الجديد

(BSB) o, (NEST) o . الطاقة الكهربائية المنتجة ((MW ومعدل استهلاك الوقود ((ton/hr للمرجل في حالة التصميم الأساسي للمحطة على الترتيب.

NFP2, NFP1 . الطاقة الكهربائية المستهلكة (MW) في مضخة التغذية للمرحلة الأولى والثانية من المرج على الترتيب .

EST . كفاءة المحطة المزدوجة التعويضية لإنتاج الطاقة الكهربائية في الشبكة.

Qcv . القيمة الحرارية للوقود النوعي (kJ/kg).

NMED, NRO . معدل استهلاك الطاقة الكهربائية النوعي (MW.hr/ton) لإنتاج مياه التحلية في وحدة التحلية من نوع التناضح العكسي والوحدة التبخيرية المتعددة التأثير على الترتيب .

DDW . كمية مياه التحلية المنتجة (ton/hr).

و"بذلك فإن البديل المناسب هو الذي يعطي أقصى قيمة للمعادلة (1) (أي البديل الذي عنده التصميم المدروس لوحدة التحلية لوحدة التوربين الغازي وكذلك الخواص الثيرموديناميكية المدروسة لهذه الوحدة تعطي أقصى فاعلية ممكنة عن طريق مقدار التوفير في كمية الوقود المستهلكة لإنتاج الطاقة الكهربائية ومياه التحلية.

ومن الجدير بالذكر في عملية بناء النموذج الرياضي الخاص بحساب التصميم الحراري للمركز الكهروحراري المزدوج تم استخدام طريقة حساب المراكز الكهروحرارية [9] ، وطريقة حساب الوحدات التوربينية الغازية ذات درجات الحرارة الابتدائية المرتفعة للغازات [10] ، وطريقة حساب المراجل البخارية المخصصة لاستغلال المصادر الثانوية للطاقة [11] ، وطريقة حساب وحدات التحلية التبخيرية المتعددة التأثير [12]. إضافة إلى ما تقدم تم تعديل طريقة حساب الوحدات التربينية الغازية أعلاه للتعامل مع الوحدات التوربينية الغازية ذات الاحتراق المتتالي وتحديد نسبة التمدد للغازات في المرحلة الأولى للتوربين الغازي من شروط عدد المراحل لهذا التوربين والتوزيع المتساوي لمقدار الهبوط في طاقة الغازات "على هذه المراحل [13].

1.4 دراسة الأداء للتصميم قيد البحث :

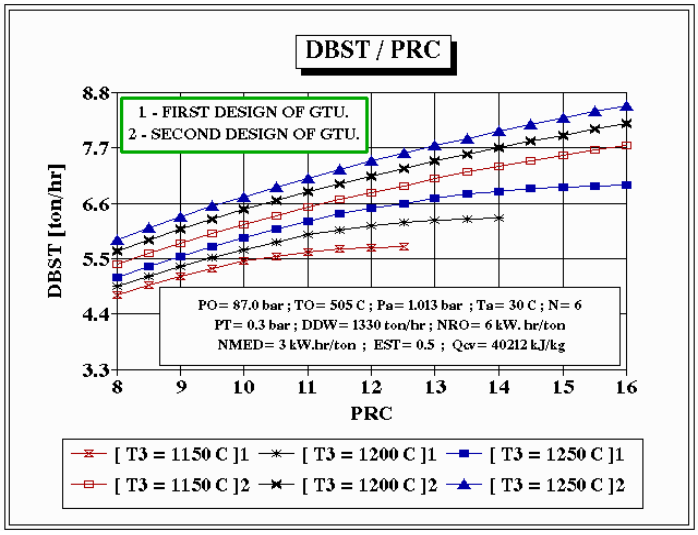
تم دراسة تأثير تصميم وحدة التوربين الغازي والخواص التصميمية الأساسية السابقة أعلاه على مقياس" الاداء الاقتصادي للتصميم قيد البحث للمركز الكهروحرارية المزدوج (مقدار التوفير في كمية الوقود المستهلكة في الشبكة الكهربائية ومياه التحلية). ويبين الشكل (**3**) تأثير نسبة الضغط للهواء (**PRC**) على مقدار التوفير في كمية الوقود من المعادلة (**1**) عند درجات حرارة ابتدائية مختلفة للغازات (**T3**) قبل التوربين الغازي. حيث يلاحظ من الشكل ارتفاع مقدار التوفير في كمية الوقود المستهلكة مع زيادة نسبة الضغط . والسبب في ذلك يمكن تفسيره إلى ارتفاع كمية الطاقة الكهربائية المنتجة للمركز الكهروحراري نتيجة لزيادة كمية الطاقة الكهربائية المنتجة لوحدة التوربين الغازي **NGT** بمقدار اكبر من الانخفاض في كمية الطاقة الكهربائية المنتجة لوحدة التوربين الغازي **NST** (الشكل (**4**)). ومن ثم إرتفاع كفاءة المركز الكهروحراري على إنتاج الطاقة الكهربائية. وعند ثبوت نسبة الضغط وزيادة درجة الحرارة الابتدائية للغازات قبل التربينية الغازية يلاحظ من الشكل (**4**) إرتفاع مقدار التوفير في كمية الوقود المستهلكة . ويمكن تفسير ذلك في هذه الحالة إلى زيادة مقدار الشغل النوعي للوحدة التربينية الغازية وارتفاع درجة حرارة غازات الإحتراق بعد التوربين الغازي. مما يؤدي ذلك إلى إنخفاض كمية غازات الإحتراق المطلوبة في المرجل لإنتاج كمية البخار اللازمة للوحدة التربينية البخارية. ومن ثم هبوط معدل إستهلاك الوقود للمركز الكهروحراري بمقدار أكبر من الإنخفاض في الطاقة الكهربائية المنتجة لوحدة التوربين الغازي (**NGT** ، **الشكل (4)**).

كما يبين الشكل (**3**) إرتفاع مقدار التوفير في كمية الوقود المستهلكة في حالة إستخدام التصميم المدروس الثاني لوحدة التوربين الغازي في المحطات والمراكز الكهروحرارية المزدوجة ثنائية الضغط مقارنة مع التصميم المدروس الأول لهذه الوحدة ". والسبب في ذلك يعود إلى زيادة كمية الطاقة الكهربائية المنتجة لوحدة التوربين الغازي (**NST** ، **الشكل (4)**) وإرتفاع مقدار الشغل النوعي لوحدة التوربين الغازي. مما يؤدي إلى انخفاض معدل استهلاك الوقود لوحدة التوربين الغازي بمقدار أكبر من الهبوط في الطاقة الكهربائية المنتجة لهذه الوحدة (**NGT** ، **الشكل (4)**). وكذلك يلاحظ من الشكل (**3**) هنالك قطع في نهاية المنحنيات في حالة التصميم المدروس الأول لوحدة التوربين الغازي. وسبب ذلك يمكن تفسيره إلى عدم توافق شروط إنتاج البخار في مرحلة الضغط المرتفع من المرجل كنتيجة لإنخفاض درجة حرارة الغازات بعد التوربين الغازي مع زيادة نسبة الضغط للهواء في هذه الوحدة .

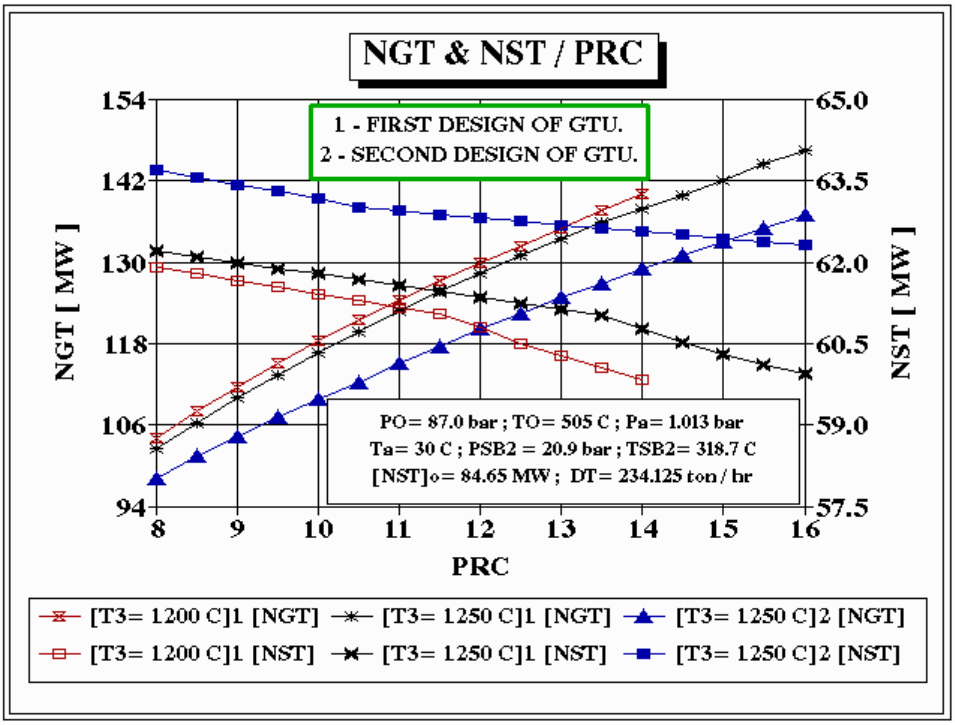
كما أن تأثير الخواص "الثرموديناميكية الأساسية لوحدة التوربين الغازي على مقدار الطاقة الكهربائية المنتجة للوحدات التوربين الغازي والبخاري مبين في الشكل (**4**). حيث يلاحظ من الشكل ارتفاع كمية الطاقة الكهربائية المنتجة لوحدة التوربين الغازي**NGT** مع زيادة نسبة الضغط للهواء في هذه الوحدة . وذلك بسبب ارتفاع كمية الغازات المطلوبة لإنتاج كمية البخار اللازمة لوحدة التوربين البخاري وزيادة مقدار الشغل

النوعي لوحدة التوربين الغازي مع ارتفاع نسبة الضغط للهواء (وذلك في المجال المدروس لهذه النسبة)."
ويبين الشكل (**4**) هبوط كمية الطاقة الكهربائية المنتجة للوحدة التربينية البخارية **NST** مع زيادة نسبة الضغط للهواء . والسبب في ذلك يعود إلى انخفاض كمية البخار المنتجة في مرحلة الضغط المرتفع من المرجل (**DSB1** ، **الشكل** (**5**)). ومن ثم هبوط مقدار الطاقة الكهربائية المنتجة لاسطوانة الضغط المرتفع (**HPT**) من التوربين البخاري .

وان تأثير درجة الحرارة الإبتدائية للغازات على مقدار الطاقة الكهربائية المنتجة للمركز الكهروحراري المزدوج مبين في الشكل (**4**). حيث يلاحظ من الشكل إنخفاض مقدار الطاقة الكهربائية المنتجة لوحدة التوربين الغازي **NGT** مع إرتفاع درجة الحرارة الإبتدائية للغازات قبل التوربين الغازي . والسبب في ذلك يرجع إلى إرتفاع درجة حرارة الغازات بعد التربينة الغازية . ومن ثم إنخفاض كمية الغازات المطلوبة لإنتاج كمية البخار اللازمة للوحدة التربينية البخارية بمقدار أكبر من الزيادة في مقدار الشغل النوعي للوحدة التربينية الغازية . أما تأثير إرتفاع درجة الحرارة الإبتدائية للغازات على كمية الطاقة الكهربائية المنتجة لوحدة التوربين البخاري **NST** فهو زيادة الطاقة الكهربائية المنتجة لهذه الوحدة "

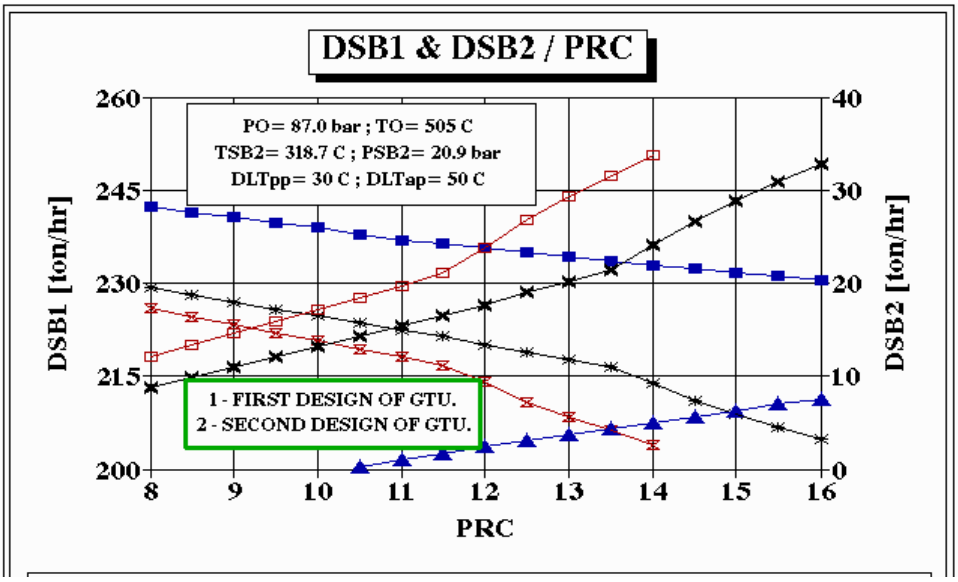


الشكل (3) يوضح علاقة مقدار التوفير في كمية الوقود المستهلكة (DBST) مع نسبة الضغط للهواء في
وحدة التوربيني الغازي(PRC) عند قيم مختلفة لدرجة الحرارة الابتدائية للغازات (T3).



الشكل (4) علاقة كمية الطاقة الكهربائية المنتجة للوحدة التربينية البخارية (NST) مع نسبة الضغط للهواء في الوحدة التربينية الغازية (PRC) عند قيم مختلفة لدرجة الحرارة الابتدائية للغازات (T3).

"وذلك بسبب إرتفاع كمية البخار المنتجة في مرحلة الضغط المرتفع من المرجل (**DSB1** ، **الشكل (5)**). ومن ثم زيادة مقدار الطاقة الكهربائية المنتجة لإسطوانة الضغط المرتفع من التوربين البخاري. وكذلك يبين الشكل (**4**) عند ثبوت الخواص الثيرموديناميكية المدروسة لوحدة التوربين الغازي فان إستخدام الإحتراق المتتابع في هذه الوحدة يؤدي إلى زيادة كمية الطاقة الكهربائية المنتجة لوحدة التوربين البخاري **NST** وهبوط كمية الطاقة الكهربائية المنتجة لوحدة التوربين الغازي **NGT** . ويمكن تفسير ذلك إلى ارتفاع درجة حرارة غازات الإحتراق بعد التوربين الغازي . مما يؤدي ذلك إلى زيادة كمية البخار المنتجة في مرحلة الضغط المرتفع من المرجل (**DSB1** ، **الشكل (5)**) وإنخفاض كمية غازات الإحتراق المطلوبة في المرجل لإنتاج كمية البخار اللازمة لوحدة التوربين البخاري بمقدار أكبر من الزيادة في الشغل النوعي لوحدة التوربين الغازي" .



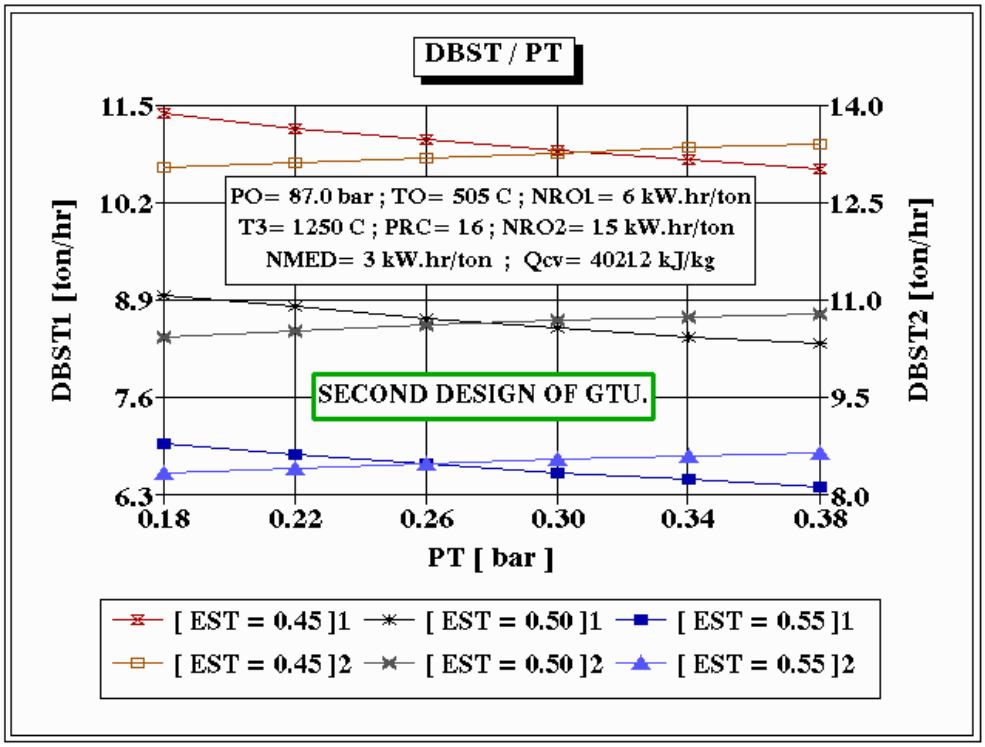
الشكل (5) علاقة كمية البخار المنتجة في مرحلتي الضغط للمرجل مع نسبة الضغط للهواء في الوحدة التربينية الغازية (PRC) عند قيم مختلفة لدرجة الحرارة الابتدائية للغازات (T3).

كما تم دراسة تأثير خواص وحدة التوربين الغازي على كمية البخار المنتجة في مرحلتي الضغط من المرجل ." حيث يلاحظ من الشكل (5) عند ثبوت نسبة الضغط للهواء وزيادة درجة الحرارة الابتدائية للغازات ارتفاع كمية البخار المنتجة في مرحلة الضغط المرتفع من المرجل **DSB1** . وذلك بسبب زيادة كمية الطاقة الحرارية المتاحة لإنتاج البخار في هذه المرحلة نتيجة لارتفاع درجة حرارة الغازات بعد التوربين الغازي . وكذلك يلاحظ هبوط كمية البخار المنتجة في مرحلة الضغط المنخفض من المرجل **DSB2** مع ارتفاع درجة الحرارة الابتدائية للغازات قبل التوربين الغازي. والسبب في ذلك يمكن تفسيره إلى انخفاض درجة حرارة غازات الاحتراق بعد موفر مرحلة الضغط المرتفع من المرجل نتيجة لزيادة كمية الطاقة الحرارية اللازمة لتسخين مياه التغذية لهذه المرحلة من المرجل ". وعند زيادة نسبة الضغط للهواء وثبوت درجة الحرارة الابتدائية للغازات يلاحظ من الشكل (5) هبوط كمية البخار المنتجة في مرحلة الضغط المرتفع من المرجل . وذلك بسبب انخفاض كمية الطاقة الحرارية المتاحة لإنتاج البخار في هذه المرحلة . أما كمية البخار المنتجة في مرحلة الضغط المنخفض من المرجل فأنها تزداد مع ارتفاع نسبة الضغط للهواء . والسبب في ذلك يعود إلى انخفاض كمية مياه التغذية اللازمة لمرحلة الضغط المرتفع من المرجل . ومن ثم ارتفاع درجة حرارة غازات الاحتراق بعد موفر هذه المرحلة من المرجل . وبالتالي زيادة كمية الطاقة الحرارية المتاحة لإنتاج البخار في مرحلة الضغط المنخفض من المرجل .

ان تأثير ضغط البخار المجهز "لوحدة التحلية **PT** وكفاءة المحطة التعويضية **EST** لإنتاج الطاقة الكهربائية وكذلك معدل استهلاك الطاقة الكهربائية لإنتاج مياه التحلية في وحدة التحلية من نوع التناضح العكسي على مقدار التوفير في كمية الوقود المستهلكة **DBST** مبين في الشكل (6). حيث يلاحظ من

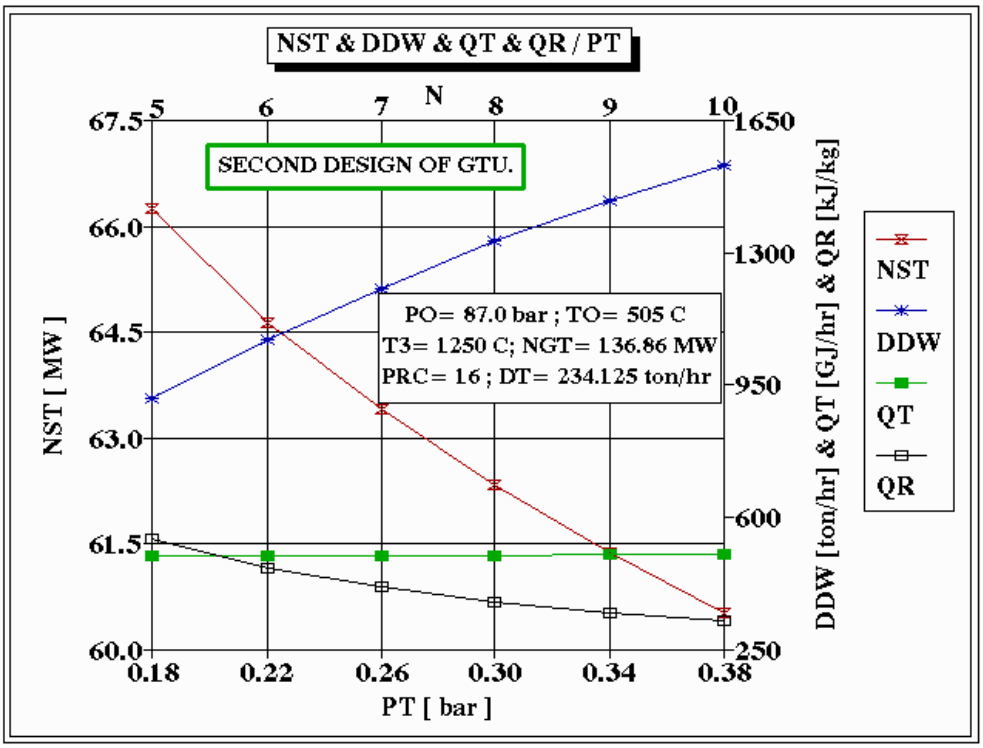
الشكل هبوط مقدار التوفير في كمية الوقود المستهلكة (**DBST1**) مع زيادة ضغط البخار المجهز لوحدة التحلية في حالة استرجاع الطاقة الهيدروليكية للمياه المستنزفة من وحدة التناضح العكسي (**NRO= 6 kW.hr/ton**). والسبب في ذلك يعود إلى هبوط الطاقة الكهربائية المنتجة للوحدة التربينية البخارية (**NST** ، **الشكل (7)**) بمقدار أكبر من الزيادة في معدل استهلاك الطاقة الكهربائية لوحدة التحلية التعويضية نتيجة لارتفاع كمية مياه التحلية المنتجة للمركز الكهروحراري (**DDW** ، **الشكل (7)**). أما في حالة عدم استرجاع الطاقة الهيدروليكية للمياه المستنزفة من وحدة التحلية (**NRO= 15 kW.hr/ton**) فيلاحظ من الشكل (**6**) ارتفاع مقدار التوفير في كمية الوقود المستهلكة (**DBST2**) مع زيادة ضغط البخار المجهز لوحدة التحلية. وذلك بسبب ارتفاع معدل استهلاك الطاقة الكهربائية لإنتاج مياه التحلية في وحدة التناضح العكسي . ومن ثم زيادة معدل استهلاك الوقود على إنتاج مياه التحلية في عملية الإنتاج المنفصل بمقدار أكبر من الارتفاع بمعدل استهلاك الوقود في المركز الكهروحراري المزدوج على إنتاج الطاقة الحرارية لوحدة التحلية . وعند ثبوت ضغط البخار المجهز لوحدة التحلية وزيادة كفاءة المحطة التعويضية يلاحظ من الشكل (**6**) هبوط مقدار التوفير في كمية الوقود المستهلكة ", وذلك بسبب انخفاض معدل استهلاك الوقود على إنتاج الطاقة الكهربائية في المحطة التعويضية.

و تأثير ضغط البخار المجهز" لوحدة التحلية **PT** على العدد التصميمي لتأثيرات وحدة التحلية N مبين في الشكل (**7**). حيث يلاحظ من الشكل زيادة ضغط البخار المجهز لوحدة التحلية تؤدي إلى ارتفاع العدد التصميمي لتأثيرات وحدة التحلية. ومن ثم انخفاض معدل استهلاك الطاقة الحرارية النوعي لوحدة التحلية (**QR**) نتيجة لارتفاع مقدار الاسترجاع بالطاقة الحرارية لوحدة التحلية. وبالتالي ارتفاع كمية مياه التحلية المنتجة "(**DDW**).



الشكل (6) علاقة مقدار التوفير في كمية الوقود المستهلكة (DBST) مع ضغط البخار المجهز لوحدة التحلية (PT) عند قيم مختلفة لكفاءة المحطة التعويضية (EST).

الطاقة الحرارية

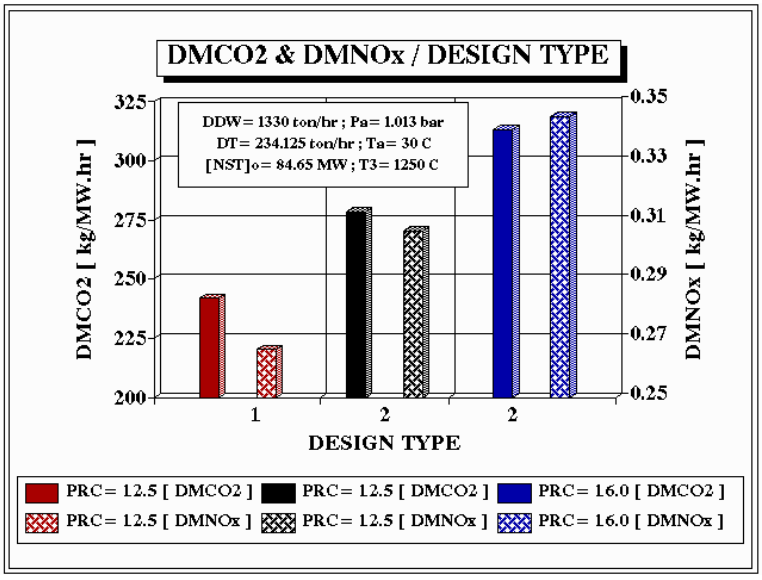


الشكل (7) علاقة كمية الطاقة الكهربائية المنتجة للوحدة التربينية البخارية (NST) ، كمية المجهزة لوحدة التحلية (QT) ، معدل استهلاك الطاقة الحرارية النوعي لوحدة التحلية (QR) مع ضغط البخار المجهز لوحدة التحلية (PT).

وكذلك يبين الشكل(7)" ارتفاع بسيط في كمية الطاقة الحرارية المجهزة لوحدة التحلية **QT** مع ارتفاع ضغط البخار المجهز لوحدة التحلية . وذلك بسبب ارتفاع درجة حرارة المتكثف الراجع من وحدة التحلية وثبوت كمية البخار المجهزة لهذه الوحدة .

وقد تم دراسة الفاعلية البيئية لتصميم المركز الكهروحراري المزدوج المدروس وتأثير تصميم الوحدة التربينية الغازية على هذه الفاعلية . حيث يلاحظ من الشكل (**8**) مقدار الانخفاض في كمية أكاسيد النتروجين (**DMNOx**) وثاني أوكسيد الكربون (**DMCO2**) المطروحة للوسط المحيط نتيجة لاستخدام التصميم المقترح للمركز الكهروحراري المزدوج مقارنة مع عملية الإنتاج المنفصل للطاقة الكهربائية ومياه التحلية . والسبب في ذلك يمكن تفسيره إلى هبوط معدل استهلاك الوقود لإنتاج نوعي الطاقة (الطاقة الكهربائية والحرارية) في التصميم المدروس للمركز الكهروحراري المزدوج وانخفاض كمية غازات الاحتراق المطروحة للوسط المحيط . وكذلك يلاحظ من الشكل (**8**) زيادة مقدار الانخفاض في كمية أكاسيد النتروجين وثاني أوكسيد الكربون المطروحة للوسط المحيط مع ارتفاع نسبة الضغط للهواء في الوحدة التربينية الغازية. وذلك بسبب زيادة كمية الطاقة الكهربائية المنتجة وارتفاع كفاءة المركز الكهروحراري المزدوج على إنتاج هذه الطاقة . ومن ثم زيادة معدل استهلاك الوقود لإنتاج الطاقة الكهربائية في المحطة التعويضية . مما يؤدي إلى ارتفاع كمية غازات الاحتراق المطروحة للوسط المحيط في عملية الإنتاج المنفصل للطاقة الكهربائية ومياه التحلية".

وكذلك يبين الشكل (**8**) الفاعلية البيئية لاستخدام الوحدات التوربين الغازي ذات الاحتراق المتتالي, (التصميم الثاني) في المحطات والمراكز الكهروحرارية المزدوجة .



الشكل (8) علاقة مقدار الانخفاض في كمية أكاسيد النتروجين (DMNOx) وثاني أوكسيد الكربون(DMCO2) المطروحة للوسط المحيط مع تصميم وحدة التوربين الغازي عند قيم مختلفة لنسبة الضغط للهواء (PRC) في هذه الوحدة .

حيث" بلغ أدنى مستوى من الزيادة في مقدار الانخفاض في كمية أكاسيد النتروجين وثاني أوكسيد الكربون المطروحة للوسط المحيط **14.9 %** مقارنة مع استخدام التصميم قيد البحث الأول لوحدة التوربين الغازي . والسبب في ذلك يعود إلى ارتفاع كفاءة المحطة المزدوجة أو المركز الكهروحراري المزدوج . ومن ثم هبوط معدل استهلاك الوقود في المحطة المزدوجة أو المركز الكهروحراري المزدوج على إنتاج الطاقة الكهربائية ".

2.1 النتائج والمناقشة:

ان دراسة اداء التصميم "المقترح للمركز الكهروحراري المزدوج تبين ان :

- يعتمد مقدار الطاقة الكهربائية المنتجة للمركز الكهروحراري بشكل أساسي على الطاقة الكهربائية التصميمية لوحدة التوربين البخاري وكذلك على تصميم هذه الوحدة.
- الفاعلية الحرارية والبيئية لاستخدام الدورة المزدوجة الثنائية الضغط في تطوير المحطات البخارية التكثيفية إلى مراكز كهروحرارية . حيث بلغ مقدار التوفير الأدنى في كمية الوقود المستهلكة **77.9 kg/hr** لكل **MW** من الطاقة الكهربائية المنتجة للمحطة البخارية . وطبقا لذلك فان مقدار الانخفاض في كمية أكاسيد النتروجين

0.26 kg/MW.hr وثاني أوكسيد الكربون **241.8 kg/MW.hr** المطروحة للوسط المحيط. وذلك عندما يكون ضغط البخار المجهز لوحدة التحلية **0.3 bar** وطبقا لذلك العدد التصميمي لتأثيرات وحدة التحلية **8** وكمية مياه التحلية المنتجة **15.7 ton/MW.hr** .

- تزداد الفاعلية الحرارية والبيئية للمركز الكهروحراري مع ارتفاع الخواص الثيرموديناميكية الأساسية للوحدة التربينية الغازية . وان استخدام الوحدات التربينية الغازية ذات درجة الحرارة الابتدائية المرتفعة للغازات يؤدي إلى ارتفاع كفاءة المركز الكهروحراري على إنتاج الطاقة الكهربائية . ومن ثم زيادة مقدار التوفير في كمية الوقود المستهلكة بالرغم من انخفاض مقدار الزيادة في كمية الطاقة الكهربائية المنتجة للمركز الكهروحراري.
- الفاعلية الحرارية والبيئية لاستخدام الوحدات التربينية الغازية ذات الاحتراق المتتابع في تطوير المحطات البخارية إلى مراكز كهروحرارية. حيث بلغ أدنى مستوى من الزيادة بمقدار التوفير في كمية الوقود المستهلكة والمؤشرات البيئية (الفقرة **1.6**) السابقة الذكر أعلاه **14.9 %** .
- ارتفاع ضغط البخار المجهز لوحدة التحلية من **0 .3 bar** إلى **0.38 bar** يؤدي إلى زيادة كمية مياه التحلية المنتجة بنسبة **15.3 %** (كنتيجة لانخفاض معدل استهلاك الطاقة الحرارية النوعي لوحدة التحلية) وكذلك هبوط الطاقة الكهربائية المنتجة لوحدة التوربين البخاري بمعدل **2.9 %** ".

2.2 التوصيات:

يمكن " إجراء دراسة جدوى . حرارية لبيان فعالية المواصفات التصميمية والخواص الثرموديناميكية المثالية للتصميم المقترح التي تعطي أقصى فاعلية اقتصادية ممكنة مع الأخذ بعين الاعتبار مقدار التغير في كلفة وحدة التوربين الغازي والمرجل المخصص لاستغلال الطاقة الحرارية لغازات العادم مع الخواص والمواصفات التصميمية لهذه الوحدة . وذلك لتأثير هذه الخواص والمواصفات على كمية البخار المنتجة في مرحلتي

الضغط من المرجل . ومن ثم المساحات السطحية للتبادل الحراري المطلوبة لإنتاج هذه الكميات من البخار ."

كما يمكن تنفيذ مثل هكذا مشروع لحل ازمة البصرة والمناطق الجنوبية بشكل عام في توفير مياة الشرب وكذلك توليد الطاقة الكهربائية بكلفة معقولة ومواصفات جيدة اذا ما تم تطبيق هذا البحث بشكل عملي وادارة رصينة لتحقيق التوافق بين الجانبين النظري والعملي وبشكل مدروس .

2.3 الرموز المستخدمة مع الجدول والرسوم التوضيحية :

تسلسل	الرمز	معناه
1	D , C	وخزان نزع الهواء .
2	DDW	ياه التحلية المنتجة للمركز الكهروحراري المزدوج
3	DLTpp , DLTap	جات الحرارة الأصغر على الطرف الساخن لمحمصات البخار والطرف البارد للمبخرات جل على الترتيب .
4	PT , DT	ضغط البخار المجهز لوحدة التحلية على الترتيب
5	EST	لمحطة المزدوجة التعويضية لإنتاج الطاقة الكهربائية .
6	CP , FP	مياه التغذية والمتكثف الأساسي على الترتيب
7	FV	لمدد للمياه المستنزفة من اسطوانتي المرجل
8	FWHi	مياه التغذية أو المتكثف الاساسي رقم (i)
9	HRSB	ستغلال الطاقة الحرارية لغازات العادم الخارجة من الوحدة التربينية الغازية
10	HPT , IPT , LPT	ة الضغط المنخفض والمتوسط والمرتفع للتربينة البخارية على الترتيب
11	MED	تحلية التبخيرية المتعددة التأثير
12	NMED , N	تصميمي لتأثيرات وحدة التحلية التبخيرية ومعدل استهلاك الطاقة الكهربائية النوعي
13	NRO	ستهلاك الطاقة الكهربائية النوعي لوحدة التحلية من نوع التناضح العكسي
14	Qcv	لحرارية للوقود النوعي المستخدم في الدراسة
15	RFWH	المياه التعويضية للمركز الكهروحراري المزدوج
16	SB	البخاري
17	P , T	حرارة والضغط على الترتيب
18	Po , To	حرارة والضغط الابتدائي للبخار قبل التوربين البخاري على الترتيب
19	.Pa , Ta	حرارة والضغط للهواء في الوسط المحيط على الترتيب
20	PSB2 , TSB2	حرارة وضغط البخار المنتج في المرحلة الثانية من المرجل على الترتيب
21	[NST]o	لكهربائية المنتجة في حالة التصميم الأساسي للمحطة البخارية

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