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Antimicrobial Resistance Profile of Different Clinical Isolates against Rocephin

(Original Research Article)

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Abstract

Antibiotic resistant microorganisms cause for an increase in illness and death as they increase the threat of unsuitable therapy. Therefore, documents on antibiotic resistance assistance describe the best probable treatment for different patients. Some bacteria can produce betalactamase enzymes such as in Gram negative bacteria. This enzyme can hydrolyze the betalactam ring of the ceftriaxone antibiotic so that the antibiotic cannot work. Hence, this study aimed to screen the antibiotic resistant profile rocephin drugs in Al saleem laboratory. Of 206 various samples were collected from patients during September through November 2020. The clinical samples such as wound swab, urine, sputum, and semen, blood, indwelling devices and fluids were collected from out patients, then; bacterial species were isolated and recognized as per the standard microbiological methods. Antimicrobial susceptibility tests were accomplished using rocephin antimicrobial disc by Kirby–Bauer disc diffusion method. Totally, 604 bacterial isolates were obtained from 280 (46.3%)

female and 324 (53.6%) male patients. *Escherichia coli* spp (39.7%) and *Klebsella* spp (15.9 %) were the predominant organisms isolated from specimens. About 295 (48.8%) of the total bacterial isolates were found to be resistant to ceftriaxone. But, 276 (45.7%) and 33 (5.5%) of the isolates remain susceptible and intermediate to ceftriaxone, respectively.. Bacterial resistance towards ceftriaxone is rising to this drug. Moreover, these strains also showed multidrug resistance mainly against clinically used drug which could reduce therapy ineffective. So, in clinical use correct medications should be carefully chosen based on the data obtained from antibiotic susceptibility tests.

Keywords: Rocephin, *E. coli* spp, *Klebsella* spp, urine, swab, Al saleem laboratory.

Introduction

Antimicrobial resistance is an increasing problem in the 21st century and known as the most serious threats to global public health.⁽¹⁾ The aminothiazol-cephalosporin ceftriaxone sodium (ceftriaxone) is a third-generation cephalosporin. The product name for this drug is Rocephin (CRO) throughout the world. CRO is used for the treatment of many community-acquired infections and can be used as an intravenous or intramuscular injection; it has been used comprehensively because of its improved stability against traditional β -lactamases. Ceftriaxone is a bactericidal agent that acts by inhibition of bacterial cell wall synthesis.^(2,3) Ceftriaxone has activity in the presence of some beta-lactamases, both penicillinases and cephalosporinases of Gram-negative and Gram-positive bacteria.⁽³⁾ Resistance to ceftriaxone is primarily through hydrolysis by beta-lactamase, alteration of penicillin-binding proteins (PBPs), and decreased permeability.⁽⁴⁾ Ceftriaxone has been shown to be active against Gram-negative bacteria and Gram-positive bacteria.^(5,6) The aim of the study designated here was to define the bacteria responsible for community-acquired infections and determine their susceptibilities to rocephin.

Materials and Methods

Collection of Bacterial Strains

Out of the 604 patients included in this study. All gram-negative and gram positive bacteria isolated from clinical specimens during September through November 2020 by Al- saleem laboratory was included in the investigation.

The bacteria were identified in microbiology department according to standard procedures. Only samples yielding a significant number of a recognized pathogen were considered for the study.

Susceptibility Testing

Microbiology department performed disk susceptibility testing as follows. For gram positive bacteria and negative bacteria, Rocephin was tested on Mueller-Hinton agar at 37C°. McFarland Standards is used in the antimicrobial susceptibility testing procedure where the bacterial suspension is compared to Standard Mcfarland, prior to swab on Muller Hinton agar. It is a part of quality control to check and adjust the densities of bacterial suspension that can be used for identification and susceptibility proceeds. However, used concentration for the antimicrobial susceptibility testing and the culture media performance testing is done by 0.5 McFarland standards in the microbiological laboratory.

Bacteria Identification

For the recognition and isolation of pathogenic bacteria, entirely the clinical specimens were collected by standard microbiological technique. Then, depending on the source of specimens, each sample was cultured onto Chocolate agar, MacConkey agar, Blood agar, Mannitol Salt agar, and CLED agar and then incubated aerobically at 37° C for 24 h. Biochemical tests such as Triple sugar iron, urease test motility test, indole and citrate utilization (MIS); were used to recognize the clinical isolates. Thus, clinical strains of *Staphylococcus aureus*, *Escherichia Coli* spp, *Klebsiella* spp, *Proteus* species, *Citrobacter* spp, *Enterobacter* spp and streptococcus spp were isolated from the collected clinical samples.

Methodology: The data analyzed by SPSS programs.

Results

Distribution of Patients According to the Genders

Totally, 604 bacterial isolates were obtained from 280 (46.3%) female and 324 (53.6%) male patients.

Table 1: Distribution of patients according to the genders.

Gender	Number	Percent
Female	280	46.3%
Male	324	53.6%
Total	604	99.9%

Distribution of Clinical Specimens Collected from Patients

Totally, 604 bacterial isolates were obtained from urine cultures (75.3%), superficial swabs (10.8%), semen (7.9%), High vaginal swab (2.6%) indwelling devices (1.3%), Blood culture (1.2%), Fluid (0.7%) and sputum (0.2%) outpatients.

Table 2: Distribution of Clinical Specimens Collected from Patients.

Sample	Frequency	Percent	Valid Percent	Cumulative Percent
Blood	7	1.2	1.2	1.2
Fluids	4	.7	.7	1.8
HVS	16	2.6	2.6	4.5
Semen	48	7.9	7.9	12.4
Sputum	1	.2	.2	12.6
Swab	65	10.8	10.8	23.3
Urine	455	75.3	75.3	98.7
indwelling devices	8	1.3	1.3	100.0
Total	604	100.0	100.0	

Distribution of samples during the months

The most samples that were assembled in the study were the urine samples followed by samples of the swab and semen, where the highest assembly was found in October.

Table 3: Distribution of Samples during the Months

Sample	Date			Total
	9.2020	10.2020	11.2020	
Blood	0	5	2	7
	0.0%	.8%	.3%	1.2%
Fluid	0	2	2	4
	0.0%	.3%	.3%	.7%
HVS	3	7	6	16
	.5%	1.2%	1.0%	2.6%
Semen	8	22	18	48
	1.3%	3.6%	3.0%	7.9%
Sputum	0	1	0	1
	0.0%	.2%	0.0%	.2%
Swab	11	30	24	65
	1.8%	5.0%	4.0%	10.8%
Urine	83	193	179	455
	13.7%	32.0%	29.6%	75.3%
Wound	1	5	2	8
	.2%	.8%	.3%	1.3%
Total	106	265	233	604
	17.5%	43.9	38.6%	100.0%

Distribution of Isolates in Clinical Specimens Collected from Patients

In the present study, *Escherichia coli* spp (39.7%) and *Klebsiella* spp (19.0 %) were the predominant organisms isolated from the study subjects.

The other bacterial isolates include *staph aureus* (11.8%), *streptococcus pneumonia* (11.6%), *Enterobacter* spp (7.0%), *pseudomonas* spp (6.5%), *streptococcus pyogen* (4.8%), *Proteus* spp (2.0%), *Citrobacter* spp (0.5%) and *Acinetobacter* spp and *diphtheria* spp (0.2%) equally as indicated in Table 2.

Table 4: Distributions of Isolates in Clinical Specimens Collected from Patients.

Bacteria	Frequency	%	Valid Percent	Cumulative Percent
<i>Acinetobacter</i> spp	1	.2	.2	.2
<i>Citrobacter</i> spp	3	.5	.5	.7
<i>Diphtheria</i> spp	1	.2	.2	.8
<i>E-coli</i> spp	240	39.7	39.7	40.6
<i>Enterobacter</i> spp	42	7.0	7.0	47.5
<i>Klebsiella</i> spp	96	15.9	15.9	63.4
<i>Proteus</i> spp	12	2.0	2.0	65.4
<i>Pseudomonas</i> spp	39	6.5	6.5	71.9
<i>Staph aureus</i>	71	11.8	11.8	83.6
<i>Streptococcus pneumonia</i>	70	11.6	11.6	95.2
<i>Streptococcus pyogen</i>	29	4.8	4.8	100.0
Total	604	100.0	100.0	

Resistance Ratio among Different Clinical Isolates against Rocephin

Organisms lying within the intermediate zones were not considered as sensitive pathogens, because they did not respond to normal therapy.

Rocephin was highly effective against *E. coli* spp and least sensitive against *streptococcus pneumonia* and *klebseilla* spp. Sensitivity patterns of ciprofloxacin against different pathogens are summarized in Table 5

Table 5: Resistance Ratio among Different Clinical Isolates against Rocephin.

Bacteria	CRO			Total
	I	R	S	
<i>Acinetobacter</i> spp	0	0	1	1
	0.0%	0.0%	.2%	.2%
<i>Citrobacter</i> spp	0	3	0	3
	0.0%	.5%	0.0%	.5%
<i>Diphtheria</i>	0	1	0	1
	0.0%	.2%	0.0%	.2%
<i>E-coli</i> spp	8	112	120	240
	1.3%	18.5%	19.9%	39.7%
<i>Enterobacter</i> spp	0	18	24	42
	0.0%	3.0%	4.0%	7.0%
<i>Klebsiella</i> spp	12	38	46	96
	2.0%	6.3%	7.6%	15.9%
<i>Proteus</i> spp	2	7	3	12
	.3%	1.2%	.5%	2.0%
<i>Pseudomonas</i> spp	3	12	24	39
	.5%	2.0%	4.0%	6.5%
<i>Staph aureus</i>	8	52	11	71
	1.3%	8.6%	1.8%	11.8%
<i>Streptococcus pneumonia</i>	0	39	31	70
	0.0%	6.5%	5.1%	11.6%
<i>treptococcus pyogen</i>	0	13	16	29
	0.0%	2.2%	2.6%	4.8%
Total	33	295	276	604
	5.5%	48.8%	45.7%	100.0%

Not: I- Intermediate; R- Resistance; S-Susceptibility.

Distribution of Pathogenic Bacteria during the Months

E. coli spp and *klebseilla* spp were more isolates from samples and the highest isolation was recorded in November.

Table 6: Distribution of Pathogenic Bacteria during the Months.

Bacteria	Date			Total
	9.20	10.20	11.20	
<i>Acinetobacter spp</i>	0	1	0	1
	0.0%	.2%	0.0%	.2%
<i>Citrobacter spp</i>	0	3	0	3
	0.0%	.5%	0.0%	.5%
<i>diphtheria spp</i>	0	1	0	1
	0.0%	.2%	0.0%	.2%
<i>E-coli spp</i>	37	93	110	240
	6.1%	15.4%	18.2%	39.7%
<i>Enterobacter spp</i>	5	28	9	42
	.8%	4.6%	1.5%	7.0%
<i>Klebsiella spp</i>	23	33	40	96
	3.8%	5.5%	6.6%	15.9%
<i>Proteus spp</i>	2	6	4	12
	.3%	1.0%	.7%	2.0%
<i>pseudomonas spp</i>	1	14	24	39
	.2%	2.3%	4.0%	6.5%
<i>staph aureus</i>	21	34	16	71
	3.5%	5.6%	2.6%	11.8%
<i>streptococcus pneumonia</i>	4	38	28	70
	.7%	6.3%	4.6%	11.6%
<i>streptococcus pyogen</i>	13	14	2	29
	2.2%	2.3%	.3%	4.8%
Total	106	265	233	604
	17.5%	43.9%	38.6%	100.0%

Resistance Profiles of Clinical Isolates to Rocephin

All the isolates were tested for susceptibility against selected third-generation cephalosporins (ceftriaxone).

Out of 604 bacterial isolates, 295 (48.8%) were found to be resistant to ceftriaxone. But, 276 (45.7%) and 33 (5.5%) of the isolates remain susceptible and intermediate to ceftriaxone, respectively.

Table 7: Resistance Profiles of Clinical Isolates to Rocephin

CRO	Frequency	Percent	Valid Percent	Cumulative Percent
Intermediate	33	5.5	5.5	5.5
Resistance	295	48.8	48.8	54.3
Sensitive	276	45.7	45.7	100.0
Total	604	100.0	100.0	

Comparison between Bacterial Growth and Susceptibility Patterns

Total of 604 isolates, 295 (48.8%) gave resistance to rocephin, while 276 (45.6%) recorded a high sensitive and 33 (5.4%) were intermediated.

Table. 8: Comparison between Bacterial Growth and Susceptibility Patterns.

CRO	Bacterial number	%
I	33	5.464
R	295	48.841
S	276	45.695
Total	604	100.000

Susceptibility Patterns during the Three Months

Various species of gram positive and gram negative bacteria have showed a high sensitivity to rocephin in October followed by November.

Table 9: Susceptibility Patterns during the Three Months.

CRO	Date			Total
	9.20	10.20	11.20	
I	6	17	10	33
	1.0%	2.8%	1.7%	5.5%
	64	120	111	295

	R	10.6%	19.9%	18.4%	48.8%
		36	128	112	276
	S	6.0%	21.2%	18.5%	45.7%
		106	265	233	604
Total		17.5%	43.9%	38.6%	100.0%

Discussion

The standards for understanding of the results considered the fact that, consistent with the CLSI (2015).⁽¹⁰⁾ The “intermediate” category, term used in this study, is designed to the connection between antibiotic and bacterial samples, for which the response degrees in blood and tissue levels may be lower than those obtainable by susceptible samples.⁽¹⁰⁾

The prevalent use of broad spectrum antibiotics has led to the occurrence of antibiotic resistant strains of bacterial group; including *E. coli* spp.⁽⁹⁾ High degrees of resistance have been mostly detected in bacteria that source common health problems. In the present study large number of the isolated bacteria strains were resistant to ceftriaxone drugs which are in agreement with 2014 WHO reports.⁽¹⁾ Totally, 604 bacterial isolates were obtained from 280 (46.3%) female and 324 (53.6%) male patients.

The majority of these isolates were *Escherichia coli* spp which is a gram-negative bacterium. Similarly, other research finding reported that *Escherichia coli* spp exhibited the highest isolates from clinical specimens.⁽⁸⁾ For *E. coli* spp, 50% of isolates were resistant to ceftriaxone. This could be owing to the high degree of adaptive alteration. Resistant organisms transmission their resistant genes either to their progeny by replication or by conjugation where the plasmids carrying the resistant gene are exchanged between the adjacent organisms.^(19,20)

This uropathogen is the major extended spectrum beta-lactamase (ESBL) producer, severely limiting the therapeutic management in cases of urinary tract infections.⁽¹¹⁾ Hence, isolates of these strains have relatively high abilities of developed resistance developing resistance.⁽¹²⁾ Additionally, most of *Escherichia coli* spp isolated from the entire specimen were found to be resistant to the action of Roepin in the current study. One of the reasons of the resistance mechanism to beta-lactam antibiotics such as Rocephin is because this bacteria produce betalactamase enzymes such as in Gram negative bacteria *E. coli* spp which synthesize the enzyme beta-lactamase AmpC. This enzyme can hydrolyze the betalactam ring of the ceftriaxone antibiotic so that the antibiotic cannot work.⁽¹⁶⁾ It was also discovered that the percentage of resistance to Rocephin amplified meaningfully for *Escherichia coli* spp infections since 2004.⁽¹³⁾ Also, other research discovery reported that *Escherichia coli* spp showed the maximum resistance to Roepin.^(14,15) *Klebseilla* spp were more resistant to Rocephin

in this study. Similarly, other research finding reported that *Klebseilla* spp exhibited the highest resistance to Rocephin.⁽⁸⁾ The majority of *streptococcus pneumoniae* were more resistant to Rocephin in this study. However, it is in line with other study showed in different areas which reported the resistant of the strains towards the rocephin. *Staphylococcus aureus* strains were found to be more resistance to ceftriaxone and rocephin which is inconsistent with previous study in which most of the strains were susceptible.⁽⁸⁾ similarly, in vitro antimicrobial study in in Karachi,” Pakistan revealed that most of the isolated *staph aureus* were resistant to it.⁽¹⁷⁾ *Proteus* spp tested isolates were resistant to rocephin. Similarly, in vitro antimicrobial study in Senegal revealed that most of the isolated Enterobacteriaceae strains were resistant to rocephin.⁽¹⁸⁾

Recommendations

Our results recommend ceftriaxone as the drug of optimal for the treatment of patients. Antimicrobial stewardship programs are highly needed to screen and control antimicrobial intake, which in turn could assistance in stoppage the increasing disaster of antimicrobial resistance.

Conclusion

Rocephin is becoming a first-line another procedure for the treatment of gram negative and gram positive Bactria.

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Conflicts of Interests

Authors declare that they have no conflicts of interest.

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**Effect of Phenological Stages on Yield, Chemical
Composition and Biological Properties of Essential Oil
Obtained from *Thymus maroccanus* Ball
(Original Research Article)**

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Abstract

The effects of phenological stages on the composition, antioxidant, insecticidal and allelopathic properties of essential oils (EOs) obtained from the aerial parts of *Thymus maroccanus* Ball were studied. The GC-MS analysis identified that analyzed EOs were dominated by carvacrol (63.70 - 68.19 %) followed by p-cymene (6.09 - 9.67 %) and γ -terpinene (3.67 - 8.49 %). When carvacrol and p-cymene increased progressively from the lowest values (63.70% and 6.09%) at the pre-flowering stage to reach the highest ones (68.19% and 9.67%) at post-flowering stage, γ -terpinene decreased gradually from the highest proportion (8.49%) to reach its lowest one (3.67%). EO from post-flowering aerial parts showed higher scavenging ability on DPPH radicals (% inhibition: 25.19 - 95.75 %; IC₅₀ = 0.26 mg/mL), contrast, essential oil from pre-flowering stage exhibited the highest Fe³⁺ reducing power ability (Absorbance: 0.329 - 0.812; IC₅₀ = 0.14 mg/mL). Insecticidal properties showed no substantial difference between *T. maroccanus* EO extracted at different growth stages. The LD₅₀ and LD₉₀ values were ranged from 0.15 to 0.17 μ L/cm², and from 0.37 to 0.47 μ L/cm², respectively in contact assays, as well as from 318.93 to 362.84 μ L/L air, and from 725.08 to 739.12 μ L/L air, respectively in fumigant assays. The results indicated that allelopathic activity of EOs not greatly affected by growth developmental stages.

Keywords: *Thymus maroccanus*; Morocco; Essential oils; Antioxidant; Allelopathic; Insecticidal.

1. Introduction

Thymus species are of great economic and industrial importance, worldwide investigated for their use in folk medicine, culinary, cosmetics and flavoring (Senatore, 1996). The genus *Thymus* comprising around 350 species of perennial, aromatic herbs and shrubs is predominantly found in the Mediterranean region, Asia, Southern Europe and North Africa (Maksimovic et al., 2008). In Morocco, this genus is represented by 21 species, 13 of which are endemic (Fennane et al., 2007). Of these endemic thyme

species, *Thymus maroccanus* Ball locally known as *Za'tar* and/or *Za'itrais* a perennial shrub that is widespread in the arid and semi-arid parts of the Moroccan mountains, at altitudes ranging from 100 to 2750 m (Tahiri, 1996).

Leaves and flowering parts of this species have been used as powders, decoctions, or infusions to treat digestive disorders such as diarrhea, fever, coughs, wounds, and numerous infections (Bellakhdar, 2006). In addition, this species is widely used as culinary flavoring agents and its flavor and aroma are familiarized and widely accepted by consumers. *T. maroccanus* is one of the most important Moroccan thyme commercialized as a source of essential oils. Many phytochemical studies so far investigated the chemical composition of *T. maroccanus* essential oils (Jaafari et al., 2007; Alaoui Jamali et al., 2012; Fadli et al., 2012).

As known, the biosynthesis of the volatile compounds is influenced by various environmental factors namely the soil mineral fertilization (Piccaglia and Marotti, 1993; Alaouijamali et al., 2014), the light intensity (Li et al., 1996), the climate conditions (Russo et al., 2013), the culture site (Ben Farhat et al., 2009), the developmental stages (Jordan et al., 2013) and the genetic baggage (Skoula et al., 1999; Li et al., 2015). Plants produce a high diversity of volatile terpenes playing different ecological functions in relation with their interactions with the environment. Terpenoids may serve to attract and guide pollinators but can also act as indirect plant defences against herbivores, or may function as direct repellents or toxicants for herbivores and pathogens, and some have the potential to eliminate reactive oxygen species (Dudareva et al., 2004). Volatiles terpenes may also provide a competitive advantage to several angiosperm species as allelopathic agents (Croteau et al., 2000). The main goal of this work is to assess the essential oil chemical composition and the antioxidant, insecticidal and allelopathic activities of *T. maroccanus* obtained at different plant phenological growth stages (pre-flowering, full-flowering, post-flowering). This investigation will permit the determination of optimal harvesting time with the desired aromatic and/or biological qualities, which may help increasing economic feasibility of the essential oil production and the obtention of new scientific data on the changes of *T. maroccanus* volatile secondary metabolites in the course of its phenological cycle.

2. Materials and Methods

2.1 Plant Material and Extraction of Essential Oils

T. maroccanus was collected at three different developmental stages, pre-flowering, full-flowering and post-flowering (Table 1). The identification of the species was done by Prof. Abdelaziz Abbad from Cadi Ayyad University. The collected aerial parts were air-dried at room temperature (≈ 25 °C) in the shade and subjected to hydro-distillation,

using a Clevenger-type apparatus for 3 h until total recovery of oil. The preparation of the EOs was performed three times (3 x 200 g) and oils were dried over anhydrous sodium sulfate, weighed and stored at 4 °C until use.

2.2 Gas Chromatography/Mass Spectrometry (GC/MS) Analysis of Essential Oils

Gas Chromatography (GC/FID) analysis was performed using Hewlett Packard Gas Chromatographer (HP 6890) with electronic pressure control, equipped with HP-5MS capillary column (30 m x 0.25 mm, film thickness 0.25µm),

FID detector set at 250°C and fed with H₂/Air mixture, and a *split-splitless* injector set at 250°C. The injection mode was split (1:50) and the injected volume was 1µl. Nitrogen was used as carrier gas with a flow rate of 1.7 ml/min. The column temperature was programmed from 50 to 200°C at heating rate of 4°C/min. The apparatus was controlled by “ChemStation” software computer system.

Gas chromatography/mass spectrometry (GC/MS) analysis was performed using Hewlett-Packard Gas Chromatographer (HP 6890) coupled with a mass spectrometer (HP 5973). Fragmentation was performed by electron impact at (70eV).

The column used was HP-5MS (30 m x 0.25 mm, film thickness 0.25µm). The injection mode was split (1:50). The column temperature was programmed from 50 to 200°C at heating rate of 4°C/min.

The components of the essential oils were identified based on their retention indices and their mass spectra by matching with reference spectra database (NIST 98 library).

2.3 Antioxidant Activity

2.3.1 DPPH Free Radical-Scavenging Activity

The antioxidant activity of *T. maroccanus* oils was measured in terms of hydrogen-donating or radical-scavenging ability, using the stable radical 2,2-diphenyl-1-picrylhydrazyl (DPPH) as a reagent (Sahin et al., 2004). Samples (EOs and control substance) were series diluted with methanol into 0.08 mg/ml to 1.22 mg/ml. Fifty microliters of various concentrations of the samples were added to 2 mL of a 60 µM methanolic solution of DPPH.

Absorbance measurements were read at 517 nm, after 20 min of incubation in the dark at room temperature. Absorption of a blank sample containing the same amount of methanol and DPPH solution acted as the negative control. Butylated hydroxytoluene

(BHT) was used as positive controls. The percentage inhibition of the DPPH radical was calculated according to the formula:

$$\% \text{ Inhibition} = (Ab - Aa / Ab) \times 100$$

Where Ab is the absorption of the blank sample and Aa is the absorption of the tested oils. The sample concentration providing 50% inhibition (IC₅₀) was calculated by plotting inhibition percentages against concentrations of the sample. The test was carried out in triplicate and IC₅₀ values were reported as means ± SD.

2.3.2 Reducing Power Determination

Reductive ability was investigated by the Fe⁺³ to Fe⁺² transformations in the presence of the oils, using the method of Oyaizu (1986). Samples (EOs and control substance) were series diluted with methanol into 0.07 mg/ml to 1.07 mg/ml for EOs and from 10 µg/ml to 200 µg/ml for control substances.

The different sample concentrations were mixed with phosphate buffer (2.5 mL, 0.2 M, pH 6.6) and potassium ferricyanide [K₃Fe (CN)₆](2.5 mL, 1%).

The mixture was then incubated at 50 °C for 20 min. A portion (2.5 mL) of trichloroacetic acid (10%) was added to the mixture, which was then centrifuged for 10 min at 3000 rpm. Finally, the upper layer of solution (2.5 mL) was mixed with distilled water (2.5 mL) and FeCl₃ (0.5 mL, 0.1%).

The absorbance was measured at 700 nm in a spectrophotometer. The oil concentration providing 0.5 of absorbance (IC₅₀) was calculated by plotting absorbance at 700 nm against the corresponding oil concentration. BHT was used as reference compounds. The test was carried out in triplicate and IC₅₀ values were reported as means ± SD.

2.4 Insecticidal Activity

2.4.1 Insect Cultures

Colonies of the red flour beetle, *Tribolium castaneum* Herbst. (Coleoptera: Tenebrionidae), were maintained in the laboratory without exposure to any insecticide. They were reared in glass containers (16 cm diameter × 22 cm height) covered by a fine mesh cloth for ventilation. Each container contained a mixture of wheat flour, wheat germ, and yeast extract (13:6:1 w/w/w). The cultures were maintained in a growth chamber at 26 ± 1 °C, with a relative humidity (RH) of 70-85% and 16:8 h light: dark photoperiod.

Only young adults (7-14 days old) were used for the tests. All experimental procedures were conducted under environmental conditions identical to those of the cultures. In all bioassays, insects were considered dead when no leg or antennal movements were observed. The bioassays were designed to assess median lethal doses (LD₅₀ and LD₉₀ values) (doses that killed 50% and 90% of the exposed insects, respectively).

2.4.2 Contact Toxicity Bioassay

The contact insecticidal activity of EOs obtained from *T. maroccanus* against *T. castaneum* adults was determined by assessing the toxicity using filter paper discs (Whatman No. 1, 9 cm diameter). Oils were dissolved in acetone at concentrations of 0.08, 0.16, 0.24 and 0.31 $\mu\text{L}/\text{cm}^2$. Several preliminary tests were conducted to select the doses to be used for each EO.

One mL of each solution was dispensed on the surface of the filter paper that was then placed in a glass Petri dish. Control filter papers were treated with acetone only. After 10 min, once the solvent had been evaporated, 10 unsexed adults were deposited into each dish. Each EO and control treatment was replicated three times, repeating each assay twice. Mortality was recorded after 24 hours.

2.4.3 Fumigant Toxicity Bioassay

To assess fumigant toxicity of *T. maroccanus* EOs, 2 cm diameter filter papers (Whatman N^o. 1) were impregnated with the different oil doses 10, 20, 30 and 40 μL . The impregnated filter papers were then attached to the screw caps of 60 mL Plexiglas bottles to give calculated fumigant concentrations of respectively 166.6, 333.3, 500 and 666.6 $\mu\text{L L}^{-1}$ air. Caps were screwed tightly on the vials, each of which contained 10 unsexed adults. Each EO and control treatment was replicated three times, repeating each assay twice. Mortality was recorded after 24 h.

2.5 Allelopathic Activity

The inhibitory potential of the *T. maroccanus* oils on the seed germination of *Medicago sativa* L. was investigated. The essential oil was emulsified with Tween 80, at the ratio 1:1 (v/v) and dissolved in distilled water to obtain a concentration of 500, 250, 125 and 62.5 mg/L, while a solution of Tween 80 in water was used as a control. Subsequently, aliquot of 5 mL of each concentration was added to glass Petri dish (9 cm) with two layers of filter papers (Whatman N^o. 1). Three replicates were prepared for each concentration of the oils, each comprising 20 seeds. The seeds were sterilized for 20 min in 1% NaClO before use. Petri dishes were sealed with a Parafilm® tape and kept at 27 °C in a dark growth chamber (Dudai et al., 1999). Germinated seeds (2 mm radicle length) were counted and removed daily. The percentage of germination was calculated after seven days of treatment.

2.6 Data Analysis

All results were expressed as the mean \pm standard deviation of three independent experiments. The statistical analysis of essential oils yields was performed using IBM SPSS Statistics version 19. The statistically significant differences were determined by one-way ANOVA, followed by B de Tukey test at the 5% level of significance. Probit analysis (Finney, 1971) was conducted on the corrected mortality data (Abbott, 1925) to estimate lethal doses (LD₅₀ and LD₉₀) with their 95% confidence intervals by IBM SPSS Statistics version 19.

3. Results and Discussion

3.1 Effect of Phenological Growth Stages on *T. maroccanus* Essential Oil

Yield

The variation of the essential oils yields of *T. maroccanus* at different phenological growth stages as calculated on the basis of dry matter weight are shown in Fig.1. The oil content increased significantly ($p < 0.05$) from pre-flowering stage (2.10 %) to full-flowering stage (2.73 %) and then decreased significantly ($p < 0.05$) in the course of post-flowering stage (1.47 %). These results are in agreement with what has been reported for the same species (Alaoui Jamali et al., 2013) and other *Thymus* species (Nejad Ebrahimi et al., 2008; Nouri and Esmaeilian, 2012). The high essential oil yield observed at full-flowering stage may be explained by the fact that plants may produce substantial amounts of essential oils in order to attract more pollinators (Pala-Paul et al., 2001), however, the low rate of biosynthesis of volatile compounds during the pre-flowering phase may be due to partial inactivation of enzymes necessary to the biosynthesis of certain compounds (Hamrouni Sellami et al., 2009). These finding clearly demonstrated that the harvesting time should be carefully selected to ensure maximum yield of essential oil. So, for *T. maroccanus*, the full-flowering stage could be favoured.

3.2 Effect of Phenological Growth Stages on *T. maroccanus* Essential Oil Composition

The chemical composition of *T. maroccanus* essential oils at different phenological stages is listed in Table 2. Thirteen components were identified in the analyzed oil samples, amounting to 97.50 %, 96.87 % and 95.71 % of the total oil, detected at the pre-flowering, full-flowering and post-flowering stages, respectively. Regardless of growth stage, *T. maroccanus* essential oils were dominated by oxygenated monoterpene group (64.76 - 69.35 %) followed by monoterpene hydrocarbons (18.78 - 25.78 %). Analyzed essential oils were dominated by carvacrol (63.70 - 68.19 %) followed by p-cymene (6.09 - 9.67 %) and γ -terpinene (3.67 - 8.49 %). The high

carvacrol content observed in *T. maroccanus* oils is in agreement with what has been previously reported for this species collected from other Moroccan regions (Saad et al., 2010; Alaoui Jamali et al., 2012; Fadli et al., 2012). Also, oil extracted from *T. maroccanus* collected in Asni region at Marrakech showed in addition of the major compound, carvacrol, p-cymene and γ -terpinene, considerable amounts of thymol and borneol which were not found in our samples (Jaafari et al., 2007).

Regarding the evolution of the major compounds of *T. maroccanus* oils through the entire vegetative cycle (Table 2), it can be stated that carvacrol and its corresponding precursors (γ -terpinene and p-cymene) quantities have shown a contrasting evolution. In fact, when carvacrol and p-cymene increased progressively from the lowest values (63.70 % and 6.09 %) at the pre-flowering stage to reach the highest ones (68.19 % and 9.67 %) at post-flowering phase, γ -terpinene decreased gradually from the highest proportion (8.49 %) to reach its lowest one (3.67 %). The inverse correlations observed between the production of carvacrol, p-cymene and γ -terpinene have previously been reported (Hudaib et al., 2002; Jordan et al., 2006) and has been considered to be directly and/or indirectly linked to the biosynthetic pathway of these monoterpenes (Saez, 1995).

3.3 Effect of Phenological Growth Stages on the Antioxidant Activity of T. maroccanus Essential Oil

The antioxidant activity of *T. maroccanus* essential oils extracted at pre-flowering, full-flowering and post-flowering stages was assessed by two complementary in vitro antioxidant assays: the DPPH assay and the reducing power capacity. The inhibition percentage, the absorbance at 700 nm and the concentrations that led to 50% inhibition (IC₅₀) are given in Tables 3 and 4. Lower IC₅₀ values indicated higher antioxidant activity. The results showed that all essential oils tested expressed interesting antioxidant potency. This activity increased steadily with increasing essential oils concentration.

For DPPH assay (Table 3), essential oil from post-flowering aerial parts showed higher scavenging ability on DPPH radicals (% inhibition: 25.19 - 95.75 %; IC₅₀ = 0.26 mg/mL) when compared to those reported for essential oils of pre-flowering and full-flowering. In contrast, essential oil from pre-flowering stage exhibited the highest Fe³⁺ reducing power ability (Absorbance: 0.329 - 0.812; IC₅₀ = 0.14 mg/mL) (Table 4). Nevertheless, the tested oils were less potent than the synthetic antioxidant BHT used as positive control (% inhibition: 96.04 - 97.96 %; IC₅₀ = 0.004 mg/mL and Absorbance: 1.003 - 1.087; IC₅₀ = 0.008 mg/mL, for DPPH and reducing power tests, respectively). The antioxidant action observed for *T. maroccanus* oil distilled at full-flowering stage was comparable to what has been reported for the same species collected from Ait- Ourir region (Alaoui Jamali et al., 2012; El Bouzidi et al., 2013).

Based on the above results, it seems that harvest time have a significant effect on the antioxidant activity of *T. maroccanus* essential oils. The chemical composition of our plant (Table 2) oils showed that the antioxidant activity is apparently related to the content of carvacrol (63.70 - 68.19 %), which is well known for its high antioxidant action (Ruberto and Baratta, 2000; Kulisic et al., 2004; Safaei-Ghomi et al., 2009). Besides, the fact that oil distilled at pre-flowering stage, which had lower level of carvacrol, exhibited the strongest Fe³⁺ reducing power ability, suggest that this oxygenated monoterpene is not the only compound responsible for the observed activity. In fact, the higher reducing power potency of the oil at this stage can be attributed to the presence of γ -terpinene in higher content than for oils extracted at other stages. This compound is characterized by strong antioxidant activity as was previously reported by many authors (Ruberto and Baratta, 2000; Tepe et al., 2005).

3.4 Effect of Phenological Growth Stages on the Insecticidal Activity of T. maroccanus Essential Oil

The toxicities of essential oils isolated from the aerial parts of *T. maroccanus* at pre-flowering, full-flowering and post-flowering stages, were tested on adults of the important stored product insect pest *T. castaneum*, using contact and fumigant bioassays. The percentage of mortality (%) and lethal doses (LD₅₀ and LD₉₀ values) obtained in both assays are given in Tables 5, 6 and 7, respectively. All essentials oils tested were toxic against adults of *T. castaneum*. The mortality increased with increasing of the essential oil doses applied. The mortality percentage values were ranged from 16.67 to 96.67 % and from 10.00 to 96.67 %, for contact and fumigant toxicity assays, respectively (Table 5). On the basis of the LD₅₀ and LD₉₀ values (Tables 6 and 7), no substantial difference was registered between *T. maroccanus* essential oils extracted at different growth stages, since no overlap between the 95% confidence limits was observed. The LD₅₀ and LD₉₀ values were ranged from 0.15 to 0.17 $\mu\text{L}/\text{cm}^2$ and from 0.37 to 0.47 $\mu\text{L}/\text{cm}^2$, respectively, in contact assays as well as from 318.93 to 362.84 $\mu\text{L}/\text{L}$ air and from 725.08 to 739.12 $\mu\text{L}/\text{L}$ air, respectively, in fumigant assays. The values obtained for contact toxicity assay were comparable with those reported for the same species collected at flowering stage from Ait-ourir region against adults of *T. castaneum* (Alaoui Jamali et al., 2016). As far as our literature survey could ascertain, this is the first study to provide data regarding the effect of phenological growth stages on the insecticidal potency of *T. maroccanus* essential oil. The above results showed that the tested essential oils presented interesting toxicity effects against adults of *T. castaneum*. The insecticidal potency of *T. maroccanus* essential oils studied is apparently related to the high content of carvacrol and the presence of p-cymene and γ -terpinene. In fact, it was previously shown that the phenolic monoterpene carvacrol, present a significant toxicity against a panel of agricultural and stored-product insects (Shaaya et al., 1990; Regnault-Roger &

Hamraoui, 1995; Gonzalez et al., 2002). Also, previous reports have showed that p-cymene and γ -terpinene were toxic against several stored-product insects (Kordali et al., 2008; Kim et al., 2010). In general, the insecticidal activity of essential oils could not be attributed only to their major compounds; other minor compounds may give rise to the insecticidal effect. Since the essential oils are very complex mixtures, the synergistic and antagonistic effect of one compound in minor and/or major percentages in the mixture should also be taken into account (Isman et al., 2001; Kordali et al., 2008).

3.5 Effect of Phenological Growth Stages on the Allelopathic Activity of T. maroccanus Essential

The allelopathic potential of the *T. maroccanus* essential oil obtained at different phenological stages on the germination of *M. sativa* seven days after treatment is illustrated in Figures 2 and 3. The results showed that *T. maroccanus* essential oils exhibit interesting allelopathic effect against *M. sativa* seeds. This effect was concentration-dependent and increased with increasing amount of the essential oils. Fig. 2 shows the cumulative germination of the treatments at 1-day intervals compared with the control. The essential oils tested registered less germination percentage than control at all concentrations (0.5 mg/mL to 0.06 mg/mL). At the highest concentration (0.5 mg/mL), the germination of *M. sativa* was completely inhibited. At the seventh day of germination, the highest germination percentage was recorded in control. Treatments with *T. maroccanus* essential oils obtained at different phenological growth stages induced germination percentages varied between 3.33 % and 86.67 %. Data presented in Fig. 3 showed clearly that the allelopathic activity of *T. maroccanus* essential oils was not greatly affected by growth developmental stages. Although, essential oil extracted at pre-flowering stage showed to a lesser degree the lowest germination percentage (0 - 85 %) compared to the remaining essential oils (0 - 86.67 %).

These findings demonstrated that *T. maroccanus* essential oils were efficient to inhibit seed germination of *M. sativa* seeds. To our knowledge, this is the first report concerning the allelopathic activity of *T. maroccanus* essential oil. The allelopathic activity of the essential oils of several *Thymus* species has been reported previously (Angelini et al., 2003; Arminanteet al., 2006), and this activity has been attributed mainly to their content of monoterpenes especially oxygenated one (Abraham et al., 2000; Kordali et al., 2007). The high content of carvacrol, an oxygenated monoterpene, in *T. maroccanus* oils therefore likely explains their important allelopathic activity. In fact, it has been previously shown that this compound possesses an inhibition effect on germination of several species (Vokou et al., 2003; Azirak and karaman, 2008; Kordali et al., 2008). In general, the induction of oxidative stress, the inhibition of water uptake, the restriction on reserve mobilization by the alteration in the activities

of gibberellic acid and α -amylase are main reported reasons of essential oils and their allelochemical constituents in the prevention of seed germination (Golisz et al., 2008; Das et al., 2012; Poonpaiboonpipat et al., 2013).

4. Conclusion

This work presents the variation of the yield, chemical composition, antioxidant, insecticidal and allelopathic effects of *T. maroccanus* essential oil in the course of its growth cycle. The results revealed that the highest yield in the essential oil was recorded for the aerial part collected at full-flowering stage. Thus, the full-flowering stage could be considered as the favorable stage for important essential oil production.

Also, slight quantitative variation was noted in essential oils chemical composition, especially for the major compounds carvacrol, p-cymene and γ -terpinene. Among the tested oils, the highest antioxidant activity was observed for oil obtained at pre-flowering and full-flowering stages.

This result suggested that *T. maroccanus* oil can be used as natural preservative ingredients in the food industry and as a natural additive in cosmetic and pharmaceutical industries. In addition, *T. maroccanus* oils at all growth stages, showed interesting insecticidal and allelopathic effects. Therefore, this endemic plant is potentially an inexpensive source of natural insecticidal and herbicide substances for insect and weed crops control. This may be also present a promising alternative to the harmful synthetics of the chemical products.

5. References

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Tables and Figures

Table 1. Collection site and geographical coordinates of the studied *T. maroccanus* Ball.

Samples	Collection site	Latitude/Longitude	Altitude (m)	Harvesting time
Pre-Flowering				February (2015)
Full-Flowering	Ourika	31°15'N/07°42'W	1345	Mai (2015)
Post-flowering				July (2015)

Table 2. Chemical composition of essential oils obtained from aerial parts of *T. maroccanus* at pre-flowering, full-flowering and post-flowering stages.

Compounds ^a	RI ^b	Pre-flowering	Full-flowering	Post-flowering
β -Thujene	938	1.26	1.34	0.74
α -Pinene	950	5.53	3.28	2.00
α -Myrcene	986	1.86	1.62	0.97
α -Terpinene	1019	1.40	1.27	1.14
p-Cymene	1023	6.09	6.39	9.67
Limonene	1031	1.15	0.89	0.59

γ-Terpinene	1062	8.49	7.74	3.67
Linalool	1072	1.06	0.64	1.16
Carvacrol	1299	63.70	66.82	68.19
Caryophyllene	1419	1.78	2.05	2.35
Aromadendrene	1440	1.77	1.34	1.64
α-Bisabolene	1533	3.13	3.19	3.06
(-)-Spathulenol	1576	0.28	0.30	0.53
Monoterpenehydrocarbons		25.78	22.53	18.78
Oxygenatedmonoterpenes		64.76	67.46	69.35
Sesquiterpenehydrocarbons		6.68	6.58	7.05
Oxygenatedsesquiterpenes		0.28	0.30	0.53
Total (%)		97.50	96.87	95.71

^a Compounds listed in order of elution; ^b Retention indices

Table 3. DPPH scavenging activity (%) and IC₅₀ values of *Thymus maroccanus* essential oils and BHT.

Concentrations (mg/mL)	Essential oils			Standard antioxidant
	Pre-flowering	Full-flowering	Post-flowering	BHT
0.08	22.31 ± 0.76 ^a	20.81 ± 1.85	25.19 ± 0.33	96.04 ± 0.26
0.15	30.61 ± 1.91	29.61 ± 2.53	33.32 ± 0.38	96.83 ± 0.19
0.30	43.95 ± 0.66	41.66 ± 1.70	48.29 ± 2.23	97.37 ± 0.25
0.61	58.13 ± 2.27	60.30 ± 1.88	69.18 ± 0.91	97.62 ± 0.13
1.22	70.77 ± 1.44	75.52 ± 0.83	95.75 ± 0.13	97.96 ± 0.19
IC₅₀ (mg/mL)	0.40 ± 0.03	0.38 ± 0.01	0.26 ± 0.01	0.004 ± 0.080

^a) Percentage inhibition (%); Values are given as mean ±SD (n = 3).

Table 4. Absorbance and IC₅₀ values of *Thymus maroccanus* essential oils and BHT.

Concentrations (mg/mL)	Essential oils			Standard antioxidant
	Pre-flowering	Full-flowering	Post-flowering	BHT
0.07	0.329 ± 0.014 ^a	0.295 ± 0.003	0.244 ± 0.003	1.003 ± 0.002
0.13	0.479 ± 0.008	0.453 ± 0.003	0.406 ± 0.005	1.014 ± 0.005
0.27	0.693 ± 0.012	0.631 ± 0.011	0.701 ± 0.010	1.047 ± 0.002
0.53	0.746 ± 0.014	0.696 ± 0.011	0.932 ± 0.006	1.063 ± 0.002
1.07	0.812 ± 0.012	0.748 ± 0.012	0.964 ± 0.005	1.087 ± 0.003

IC₅₀ (mg/mL)	0.14 ± 0.00	0.18 ± 0.00	0.16 ± 0.00	0.008 ± 0.100
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^{a)} Absorbance at 700 nm; Values are given as mean ± SD (n = 3).

Table 5. The percentage of mortality (%) of *T. maroccanus* essential oils against the adults of *T. castaneum* in contact and fumigant toxicity bioassays.

Bioassays		Mean mortality (%)		
Contact toxicity	Concentrations	Pre-flowering	Full-flowering	Post-flowering
	(μL/cm²)			
	0	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
	0.08	16.67 ± 3.17	23.33 ± 2.77	20.00 ± 0.00
	0.16	46.67 ± 5.77	50.00 ± 2.44	36.67 ± 3.28
	0.24	56.67 ± 2.88	70.00 ± 1.32	63.33 ± 4.76
	0.31	96.67 ± 3.47	83.33 ± 4.28	83.33 ± 1.42
Fumigant toxicity	Concentrations			
	(μL/Lair)			
	0	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
	166.67	20.00 ± 0.00	13.33 ± 1.45	10.00 ± 4.00
	333.33	43.33 ± 2.56	36.67 ± 2.48	30.00 ± 0.00
	500.00	76.67 ± 4.80	70.00 ± 0.00	73.33 ± 3.12
	666.67	90.00 ± 1.00	93.33 ± 1.43	96.67 ± 2.62

Table 6. Contact toxicity against *Tribolium castaneum* (LD₅₀ and LD₉₀ values) of the essential oils isolated from the aerial parts of *T. maroccanus* collected at pre-flowering, full-flowering and post-flowering stages.

Essential oils	LD ₅₀ ^a (95% CL) ^b	LD ₉₀ (95% CL)	Slope ± SE	Chi square	df
				(χ ²)	
Pre-flowering	0.16 (0.11-0.22)	0.37 (0.26-1.19)	3.57±1.08	2.37	2
Full-flowering	0.15 (0.08-0.22)	0.43 (0.27-3.89)	2.77±0.98	0.06	2
Post-flowering	0.17 (0.11-0.26)	0.47 (0.29-3.81)	2.93±1.01	0.63	2

LD: lethal dose. ^c Concentration: μL/cm². ^b Confidence limits.

Table 7. Fumigation toxicity against *Tribolium castaneum* (LD₅₀ and LD₉₀ values) of the essential oils isolated from the aerial parts of *T. maroccanus* collected at pre-flowering, full-flowering and post-flowering stages.

Essential oils	LD ₅₀ ^a (95% CL) ^b	LD ₉₀ (95% CL)	Slope ± SE	Chi square	df
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				(χ^2)	
Pre-flowering	318.93 (205.86-433.00)	739.12 (517.65-2247.85)	3.51±1.05	0.55	2
Full-flowering	353.12 (252.64-465.91)	725.08 (530.24-1731.69)	4.10±1.15	0.96	2
Post-flowering	362.84 (272.55-461.85)	683.03 (520.81-1354.80)	4.88±1.28	1.71	2

LD: lethal dose. ^c Concentration: μ L/Lair. ^b Confidence limits.

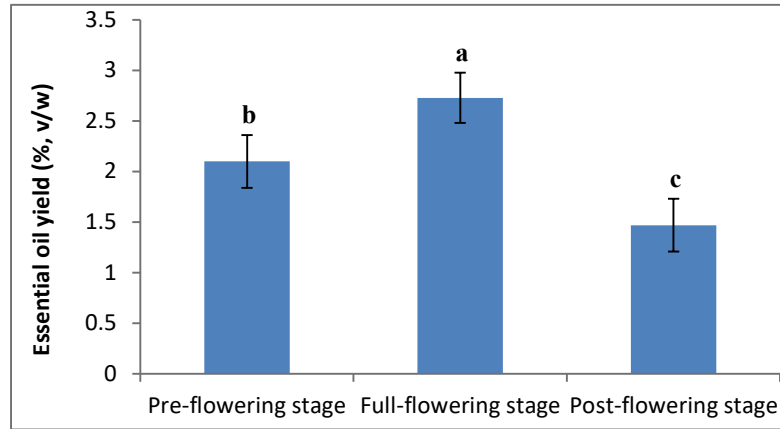
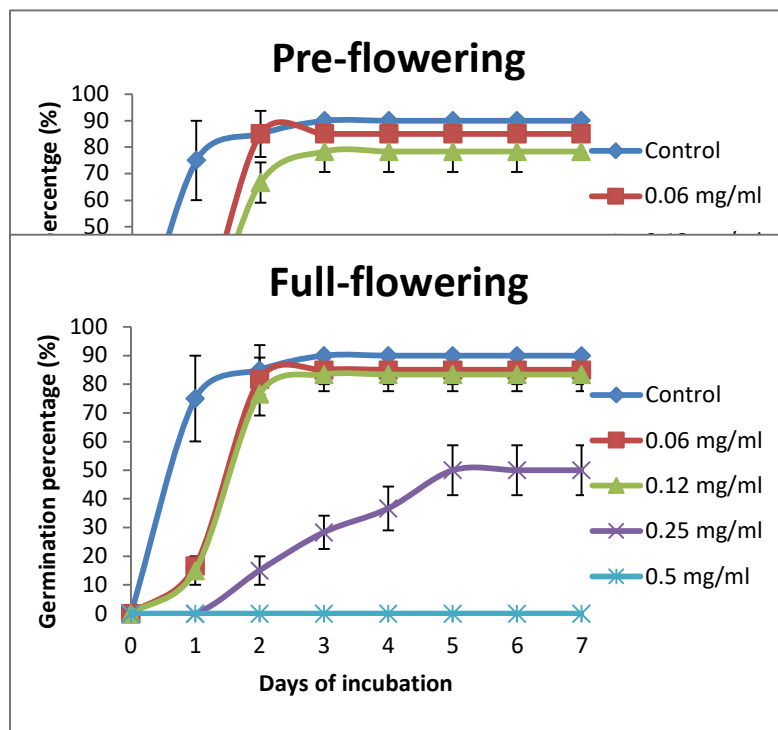


Figure.1. *T.maroccanus* essential oil yields at different growth stages. Values (means of three replicates) with different letters are significantly different at $p < 0.05$ (B de Tukey test).



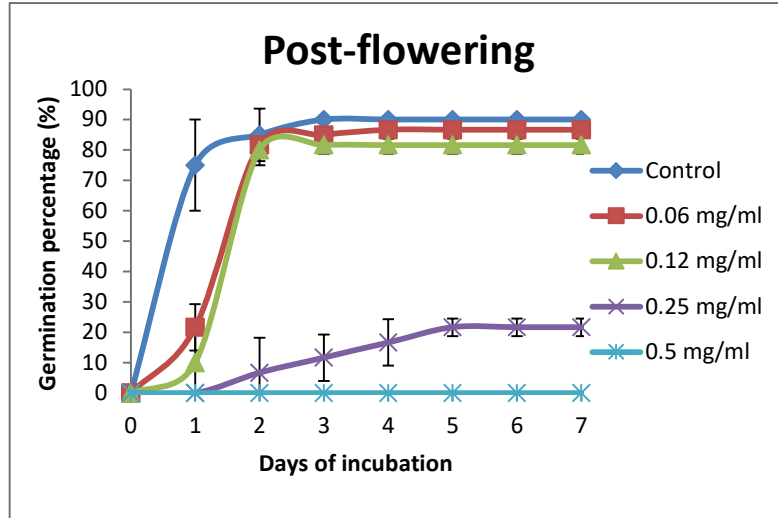


Figure 2. Cumulative germination of *M. sativa* seeds treated with *T. Moroccan* essential oils during the three different phenological stages. Data represent means of three replicates represented by standard error.

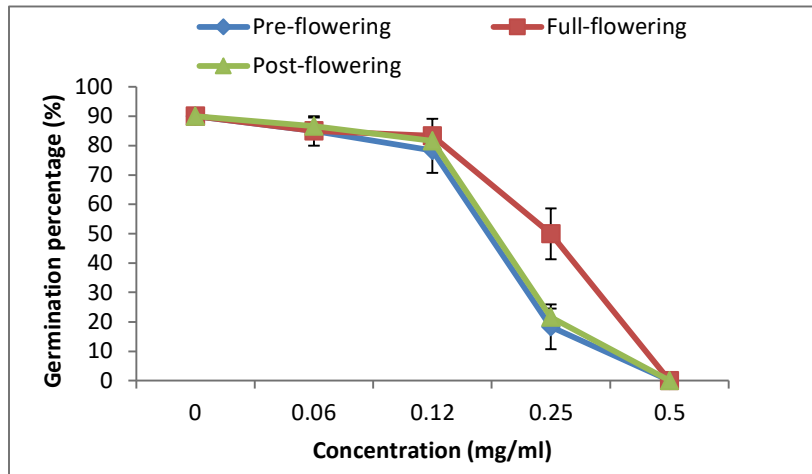


Figure 3. Final germination of *M. sativa* seeds treated with *T. maroccanus* essential oils after 7 days of the experience. Data represent means of three replicates represented by standard error.

Hepatitis C Virus and Treatment at Tobruk Liver Disease Center

(Original Research Article)

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Abstract

A liver is vital organ in human body. It's not just responsible for nutrient and filters of the blood but also for fights infections. Because of this function, any inflammatory condition of the liver causes hepatitis and it's commonly caused by a viral infection. Globally, viral hepatitis types are hepatitis A, hepatitis B, hepatitis C, hepatitis D& hepatitis E. A substantial health threat to humans and

causes approximately 700,000 deaths each year worldwide is recorded by hepatitis C virus. However, 30 years after the discovery of this virus in 1989, nearly perfect antiviral drugs that can clear up to 95% of this virus have been developed. This study investigated which type of hepatitis (A,B&C) was common between patients and also the most male & female patients who HCV infection at Tobruk liver centre in Tobruk city, in addition, the common drug that used in Liver disease centre in Tobruk . The data was collected from Tobruk liver disease centre from January to March. It shows that hepatitis C was common among patients. Females are most HCV infected than male as 22 to 17 respectively. The common drug used for HCV treatment in Tobruk liver disease centre is Sofosbuvir - Ledipasvir 400/90mg tablet (Harmony).

Keywords: liver disease, hepatitis C, HCV, treatment hepatitis C, Tobruk liver disease centre.

1. Introduction

The liver is a vital organ and supports almost every other organ in the body. Because of its strategic location and multidimensional functions, the liver is also prone to many diseases. The bare area of the liver is a site that is vulnerable to the passing of infection from the abdominal cavity to the thoracic cavity. Liver diseases may be diagnosed by liver function tests–blood tests that can identify various markers. For example, acute-phase reactants are produced by the liver in response to injury or inflammation (Musleh, M. M., et al, 2019).

Hepatitis is a common condition of inflammation of the liver. The most usual cause of this is viral, and the most common of these infections are hepatitis A, B, C, D, & E. Some of these infections are sexually transmitted (Czelusta, A., et al., 2000) . Inflammation can also be caused by other viruses in the family Herpesviridae such as the herpes simplex virus (Mehraj, V., & Routy, J. P. 2015). Chronic (rather than acute) infection with hepatitis B virus or hepatitis C virus is the main cause of liver cancer. Globally, about 248 million individuals are chronically infected with hepatitis B, and 142 million are chronically infected with hepatitis C . Globally there are about 114 million and 20 million cases of hepatitis A and hepatitis E respectively, but these generally resolve and do not become chronic.

Hepatitis D virus is a "satellite" of hepatitis B virus (can only infect in the presence of hepatitis B), and co-infects nearly 20 million people with hepatitis B, globally (Hofstraat, S. H. I., et al., 2015). The authors assessed gender differences in hepatitis C infection where notices the rate of hepatitis C infection among men was nearly twice that among women (Butterfield, M. I., et al, 2003). HCV infection affects men and women differently. Women are more likely to have spontaneous clearance of the virus and less likely to have disease progression if they are chronically infected. However, in both men and women, the burden of the disease will continue to be lasting and

significant in the years to come (Baden, R., Rockstroh, J. K., & Buti, M. 2014). In last studied investigated the distribution of HCV prevalence and genotypes among different gender and age patients with chronic HCV infection in WuHan from 2011 to 2015. The highest prevalence of HCV infection was at the age group 50-59 (25.85 % of 2685) and the lowest prevalence was 0-9 (0.93 % of 2685). were more common in female patients than males (Niu, Z., Zhang, P., & Tong, Y. 2016).

Those with chronic hepatitis C are advised to avoid alcohol and medications toxic to the liver. They should also be vaccinated against hepatitis A and hepatitis B due to the increased risk if also infected. Use of acetaminophen is generally considered safe at reduced doses. No steroidal anti-inflammatory drugs (NSAIDs) are not recommended in those with advanced liver disease due to an increased risk of bleeding. Ultrasound surveillance for hepatocellular carcinoma is recommended in those with accompanying cirrhosis. Coffee consumption has been associated with a slower rate of liver scarring in those infected with HCV (Novo-Veleiro, I., et al., 2016). In the past decade, there have been many changes in the treatment of HCV with the addition of new and more effective agents. Harvoni is the first once-daily, fixed-dose oral combination therapy that has been approved for HCV genotype 1. It is unique in that it does not require the coadministration of interferon and/or ribavirin and has demonstrated superior SVR rates at the end of post-treatment week 12 compared to historical controls. As of December 19, 2014, Harvoni had earned a place in the HCV treatment guidelines, along with Viekira Pak (Gritsenko, D., & Hughes, G. 2015). There is currently no effective vaccine against hepatitis C (WHO.,2021). The aim of study investigated which type of hepatitis (A,B&C) was common between patients and also the most male & female patients who HCV infection at Tobruk liver centre.

2. Materials and Methods

Sampling

The samples were taken by the Liver disease Center in Tobruk, It's collected from January to March of the year 2021, and there were 39 samples as shown Table 1.

Method Tests and Treatment at Tobruk Liver Centre

The hepatitis C test identifies hepatitis C virus antibodies, detects the viral RNA, and/or identifies the hepatitis C strain. The hepatitis C test may include several different tests:

- **Hepatitis C RNA test** Hepatitis C antibody test: Antibodies are part of the body's response to infection. The hepatitis C antibody test determines whether a patient has been exposed to the hepatitis C virus at some point

in their lives. If this test is positive, the next step is a hepatitis C RNA test.

- **Hepatitis C RNA test:** RNA is a type of genetic material from the hepatitis C virus that can be detected in the blood. If the test results are positive after a hepatitis C antibody test, doctors use a hepatitis C RNA test to look for and/or measure the amount of virus in the blood. Qualitative HCV RNA tests can detect the presence of HCV RNA, while quantitative HCV RNA tests measure the amount of HCV RNA. To understanding the amount of hepatitis C virus in the blood helps monitor response to treatment.
- **Genotype Testing:** There are at least six types of hepatitis C, which are also called strains or genotypes. Treatment for hepatitis C depends on the strain, so genotype testing is done to guide treatment in patients diagnosed with HCV infection. amount of hepatitis C virus in the blood helps monitor response to treatment.

Screening is recommended at least once for all adults 18 years of age or older, except for settings with very low prevalence of hepatitis C virus. Screening is also recommended during pregnancy and for patients of any age with risk factors for hepatitis C infection. In patients with risk factors, periodic examination is recommended as long as the risk factors persist.

In the city of Tobruk in the Hepatitis Center, Harvoni found the most commonly used drug and achieved a success rate of about 99% in patients with hepatitis C because it is more effective and has no side effects.

Table 1. Total Patients with HCV and Different Age.

years	Male	Female
15-25	0	0
25-35	4	4
35-45	3	1
45-55	4	6
55-65	2	6
75-85	2	1

3. Results and Discussion

The aim of this study is to investigate type of hepatitis (A,B&C) that was common between patients, and identify the total numbers of males and females infected with HCV at Tobruk liver disease centre. Data were collected from January to

March of the year 2021, at Tobruk liver disease centre. There were 39 HCV patients. The graph below shows that the total average of males and females infected with hepatitis A, B, and C.

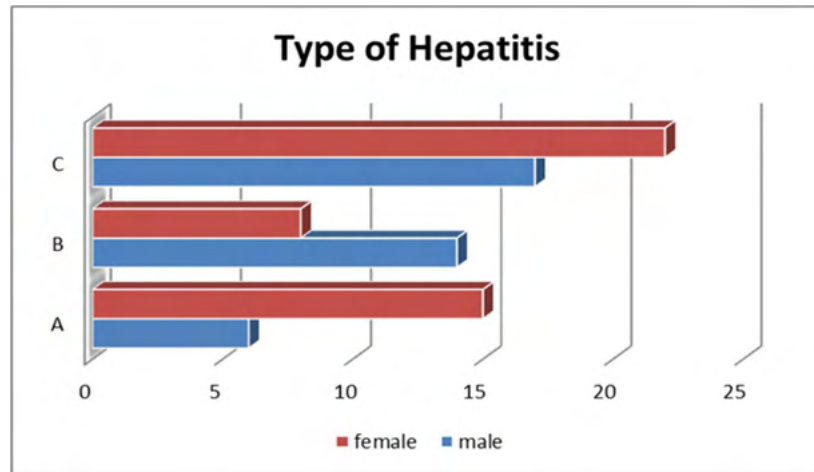


Figure 1. Patients with Hepatitis A, B & C.

As shown in fig 1 where the patients with hepatitis C was more than A and B. In addition, the women are affected more than men by hepatitis C and hepatitis A.

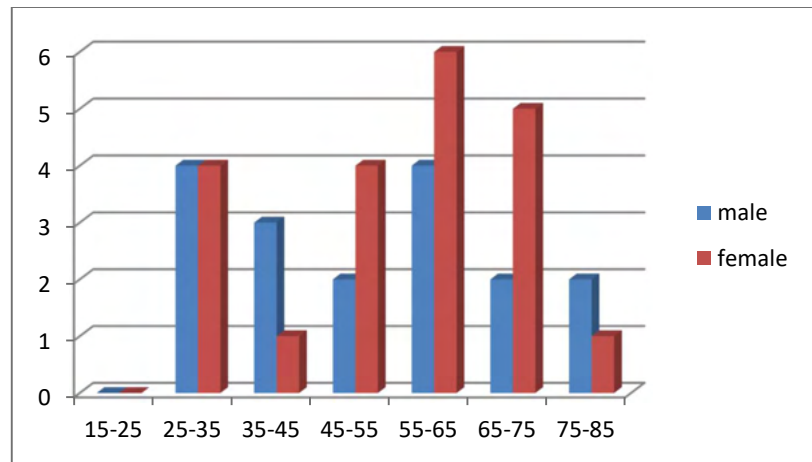


Figure 2. Ratio Age and Gender with HCV.

The highest prevalence of HCV infection was at the age group (55-65y) where the females affected more than males. Age group (25-35 y) between males and females are equal. In the age group (35-45, 75-85), the man affected more than female whereas, in age group (15-25 y) no affected as shown in fig 2. During the study in

Tobruk, it was found that females were most susceptible to infection with hepatitis C virus. This indicates that elderly women were at the risk of hepatitis C than younger ages to develop liver cirrhosis. In comparison, young women infected with chronic hepatitis C virus show slow progression of liver disease, including cirrhosis and hepatocellular carcinoma. Women are at higher risk of hepatitis C infection due to menopause, women who give birth by caesarean section. This is due to contaminated blood transfusions, or the carrier itself may be infected with hepatitis C virus.

Butterfield et al, (2003) conducted studies assessed gender differences in hepatitis C infection. Also, the rate of hepatitis C infection among men was nearly twice that among women (Butterfield, M. I., et al, 2003). This agree with study with age group (25-35y) where the rate HCV infection was equal. Women are at higher risk of hepatitis C infection due to menopause. Biological studies in British Columbia suggest that postmenopausal women may lose the supposed protective effect of estrogenic on the liver in the postmenopausal period (Niu, et al. 2016). The highest prevalence of HCV infection was at the age group 50-59y (25.85 % of 2685) and the lowest prevalence was 0-9 (0.93 % of 2685) were more common in female patients than males (Niu, et al. 2016). This is agreed with our study only with age group that affected. But in our study the females affected more than males.

Novo-Veleiro, et al., (2016) conducted study those with chronic hepatitis C are advised to avoid alcohol and medications toxic to the liver. Ultrasound surveillance for hepatocellular carcinoma is recommended in those with accompanying cirrhosis. Coffee consumption has been associated with a slower rate of liver scarring in those infected with HCV (Novo-Veleiro et al., 2016). That agree what the Tobruk liver disease centre was recommended. Gritsenko and Hughes (2015) conducted study harvoni had earned a place in the HCV treatment guidelines, along with Viekira Pak (Gritsenko, D., & Hughes, G. 2015). This gives an agreement with this study. Harvoni was the most commonly used drug and achieved a success rate of about 99% in patients with hepatitis C because it is more effective and has no side effects. There is currently no effective vaccine against hepatitis C (WHO.,2021).

4. Conclusion

The aim of study investigated which type of hepatitis (A, B&C) was common between patients and also the most males & females who HCV infection at Tobruk liver centre. It was found that females are most susceptible to infection with hepatitis C virus. The highest prevalence of HCV infection was at the age group (55-65) where the females affected more than males. In the city of Tobruk in the Hepatitis Center, Harvoni found the most commonly used drug and achieved a success rate of about 99% in patients with hepatitis C because it is more effective and has no side effects. In the city of Tobruk in the Hepatitis Center screening is recommended at least once for all adults 18 years of age or older, except for settings with very low prevalence of hepatitis C

virus. Screening is also recommended during pregnancy and for patients of any age with risk factors for hepatitis C infection. In patients with risk factors, periodic examination is recommended as long as the risk factors persist. More studies are needed to confirm these results

Acknowledgement

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Statistical Study on the Effect of Covid-19 on Patients with Chronic Diseases and Role of Radiological Diagnosis in Tobruk City

(Original Research Article)

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Abstract

COVID-19, a viral respiratory disease first reported in December 2019, quickly became a threat to global public health. Further understanding of the epidemiology of the SARS-CoV-2 virus and the risk perception of the community may better inform targeted interventions to reduce the impact and spread of COVID-19. In this study; we aimed to examine the association between chronic diseases and serious outcomes by radiological diagnosis of patients with COVID-19 infection. Across –sectional study was conducted among adult patient from 23 July to 30 August 2020 at Alhia Center ,Tobrouk, Libya .Both variable and multivariable logistic regression analysis with 95% confidence interval were fitted to identify chronic disease with covid -19 .The adjusted odds ratio (AOR) was used to determine the magnitude of the independent variables P-value <0.05 was considered statistically significant .Sample size (n=151) (F=82) (M=69) using logistic regression models diagnosis (Clinical examination , Radiographic , Swab ,Rapid test), deaths =23.

Keywords: COVID-2019, Tobruk city, Alhia center , chronic diseases , chest X-ray , computed tomography ,Diagnosis.

Introduction

December of 2019, a new severe acute respiratory syndrome, COVID-19, was reported in Wuhan, China. The virus causing this airborne disease was determined to be coronavirus-2 (SARS-CoV-2) [1]. Coronavirus is the biggest pandemic on the planet after H1N1 flu pestilence in 1918 [2]. Based on the current studies the clinical course of the sickness shifts from gentle upper respiratory parcel disease discoveries to serious viral pneumonia joined by loss of taste and smell and respiratory disappointment [3]. Although the virus infects individuals of all ages; it is known that people at an older age and with concomitant chronic diseases have more severe symptoms.

Studies show that among the expanding number of cases generally affected populations are people with previously known chronic diseases [4]. Hazard factors related with serious disease and mortality are old age, cardiovascular sickness (CVD), diabetes mellitus (DM), hypertension (HT), chronic lung illness, chronic kidney illness (CKD) [5]. Several studies have reported that chronic conditions, such as respiratory and cardiovascular diseases, are associated with worse outcomes following infection [6]. These illnesses, which are hazard factors that increment the case casualty rates, have been the main source of death in totally developed or non-industrial countries around the world [7].

Severe viral infections causing systemic inflammatory syndrome increase the risk of plaque, rupture and thrombus formation, and thus result in cardiovascular events [8]. In the course of COVID-19, microangiopathic changes occurring in the respiratory tract of diabetic patients reduce gas exchange and lung compliance and cause a significant decrease in forced vital capacity (FVC) and forced expiratory volume in 1.second (FEV1) [9]. Hypertension is another important disease that should be set

consideration in Covid patients. SARS-CoV-2 enters target cells by restricting to angiotensin converting enzyme2 (ACE2) expressed on epithelial cells of lung, kidney, veins. ACE2 articulation expansions in patients with HT and DM, who are treated with ACE inhibitors or receptor blockers [10]. Identification of additional risk factors associated with COVID-19 patients will also affect the survival of individuals with chronic disease. In this study, it aims to detect co-morbidities in hospitalized patients with a diagnosis of COVID-19[11].

Imaging techniques play an important role in diagnose the disease, determine its severity, guide treatment and assess treatment response. The current recommendation of the vast majority of scientific and radiological associations is that imaging tests should not be used as screening tools for detecting COVID-19. Rather, they should be reserved for evaluating complications [16]. Chest X-ray is generally the first-line imaging test in patients with suspected or confirmed COVID-19 due to its usefulness, availability and low cost, though it is less sensitive than computed tomography (CT).[17] The optimal chest X-ray includes posteroanterior (PA) and lateral projections with the patient standing.[18] .

Methodology

Study Design

Across –sectional study was conducted among adult patient from 23July to 30Augusts 2020 at Alhia Center ,Tobrouk city Libya .Both variable and multivariable logistic regression analysis with 95% confidence interval were fitted to identify chronic disease with covid -19 .The adjusted odds ratio (AOR) was used to determine the magnitude of the independent variables P-value <0.05 was considered statistically significant .Sample size (n=151) (F=82) (M=69) using logistic regression models diagnosis (Clinical examination , Radiographic , Swab ,Rapid test, Gene expert),deaths =23.

Statistical Analysis

Statistical analysis was performed by using SPSS Windows (Graduate Pack, version 23). Logistic regression model was used to assessment the associated between the selected disease and death or intensive care unit (ICU) admission adjusted for age.

Results

The study sample amounted to 151 patients, (Females =82) and (Males=69). Table (1) shows distribution of the studied sample by age group among patients. It appears from the table that 7.3% of sample was less than 30 year or less, 11.9% were between

31-40 year, 21.2% were between 41-50 year, 14.6% were between 51-60 year, 21.9% were between 61-70 year, 23.2% were older than 70 years.

Table (1): Distribution of the Studied Sample by Age Group among Patient at Alhia Center.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30 years or less	11	7.3	7.3	7.3
	31 - 40 years	18	11.9	11.9	19.2
	41 - 50 years	32	21.2	21.2	40.4
	51-60 years	22	14.6	14.6	55.0
	61- 70 years	33	21.9	21.9	76.8
	older than 70 years	35	23.2	23.2	100.0
	Total	151	100.0	100.0	

There was statistically significant outcome with age pearson chi-square (value 20.869, sig = 0.001). Table (2) shows distribution of the studied sample by gender among patients, it apparent from table that 54.3% females and 45.7% males. There was no statistical significant (sig = 0.359). Studying the distribution of the studied sample by diagnosis method among patient, Table (3) shows that 91.4% diagnosis by Clinical examination , 0.7% by Radiographic, 0.7% by Rapid test, 0.7% by Swap, 4.6% Radiology and clinical, 2.0% by gene expert. There was no statistical significant (sig = 0.76).

Table (2): Distribution of the Studied Sample by Gender among Patient at Alhia Center

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	69	45.7	45.7	45.7
	Female	82	54.3	54.3	100.0
	Total	151	100.0	100.0	

Table 3: Distribution of the Studied Sample by Diagnosis Method among Patient at Alhia Center.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Clinical	138	91.4	91.4	91.4
Radiology	1	.7	.7	92.1
Rapid Test	1	.7	.7	92.7
Swap	1	.7	.7	93.4
Radiology+ Clinical	7	4.6	4.6	98.0
Gene Expert	3	2.0	2.0	100.0
Total	151	100.0	100.0	

Table (4) Shows distribution of the studied sample by diabetes mellitus among patient, it apparent from table that 80.8% had no diabetes,19.2% had diabetes, there was no statistical significant(0.201).

Table 4. : Distribution of the Studied Sample by Diabetes Mellitus among Patient at Alhia Center.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid No	122	80.8	80.8	80.8
Yes	29	19.2	19.2	100.0
Total	151	100.0	100.0	

Table (5) Shows distribution of the studied sample by hypertension among patient ,it apparent from table that 72.8% had no hypertension ,27.2% had hypertension, there was no statistical significant(0.239).

Table 5: Distribution of the Studied Sample by Hypertension among Patient at Alhia Center.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid No	110	72.8	72.8	72.8
Yes	41	27.2	27.2	100.0
Total	151	100.0	100.0	

Table (6) Shows distribution of the studied sample by cardiovascular among patient, it apparent from table that 95.4% had no cardiovascular, 4.6% had cardiovascular, there was no statistically significant (0.415).

Table 6: Distribution of the Studied Sample by Cardiovascular Disease among Patient at Alhia Center.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid No	144	95.4	95.4	95.4
Yes	7	4.6	4.6	100.0
Total	151	100.0	100.0	

Table (7) Shows distribution of the studied sample by pregnancy among patient, it apparent from table that 98.7% had no pregnancy, 1.3% had pregnancy, there was no statistical significant (0.516).

Table 7: Distribution of the Studied Sample by Pregnancy among Patient at Alhia Center.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid No	149	98.7	98.7	98.7
Yes	2	1.3	1.3	100.0
Total	151	100.0	100.0	

Table (8) Shows distribution of the studied sample by renal diseases among patient, it apparent from table that 98.7% had no renal diseases, 1.3% had renal diseases, there was no statistical significant (0.42).

Table 8: Distribution of the Studied Sample by Renal Disease among Patient at Alhia Center

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid No	148	98.0	98.0	98.0
Yes	3	2.0	2.0	100.0
Total	151	100.0	100.0	

Table 9: Distribution of Studied Sample for all Chronic Disease at Alhia Center.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid No disease	98	64.9	64.9	64.9
DM	9	6.0	6.0	70.9
HTN	16	10.6	10.6	81.5
CV	1	.7	.7	82.1
Pregnancy	2	1.3	1.3	83.4
DM+HTN	16	10.6	10.6	94.0
DM+HTN+CV	4	2.6	2.6	96.7
HTN+CV	2	1.3	1.3	98.0
RF	1	.7	.7	98.7
RF+ HTN	2	1.3	1.3	100.0
Total	151	100.0	100.0	

Table 10: Distribution of the Studied Sample by Death among Patient at Alhia Center

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid recovery	125	82.8	82.8	82.8
Death	26	17.2	17.2	100.0
Total	151	100.0	100.0	

The distribution of the age and outcome among the patients at Alhia Center is shown in the Table 11.

Table 11. Distribution of the Studied Sample by Age and Outcome among Patient at Alhia Center (Age Group and Outcome).

	Outcome		Total
	Recovery	Death	
Age group			
30 years or less	11	0	11
31 - 40 years	18	0	18
41 - 50 years	30	2	32
51-60 years	20	2	22
61- 70 years	23	10	33
older than 70 years	23	12	35
Total	125	26	151

Pearson Chi-Square Test: Value: 20.869* Asymp Sig. (2-sided): 0.01			
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Table 12: Distribution of the Studied Sample DM and Outcome among Patient at Alhia Center. (DM and Outcome).

		Outcome		Total
		Recovery	Death	
DM	No	103	19	122
	Yes	22	7	29
Total		125	26	151
Pearson Chi-Square Test:				
Value: 1.206*				
Sig: 0.201				

Table13: Distribution of the studied sample by HIN and outcome among patient at Alhia center (HTN and outcome)

	Outcome	Total

		Recovery	Death	
HTN	No	93	17	110
	Yes	32	9	41
	Total	125	26	151
Pearson Chi-Square Tests:				
Value:0.88				
Sig: 0.239				

Table14: Distribution of the studied sample by CV and outcome among patient at Alhia center> (CV and outcome)

		Outcome		Total
		Recovery	Death	
CV	No	120	24	144
	Yes	5	2	7
	Total	125	26	151
Pearson Chi-Square Tests:				
Value : 0.66				
Sig: 0.415				

Table 15:Distribution of the studied sample by pregnancy and outcome among patient at Alhia center

Pregnancy * Outcome Crosstabulation

	Outcome	Total
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		Recovery	Death	
Pregnancy	No	123	26	149
	Yes	2	0	2
	Total	125	26	151
Chi-Square Tests:				
Value: 0.42				
Sig: 0.516				

Table 16: Distribution of the studied sample by renal and outcome among patient at Alhia center
-Renal * outcome Crosstabulation

		Outcome		Total
		Recovery	Death	
Renal	No	122	26	148
	Yes	3	0	3
Total		125	26	151
Pearson Chi-Square Test:				
Value: 0.63				
Sig: 0.42				

Table 17: Distribution of the Studied Sample by Gender and Outcome among Patient at Alhia Center. -Gender * outcome Crosstabulation

		Outcome		Total
		Recovery	Death	
Gender	Male	55	14	69
	Female	70	12	82

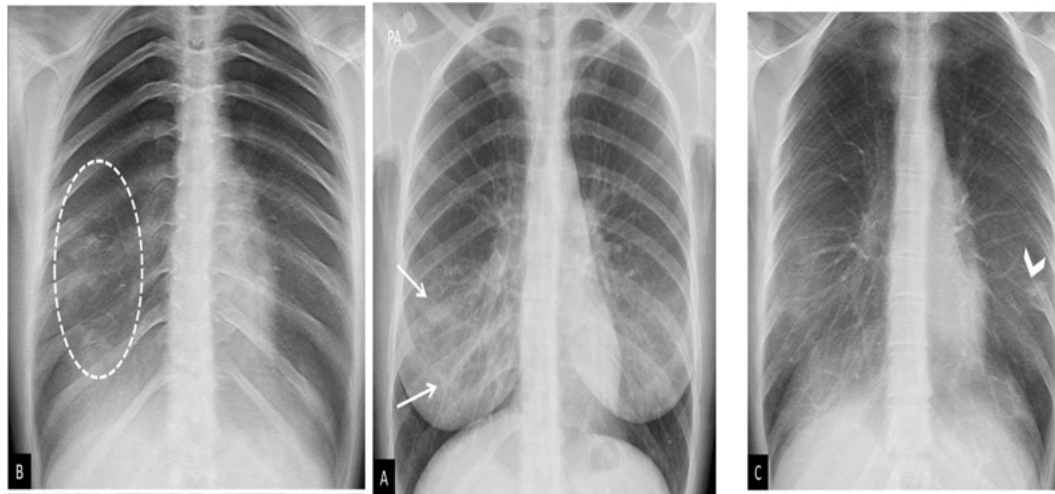
Total	125	26	151
Chi-Square Tests: Value: 0.84 Sig: 0.359			

Table 18: Distribution of the Studied Sample by Over all Chronic Disease and Out among Patient at Alhia Center. Over all Chronic Disease * Outcome.

	Outcome		Total
	Recovery	Death	
No disease	83	15	98
DM	7	2	9
HTN	12	4	16
CV	1	0	1
Over all Chronic Pregnancy	2	0	2
Disease DM+HTN	13	3	16
DM+HTN +CV	2	2	4
HTN+CV	2	0	2
RF	1	0	1
RF+ HTN	2	0	2
Total	125	26	151
Pearson Chi-Square Test: Value: 5.795 Sig: 0.76			

Discussion

Coronavirus is a new severe acute respiratory syndrome, COVID-19, was reported in Wuhan, China. The virus causing this airborne disease was determined to be coronavirus-2 (SARS-CoV-2). COVID-19 is the largest pandemic in the world after H1N1 flu pestilence in 1918 [2]. Based on the current studies the clinical course of the disease varies from mild upper respiratory tract infection findings to severe viral pneumonia accompanied by loss of taste and smell and respiratory failure [3]. In the Our study it was found that out of the 151 patient at Alhyia center, in Tobruk city ,26(17.2%) death , the results shows deaths in this study increased with age chi- square tests (0.001) ,(see table 11). Another study in U.K in patients admitted to hospital with COVID-19, mutually exclusive categories of obesity and chronic disease are consistently associated with in-hospital mortality in younger adults but not in those 70 years of age or over for men or 80 years and over for women [12]. Another study to systematically evaluate the impact of age on the clinical characteristics and important outcomes for COVID-19 patients, thus helping clinicians to establish risk stratification of COVID-19 patients as early as possible. Sporadic studies have mentioned that elderly people may tend to die after infection [13].older patients presented significantly lower levels of lymphocytes than younger patients. Lymphocytes are generally elevated in response to common viral infections, but are abnormally decreased in severe acute respiratory syndrome (SARS) and COVID-19 [14]. In our study shows that patients 80.8% had no diabetes,19.2% had diabetes, 72.8% had no hypertension ,27.2% had hypertension, 95.4% had no cardiovascular, 4.6% had cardiovascular, 98.7% had no pregnancy, 1.3% had pregnancy, .7% had no renal, 1.3% had renal disease. Another study common chronic disease among patients was hypertension with 47.2%. This was followed by diabetes mellitus (32.8%) and heart disease (27.5%), Respectively [15]. Although there are significant differences in sensitivity between PCR, CT and portable X-ray, it is accepted that the latter can be used as a triage method in certain scenarios [19] Digital chest tomosynthesis is a technique that uses X-rays in projections with different angles to gather information from different lung sections. This avoids overlapping structures and enables more precise detection of small pulmonary lesions that cannot be visualised on conventional chest X-ray (Fig 1) [20] . Our study shows the use of radiological diagnostics with a clinical diagnosis (4.6 %) see table 3.



(Fig 1) Tomosynthesis. **A 30-year-old woman with COVID-19.** (A) Conventional posteroanterior chest projection. Bilateral opacities in lower fields (arrows) that could correspond to dense breast tissue. Owing to uncertainties around the right hemithorax (arrows), a decision was made to perform a digital tomosynthesis (DT) study. (B and C) DT images. These show extensive consolidation in the right lower lung field (white circle in B), as well as small contralateral consolidations only visualised on DT (arrow tip in C) corresponding to foci of pneumonia.

Conclusion

It would be appropriate to evaluate carefully to COVID-19 patients, particularly for the chronic diseases. Specific attention should be paid to people at an older age COVID-19 patients with chronic diseases, especially DM, HTN.

In conclusion, the clinical features and prognosis of the disease vary among patients of different ages and a thorough assessment of age may help clinicians worldwide to establish risk stratification for all COVID-19 patients. Patients aged ≥ 60 years showed heavier clinical manifestations, greater severity and longer disease courses compared with those aged < 60 years. Closer monitoring and more medical interventions may be needed for the elderly. The choice of radiological diagnostics in the initial diagnosis of the patient.

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Study on Percentage of Tannin and Caffeine in Libyan Green Tea Beverages and their Nutritional Effect on Human Health

(Original Research Article)

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Abstract

This study is to determinate the percentage of caffeine and tannin in green tea by three Libyan traditional methods and the effect of heating time. Also, it aimed to study the nutritional healthy benefits and side effects of these constituents. Three samples of vert chine chunmee (NAPT) of green teas were analyzed. The first sample was raw, the second sample was boiled for 30 minutes and the third sample was boiled for 5 minutes. The heating temperature was at 100C°. The percentage of tannin and caffeine were estimated in each sample. Caffeine percentage in the three samples was 0.021, 0.022, 0.012, respectively. Tannin participation in green tea prepared by second Libyan traditional method (green tea boiled for 30 minutes) has 83mg/100ml of tannin. This value is higher than raw and third Libyan traditional method (green tea boiled for 5 minutes), which it was 10.9 mg/100 ml and 49mg/100ml, respectively. This study reveals that the heating time affects on the percentage of caffeine and tannin in green tea; as the heating time increases, the percentage of caffeine and tannin increases. But the percentage of tannin in green tea prepared by traditional Libyan methods was higher than caffeine. The rise in tannin percentage in green tea may lead to genetic defect; therefore, the third Libyan traditional method (boiling time for 5 min) may nutritionally consider the best for improving human health, followed by the first Libyan method. They provide the smallest percentage of caffeine and tannin in Libyan green tea beverages.

Keywords: Tannin, Caffeine, Libyan Traditional Methods, Heating Time, Nutritional Healthy Benefits, Libyan Green Tea Beverage.

Introduction

Tea represents one of the majority consumable beverages in the world. Tea can be classified into three main types, depending on the level of oxidation including green tea, oolong tea and black tea. Green tea is mainly the healthiest form because it has the maximum amount of polyphenol about 30-40%. While, the other teas types represent about 3-10%. Nutritionally, tea has been believed a medicine and a healthful beverage since ancient times. But, newly it has received a big deal of attention because tea polyphenols are powerful antioxidants. [1-5] Proximate analysis of green tea dried leave demonstrated that it has 37% polyphenols, 25% carbohydrates, 3.5% Caffeine, 15% protein, 4% soluble amino acids, 6.5 % lignins, 1.5% organic acids, 2% lipids, 5% Ash and 0.5% chlorophyll. The polyphenols in green tea are flavan-3-ol derivatives commonly known as catechins. These mainly consist of four compounds, (-)-epicatechin (EC); (6.4% approximately), [6] (-)-epigallocatechin (EGC) (19% approximately); EC gallate (ECG) (13.6% approximately) and EGC gallate (EGCG) that represents approximately 59% of the total of catechins [7-8] which possesses strong antioxidative activity. [9] The method of extraction of tea has an effect on its phenolic and caffeine contents and its biological activity.

A previous study in 2008 in USA reported that there was nothing of the speed at which the caffeine is extracted, since tea was steeped for 3 minutes, not fewer. It does not

negate at all the idea that most of the caffeine is extracted during the first 30-45 s. It guesses that speed of extraction during the first 30 s. All studies illustrate that even after a 3-4 minutes infusion, there is still between 10-25% of caffeine left since that is what come out in a second infusion. A report by Pakistani researchers , about effects of temperature and water steeping duration on antioxidant activity and caffeine content of tea, the result showed that the total phenolic contents of green tea prepared with cold water steeping are higher than those of any other teas prepared in hot. It is suggesting that some phenolic compounds in green tea might not be heat resistant and degraded at higher temperatures. Another study in Addis Ababa , Athiopia, 2011 by Tadelech Atomssa and A.V.G holop explained that green tea extract decreased the absorption of non-heme iron by 25%. However, vitamin C enhances non-heme iron absorption, so it should squeeze lemon into tea or eat other vitamin-C rich foods such as broccoli, with the meal. [10-14]

Nutritionally, green tea is a popular beverage and can be used as food supplements. It has been described by dietitian for assist patients with clogged arteries, endometrial and ovarian cancer, low blood pressure, bone health (osteoporosis), changes in cervical cells due to human papiloma virus (HPV), white patches in the gums, the prevention of Parkinson's disease. It decreasing cholesterol and hypertension and diabetes. Oral health, weight loss, antiaging, Asthma, immunity, liver diseases, flu and cold. Other uses included a range of cancers (bladder, esophagus, pancreas, breast, colon, stomach, leukemia, mouth, prostate, and lung); acne, heart disease, diabetes, infertility, heart health (high blood pressure, respiratory infections, improvement of athletic performance and wrinkles. [15-23]

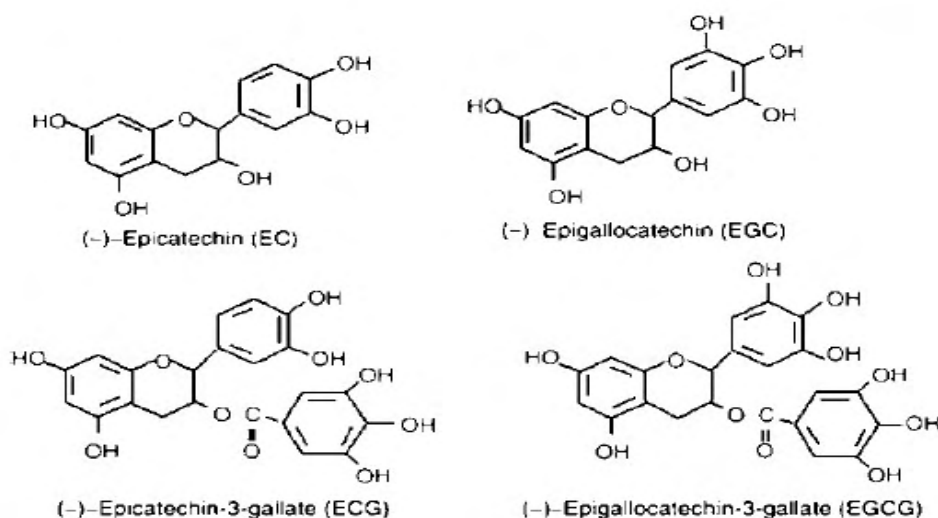


Figure 1. Polyphenols in Green Tea.

High-tannin tea has also been shown to diminish the need for blood removal from people with iron overload, or hemochromatosis. Hemochromatosis arises from a genetic defect that permits uncontrolled absorption of iron. [2-3] Caffeine is recognized as xanthine derivative which come from plants are possibly the oldest known stimulants. It is the most potent ability to enhance alertness, put off sleep and to develop attention. The bigger amounts of caffeine can cause difficulties. These ranges are from headaches and anxiety to irritability and insomnia. [2, 6] In addition, green Tea consumption has an effect on drugs. [24-25] It may inhibit the actions of adenosine, raise the effectiveness of beta-lactam antibiotics by decreasing bacterial resistance to treatment, diminish the sedative effects of benzodiazepines enhance blood pressure in people taking propranolol and metoprolol, reduce *Clozapine* if taken less than 40 minutes after drinking it. When taken together with ephedrine; green tea may lead to insomnia, weight loss, agitation, and tremors. It also decreases blood levels of lithium. Oral contraceptives can prolong the amount of time caffeine stays in the body and may raise its stimulating effects, with Phenylpropanolamine can cause mania and a severe rise in blood pressure. It should not be taken with *warfarin* because it has vitamin K and, thus, can render warfarin ineffective and it should not be mix *aspirin* with green tea together because increase the threat of bleeding. They both prevent platelets from clotting. [5, 19, 21] Therefore, studying of polyphenolic and caffeine contents in green teas beverages prepared by Libyan traditional methods will be high attention merit. The aim of the present study is to determine the percentage of tannin and caffeine in most common green tea performed by common Libyan methods. It is also to study nutritional and healthy benefits and side effects of these constituents in each method.

Materials and Methods

Materials

Green tea samples, Analytical balance, hot water, 100 volume flasks, cooler, separating funnels, filter papers, crucible, drier, and chemical solution such as ammonia solution, chloroform, Quinine sulphate, 1N H₂SO₄.

Sampling

The present study analyzes three samples of green tea from the vert chine chunmee (NAPT), which is the most type of green tea used in Libya. First sample was raw green tea, while, the second sample of green tea was boiled for 30 minutes. The third sample of green tea was boiled for 5 minutes. The boiling temperature was 100 °C.

Extraction by Common Libyan Method for Caffeine

For manually separation of caffien, it takes 5 grams or 5 ml tea in 400ml hot water. Put it in 100 volume flask + 5ml craz I+ 5ml craz II & complete to volume by hot water, cool it, then put all in separating funnel then add 10 ml ammonia solution & separate by 25 ml chloroform for 5 times & collect in crucible.

Extraction by Common Libyan Method for Caffeine

For manually separation of tannin, it takes 5 grams or 5 ml of green tea in 400 ml water, make it boiling for 1 hour then filtrate it. Add 1 gram Quinine sulphate to 25 ml water then add 2.5 ml 1N H₂SO₄ then add all to filtrate. The precipitate is formed by known weight then dries it.

Statistical Analysis

Descriptive statistics were performed using SPSS Statistics Software Program (version20, Inc., Chicago, Illinois, USA). Independent T Test was used to assess the significance of the association between percentages of caffeine and tannin according to temperature time of separation. In all tests, $\alpha < 0.05$ was regarded statistically significant. All confidence intervals (CIs) were calculated at the 95% level of statistical significance. Graphs of percentages of caffeine and tannins were constructed using Microsoft office excel 2016 program. The percentage formulas were calculated based on the Libyan National Center for Standards in the Nutrition Laboratory, Al-Arab Medical University, Benghazi, Libya.

Results and Discussion

Effect of Heating Time

In the present chemical analysis, there was a significance difference between percentages of caffeine in the three sample preparations. The average percentage of caffeine in the samples 1, 2, and 3 was 0.021%, 0.022%, 0.012%, respectively. In comparison, there also was a significance difference between percentages of tannins in the three sample preparations. The average percentage was 0.0109 %, 0.049 % and 0.083%, respectively. This indicates that caffeine and tannin contents increase with heat, as the percentage increases by increasing the heating time.

Table 1: Average Percentages of Caffeine and Tannin in Green Tea Samples.

Tannin %	Caffeine %	Green Tea Sample
0.0109	0.021	Raw Green Tea (Sample 1)
0.083	0.0224	Green Tea Boiled for 30 minutes (Sample 2)

0.049	0.0125	Green Tea Boiled for 5 minutes (Sample 3)
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According to the Libyan National Center for Standards, the Libyan standard criteria ratio for caffeine in raw green tea steeped in boiled water was 1.5 %. While, the Libyan standard criteria ratio for tannin in raw green tea was 10.5 %. This chemical analysis demonstrated that the method of the preparation may affect on the percentage of caffeine and tannin in green tea. For example, in tannin separation, the increase in the temperature of green tea will raise the participation of tannin. The green tea prepared by second Libyan traditional method contains 83mg/100ml of tannin. This value is higher than the raw green tea sample and the sample prepared by the third Libyan traditional method. It was 10.9 mg/100 ml and 49mg/100ml in raw green tea and green tea prepared by third traditional Libyan method, respectively.

The Extraction Method that Nutritionally Benefit for Human Health

The second Libyan preparation considers the highest sample containing caffeine, which has 22.4 mg/100 ml of caffeine. The third traditional method contains 12.5 mg/100ml of caffeine whereas, the first traditional methods (raw green tea) contains 2.1mg/100 of caffeine (Figures 2, 4).

All these three samples prepared at a constant time. In this study the second traditional Libyan method has higher percentage of tannin than the first (raw green tea) and the third common method (Figures 3, 4).

Polyphenols are touted as excellent antioxidants. High-polyphenols tea has also been shown to reduce the need for blood removal from people with iron overload [10-14]. .

In our study, the sample boiled for 30 minutes contains higher caffeine percentage than other Libyan tradition preparations, which contains 22.4 mg/100ml of caffeine.

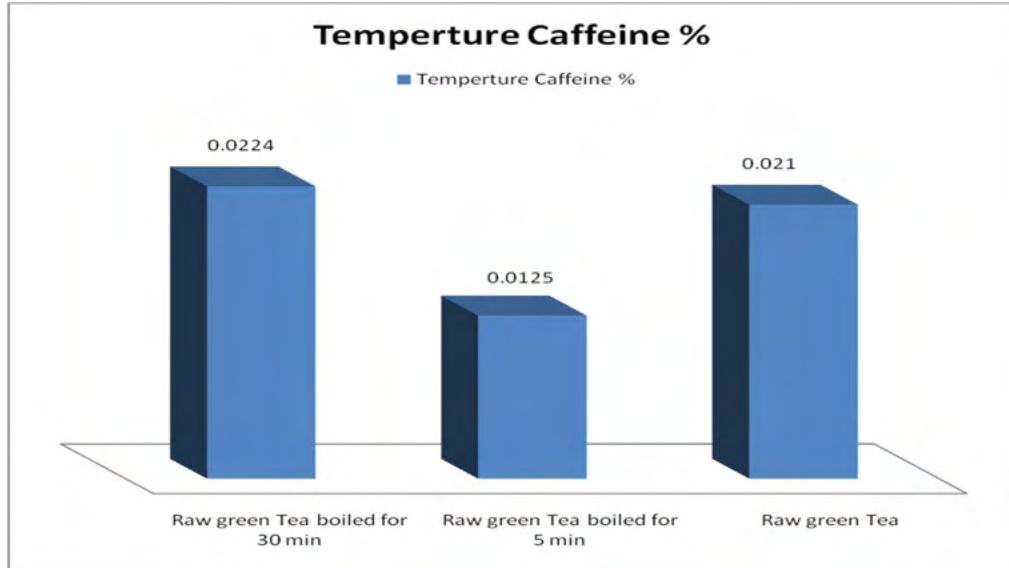


Figure 2. Caffeine Percentage in Green Tea Boiled for 30 min, Green Tea Boiled for 5 min and Raw Green Tea.

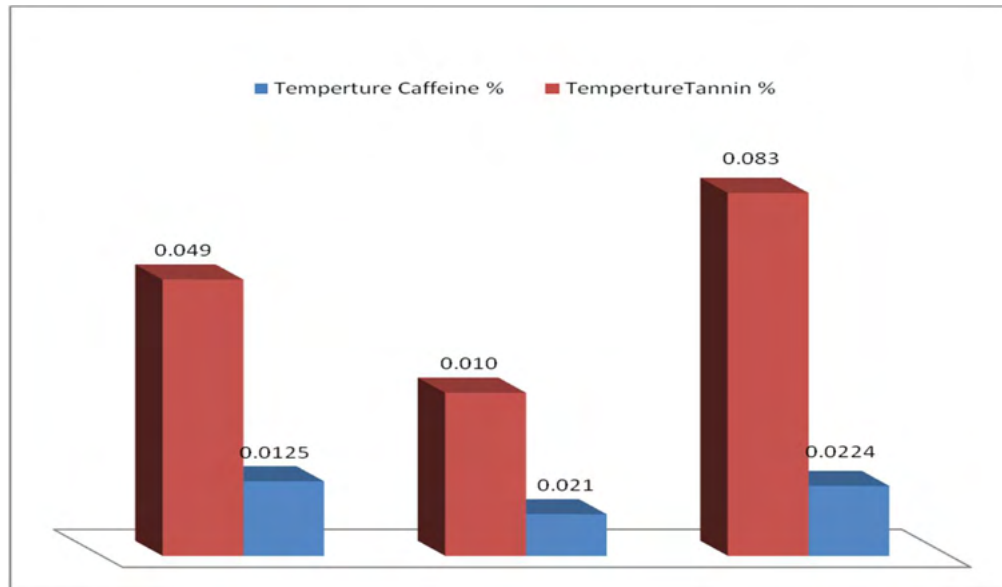


Figure 3 . Percentage of Caffeine and Tannin in Green Tea Boiled for 5 min, Raw Green Tea and Green Tea Boiled for 30 min.

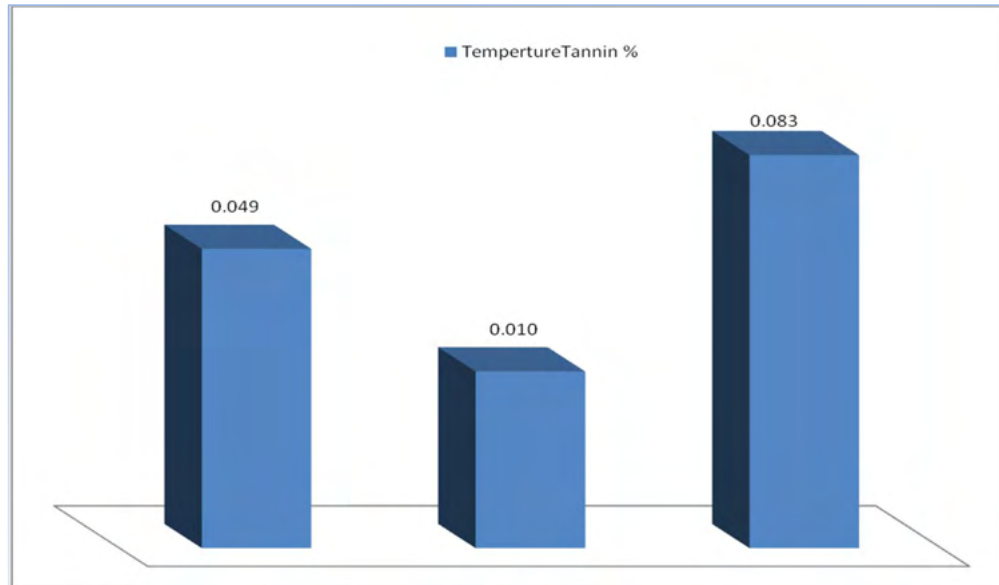


Figure 4. Tannin Percentage in Green Tea Boiled for 5 min, Raw Green Tea and Green Tea Boiled for 30 min.

The results illustrated that there was statistically significant difference between percentages of caffeine and tannin according to their heating times ($P= 0.026$). This implies that tannin and caffeine percentages increase with heat. Also, tannin percentages in the three green tea samples prepared by the Libyan traditional methods were higher than caffeine percentages. Tannin may lead to genetic defect, abnormal absorption of iron and other health difficulties [2,3]. Therefore, the boiling time in green tea prepared by Libyan traditional method should be short to have a minimum amount of tannin. This points to that the third Libyan traditional method (boiling time for 5 min) is nutritionally the best for human health because it provides a healthy percentage of caffeine and tannin, followed by the first Libyan traditional method.

Conclusion

In alternative medicine, green tea strongly has the ability to improve alertness, put off sleep and to enlarge attention. However, consuming large amount of caffeine may cause negative side effects such as headaches and anxiety to irritability and insomnia. We can consider that all three Libyan traditional methods performed for green tea samples have health benefits. A 30 minutes boiling traditional method is the most common Libyan method contains the highest polyphenolic and caffeine contents. This indicates that the second traditional Libyan method has higher percentage of tannin and caffeine than raw and the third Libyan common methods.

Also, tannin percentages in the three green tea samples prepared by the Libyan traditional methods were higher than caffeine percentages. The rise in tannin percentage in green tea may lead to genetic defect, abnormal concentration of iron, and

other health problems. Consequently, the boiling time in green tea prepared by Libyan traditional method should be at short time. This picks out that the third Libyan traditional method (boiling time for 5 min) may nutritionally consider the best for improving human health, followed by the first Libyan traditional method. They provide a small percentage of caffeine and tannin in green tea beverage.

Competing Interests

We (authors) declare that we have no conflict of interest.

Acknowledgments

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**Identification of Preoperative Profile For Patients With Brain Tumors and the Role of Nursing Care in the Neurosurgery Unit at Alexandria University Hospital
(Original Research Article)**

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Abstract

Brain tumors usually alter the tissues in which they are located. Thus, the immediate behavioral consequences of a brain tumor directly reflect the functions of the neural systems in the vicinity of the tumour. Nursing care is a very important part of the treatment plan of brain tumors. The goals of nursing care depend on the patient's needs and how the tumor has affected his or her daily activities. A descriptive analysis of 30 preoperative adult patients has been carried out at the Neurosurgery unit at Alexandria University Hospital between March to September 2019 was conducted at the morning and afternoon shift. Thirty adult preoperative patients of both sexes were consented and recruited to the study. A preoperative assessment sheet was developed. Analysis

of the prevalence of preoperative symptoms was conducted. The preoperative symptoms include: headache (93.8%), dizziness (71.4%), seizures (50%), anxiety (45.8%), loss of attention and concentration (66.7%). Assessment of cranial nerves and motor functions revealed: defective or absent central vision (36.7%), dilated pupil (30%), the trochlear and abducent nerves were not affected in all patients (100%), muscle atrophy (12.5%), positive Romberg test (41.7%), finger-to-finger test was impaired (34.8%) of patients, heel to shin test was impaired in one-third (33.3%) of the assessed population. Identification of patients' problems and analysis of these problems are very important to the nurse to fulfill the required nursing care to provide success for brain tumor operations and either relieve or adapt the patients manifestations to accommodate with their medical condition.

Keywords: Neurosurgery, Brain tumors, Surgical Oncology, Nursing care.

Introduction

The tumor or neoplasm is a new growth of brain tissue that is uncontrolled and progressive. Many types of tumors may arise within various regions of the brain. Brain tumors usually alter the tissues in which they are located. Thus, the immediate behavioral consequences of a brain tumor directly reflect the functions of the neural systems in the vicinity of the tumor⁽¹⁾.

Tumors located within the frontal lobes often produce behavioral effects in early stages of their development, before they result in increased intracranial pressure (ICP). Some early signs of frontal tumors are reduced emotionality, loss of initiative, and an inability to lead with complex problems⁽²⁾. Nursing care is a very important part of the treatment plan of brain tumors.

The goals of nursing care depend on the patient's needs and how the tumor has affected his or her daily activities. The medical team makes every effort to help patients return to their normal activities as soon as possible.

Patients and their families may need to work with a nurse to overcome any difficulty in activities of daily living, such as eating, dressing, bathing, and using the toilet. So identification of patient's problems helps the patient to reach to this target, and according to nursing philosophy, the nursing problems should be written into form that defines nursing diagnosis (3-5).

Therefore, the aim of this study is to develop a preoperative nursing care protocol for patients with brain tumors.

Methods

This is a descriptive study that was conducted following approval from the institutional representative at the department of neurosurgery located at the University Hospital of Alexandria between March to September 2019, at the morning and afternoon shift.

Thirty adult preoperative patients of both sexes were consented and recruited to the study. Patients aged 20 to 60 years and diagnosed as having brain tumour were included to the study. While patients who have any chronic illness as diabetes mellitus, hypertension, ophthalmic disease, musculo-skeletal disorders, psychotic disease or cardiopulmonary disorders were excluded to focus about nursing diagnoses related to brain tumor. A preoperative assessment sheet for patient with brain tumor was developed based on the review of related literature (6-14). Available data included biosociodemographic information (e.g., age, sex, occupation, marital status, education, duration of pre-operative hospitalization, location of lesion).

Also data included preoperative clinical data (radiological investigation, prescribed medication, and laboratory investigations), neurological assessment (level of consciousness using Glasgow Coma Scale, assessment of headache, dizziness, vertigo, seizures, vomiting, cognitive functions, cranial nerves, reflexes, motor and sensory functions).

In addition to the general preoperative assessment which evaluate the physical, psychological, social and spiritual aspects. The tool was tested for reliability by Cronbach's Alfa test, by 12 patients with brain tumor disease. These patients were excluded from the data collection. The data were analyzed and the reliability coefficient of the tool indicated positive correlation ($r=0.67$).

Results

Among the studied group, less than one-half (46.7%) of patients were males, and more than one-half (53.3%) were females (Figure 1), the majority of patients (93.8%) had headache as a chief complaint, with more than two-thirds (68.8%) of patients suffering from severe morning headache.

All the patients received analgesic to relieve pain. An equal proportion of patients (93.8%) were also suffering from symptoms of visual changes. However, most of the patients had more than one response in both precipitating factor and associated factor (Table 1).

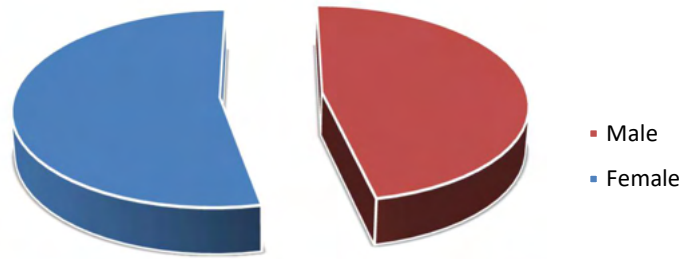


Figure 1: Distribution of Studied Patients in Relation to Sex.

Table (1): Distribution of Studied Patients in Relation to Headache Assessment

Headache assessment		N	%
Headache present	➤ Yes	16	66.7
	➤ No	8	33.3
Headache as a chief complaint	➤ Yes	15	93.8
	➤ No	1	6.3
Location of headache	➤ Frontal	5	31.3
	➤ Temporal	3	18.8
	➤ Occipital area	3	18.8
	➤ Allover	5	31.3
Severity of headache	➤ Moderate	5	31.3
	➤ Severe	11	68.8
Onset of headache	➤ Morning	11	68.8
	➤ Evening	3	18.8
	➤ On wakening from sleep	2	12.5
Duration of headache	➤ Over hours	10	62.5
	➤ Over days	5	31.3
	➤ Over minutes	1	6.3
Character of headache	➤ Episodes	9	56.3
	➤ Constant pressure	2	12.5
	➤ Dull	5	31.3
Relieving factors	➤ Analgesics	16	100

Precipitating factors	➤ Activity	5	29.4
	➤ Work environment	2	11.8
	➤ Emotional upset	5	29.4
	➤ None	7	71.2
Associated symptoms	➤ Nausea and vomiting	4	25.0
	➤ Visual changes	15	93.8
	➤ Pain with bright light	1	6.3
	➤ Others	2	12.5

A total of 71.4% of patients experienced dizziness as a chief complaint, less than three-quarters (71.42%) of patients had increased dizziness attacks with increased activity.

On the other hand, approximately two-thirds (66.7%) of patients had an associated difficulty of movement leading to immobility. Similarly, more than one response was reported in relation to associated factors (Table 2).

Table (2): Distribution of Studied Patients in Relation to Dizziness Assessment.

Dizziness assessment		N	%
Dizziness present	➤ Yes	7	29.17
	➤ No	17	70.83
Chief complaint	➤ Yes	5	71.4
	➤ No	2	28.6
Onset	➤ Abrupt	4	57.14
	➤ Gradual	3	42.85
Precipitating factors	➤ After change in position	2	28.57
	➤ Activity	5	71.42
Associated findings	➤ Nausea and vomiting	2	33.3
	➤ Pallor	3	50.0
	➤ Immobility	4	66.7
	➤ Tinnitus along with dizziness	1	16.7

One-half (50%) of patients were complaining of seizures, 50% of the patients who suffer from seizures had it as a chief complaint. Moreover, there was a tendency of increased percentage of grand mal convulsions (75%) among patients with seizures. Conversely, three-quarters (75%) of them were suffering from loss of consciousness during or after seizure attacks. More than one response was reported in associated factor (Table 3).

Table (3): Distribution of Studied Patients in Relation to Seizures Assessment.

Seizures assessment		N	%
Seizures present	➤ Yes	12	50
	➤ No	12	50
Chief complaint	➤ Yes	6	50
	➤ No	6	50
Seizures Type	➤ Tonic	3	25.0
	➤ Grand mal	9	75.0
Associated findings	➤ Color change in face or lips	3	25.0
	➤ Loss of consciousness	9	75
	➤ Incontinence	3	25.0

Less significantly, only two patients had dysarthria, while being oriented to time, place and persons and having an intact immediate and recent memory. One patient impaired to intact remote memory. Attention and concentration were shown to be intact in (33.3%) of patients. Surprisingly, less than one half (45.8%) of patients were having an anxious mood (Table 4). Interestingly, only two patients had anosmia while more than two-third (36.7%) of patients had defective or absent central vision. 30% of patients were shown to have dilated pupil. The trochlear and abducent nerves were not affected in 100% of patients. Only one patient demonstrated a weakness of masseter muscle. Furthermore, one patient was had asymmetric facial movement. Similarly, one patient was complaining of decreased hearing, two patients had no gag reflex, two patients had dysphagia and one patient had paralysis of sternomastoid/trapzius muscle. Lastly, the hypoglossal nerve was affected in three patients who presented with tongue paralysis. Concerning the assessment of motor function, more than one-tenth (12.5%) of the assessed population had muscle atrophy. A reduced muscle tone was noticed in two patients (i.e. hypotonia), while one patient had spastic hypertonia, and a third patient had rigid hypertonia. Muscle strength was unaffected in less than one-quarter (41.7%) of patients. Moreover, only one patient was reported to have tremors as involuntary movements.

Table (4): Distribution of Studied Patients in Relation to Cognitive Function Assessment

Cognitive function assessment		N= 24	%
Speech	➤ Normal	21	87.5
	➤ Dysphonia	1	4.2
	➤ Dysarthria	2	8.3
Time Orientation	➤ Oriented	24	100

Place Orientation	➤ Oriented	24	100
Persons Orientation	➤ Oriented	24	100
Immediate Memory	➤ Intact	24	100
Recent Memory	➤ Intact	24	100
Remote Memory	➤ Intact	23	95.8
	➤ Impaired	1	4.2
Attention and concentration	➤ Intact	16	66.7
	➤ Impaired	8	33.3
Mood and affect	➤ Normal	2	8.3
	➤ Depression	6	25
	➤ Anxiety	11	45.8
	➤ Liability	1	4.2
	➤ Fear	2	8.3
	➤ Apathy	1	4.2
	➤ Irritability	1	4.2

Findings arise from the gait and coordination assessment revealed that two patients had ataxic gait, while one patient had hemiplegic gait. 41.7% of patients had positive Romberg test and 21.7% of patients had slow alternative movement. The finger-to-finger test was impaired in more than one-third (34.8%) of patients.

Similar pattern was also evident in heel to shin test, which was impaired in one-third (33.3%) of patients. Indeed, 56.67% of the studied patients reported insomnia that related to hypothalamic dysfunction, psychological response, hospital noises and life style disruption. While (6.67%) of the patients were concerned with fear that might be explained by loss of independence, invasive procedures and surgery and its outcome (Table 5).

Table (5): Prevalence of Actual Nursing Diagnoses among Studied Patients.

Actual nursing diagnoses	NO	%
Ineffective Airway Clearance (accumulation of secretion) related to: Prolonged bed rest, decrease cough reflex, secondary to: decreased level of consciousness (8-12).	6	20
Imbalanced Nutrition: More Than Body Requirement (overweight/obesity) related to: Hypothalamic dysfunction (Altered satiety patterns), medications (steroids), lack of basic nutrition knowledge.	6	20
Insomnia related to: Hypothalamic dysfunction, psychological response, hospital noises, life style disruption.	17	56.67
Impaired Urinary Elimination (dysuria/ Urine dripping) related to: Loss of perineal tissue tone, environmental barriers to bathroom	10	33.3

Constipation R/to: Sensory/motor disorders, side effects of drugs, habitual laxative use, immobility (lack of activity), inadequate diet, and fluid intake/ day.	4	13.3
Ineffective Individual Coping related to: Inability to meet role expectations, disease process, inability to meet basic needs.	15	50
Diversional Activity Deficit related to: Lack of motivation with signs of depression, monotonous environment, long-term hospitalization.	17	56.67
Anxiety related to: Prognosis of surgery, thinking about the family, hospitalization (change life style).	11	36.67
Disturbed Body Image related to: Loss of function role in the community, change behavior secondary to brain tumor.	10	33.3
Grieving (depression) related to: Loss of role, separation from family.	6	20
Fear related to: Loss of independence, invasive procedures, surgery and its outcome.	2	6.67
Impaired Social Interaction related to: Barrier communication (dysarthria), knowledge/skill deficit about ways to enhance mutuality, self-concept disturbance, limited physical mobility	5	16.67
Spiritual Distress (hopelessness) related to: Diagnosis of a danger from illness, loss of physical abilities.	13	43.3

*More than one Actual Nursing Diagnosis formulate for the same patient.

When assessing the prevalence of high risk nursing diagnoses, it was evident that less than one-half (40%) of patients were complaining from seizures attacks, therefore diagnosed as having high risk for Injury. Nevertheless, a high risk nursing diagnoses was also formulated for additional six comatose patients.

Furthermore, a risk for aspiration was identified for two patients who had a depressed gag reflex due to compression of tumor on the vagus nerve (Table 6).

Disuse Syndrome (**activity intolerance, impaired physical mobility, impaired skin integrity**) was detected by nursing diagnoses in six patients (20%), which was related to disturbed level of consciousness secondary to increase intracranial pressure and brain stem dysfunction. It's noteworthy that this was the only prevalent syndrome among studied patients.

Table (6): Prevalence of High Risk Nursing Diagnoses among Studied Patients.

High Risk nursing diagnoses	NO	%
Risk for Injury (seizures) R/to: Disruption in the normal flow of electricity in the brain, discontinuation on medication intake.	12	40
Risk for Aspiration R/to: Reduce of level of consciousness, depressed gag reflex.	8	26.67
	6	20

Risk for Impaired Skin Integrity (itching, pain, of affected/ surrounding area) R/to: Physical immobilization		
Risk for Impaired Oral Mucous Membrane (Xerostomia) Related to: [ET, nasogastric tube], NPO for more than 24 hours ineffective oral hygiene	6	20

*More than one high-risk nursing diagnosis formulate for the same patient.

Overall, all actual nursing diagnoses reflected collaborative problems because all these problems occurred due to increased intracranial pressure, affection of brain centers or compression of tumors on cranial nerves. Therefore, the nurse alone cannot manage this problem without collaborate the health team (Table 7).

Table (7): Prevalence of Collaborative Problems among Studied Patients.

Collaborative problems	NO	%
PC: Acute pain (severe/moderate acute pain in the head) related to: Increase intracranial pressure. Pressure on or stretch of pain-sensitive structures (dura matter covering the brain and blood vessels wall).	16	53.3
PC: Activity Intolerance (dizziness/vertigo/anemia) related to: Disturbance of the function of the vestibular system by ischemia or compression, decrease hemoglobin level.	11	36.67
PC: Impaired physical mobility (paralysis of sternomastoid and trapzius/ impaired coordinate of muscle/ ataxia) related to: Compression of foramen magnum tumor on spinal accessory, cerebellar dysfunction.	13	43.3
PC: Imbalanced Nutrition: Less Than Body Requirement (anorexia/ vomiting) related to: A compression on the vomiting center (chemo-receptor trigger zone) at the floor of the fourth ventricle, depression, psychological stress	8	26.67
PC: Impaired Remote Memory (amnesia) related to: Compression of tumor on parietal lobe.	1	3.33
PC: Impaired Swallowing (Dysphagia) related to: Compression of tumor on vagus nerve.	2	6.67
PC: Alteration in Sensory Perceptual (impaired vision/anosmia) related to: Compression on or ischemia of the optic nerve, tumoral compression on olfactory tract and/or olfactory bulb at the inferior surface of frontal lobe.	13	43.33
PC: Overflow incontinence related to: Impaired conduction of impulses above the reflex arc level secondary to compression by tumor.	2	6.67
PC: Ineffective Sexuality Pattern (Impotence) related to: Hormonal disturbance mainly increases prolactin level.	3	10

*PC: potential collaborative

*More than one collaborative problem formulate for the same patient.

Discussion

Since human beings are not merely physiological creatures, basic needs occur in the emotional, sociocultural, intellectual, and spiritual realms as well as the physiological realm. The entire person (body, mind, and spirit) is influenced by satisfaction of needs. A **need** is anything that is absolutely essential for one's existence. **Basic human needs** are those that are necessary for every person's survival⁽¹⁵⁾. The role of the nurse varies depending on the needs of the patients. She will deliver treatment and appropriate interventions, within her scope of practice and working within a multi-disciplinary team. Nurses and clinicians are consistent members of the team who care for the patients and their families throughout the course of the illness. Their intervention as caregiver, rehabilitation, nursing specialist and educators in a liaison role between the patient/family and various members of the medical team is critical for the patient and family throughout the course of the illness⁽¹⁶⁾.

The process of care for the neurosurgery practitioners includes screening, assessment, care coordination and implementation. The nurse will provide this service throughout the continuum of care. This will include outpatient management, pre-admission, pre-operative management, post operative management and discharge planning and follow up services for the neurosurgical patient. It is essential that preoperative care include accurate assessment both general and neurological⁽¹⁷⁾. Following the assessment, identification of the problem will be clear to formulate nursing diagnoses. Regarding the air, which is considered an important basic need, the present study showed no related problems in patients with brain tumor. This agrees with Barker (2017) who found no relation between hypoxia or anoxia and brain tumor⁽¹⁸⁾.

In view of nutrition, Dudek (2018) stated that imbalanced nutrition (less than body requirement) is evident in the terminal stages of the disease in a large proportion of patients with brain tumors, but can also be apparent at the time of diagnosis. Weight loss does not appear to be related to the size of tumor or calorie intake and even can be present when the tumor represents a very small percentage of total body weight⁽¹⁹⁾.

Furthermore, the results of the present study revealed that the studied patients suffered from headache, which increased in the morning; it may be due to increased intracranial pressure in the supine position when patients are a sleep. These results are supported by Lindsay (2016) who reported that the headache is an associated symptom of increased ICP due to compression of pain sensitive structures within the intracranial compartment including the middle meningeal artery and its branches, the large arteries at the base of the brain, the sinuses and bridging veins, and the dura at the base of the cranial fossa. It is also reported that headache increases in the morning⁽²⁰⁾. Moreover, continuous headache along the day may be present probably because of the associated anxiety.

The findings of the current study demonstrated that patients with brain tumors reported insomnia and their worries about waking up several times during the night (interruption of sleep), having difficulty to sleep at night, changing position frequently until feeling rest during sleep and spending much of the day lying down in order to rest. Sleep disturbances in patients with brain tumor are related to different causes such as headache, anxiety, and environmental. Female patients reported sleep disturbances, this experience might be due to that they are always thinking of their responsibilities toward their families that lead to disturbance in rest and sleep pattern.

Moreover, pre-operative insomnia has a great impact on postoperative pain. This agrees with Sunaetr (2018) who demonstrated that pre-operative insomnia increased the intensity of post-operative pain ⁽²¹⁾. So, it should be dealt with seriously as it may cause negative consequence.

Having successfully reported the preoperative symptoms, findings showed that the patients reported disruption in sexual function and lack of desire could be explained by the intensity of physical manifestations as headache, which fills the patient with sadness and depression, or by hormonal disturbance in patients with pituitary tumours. These results are in line with Balon et al (2015), who reported that the disruption of sexual function could be attributed to psychological, pharmacological, physical, and hormonal factors. Many chronic illnesses can impact a person's sexual expression, either directly through changes in vascular, pulmonary, neurological, or hormonal systems, or indirectly, through changes in self-image, self-esteem, mood, energy level, and pain level ⁽²²⁾.

Correspondingly, patients involved in the study reported concerns related to mobility and ambulation. These concerns are arranged from partial immobility (like walking shorter distances, not being able to climb up or down stairs, walking more slowly, getting around only by using a walker) to complete immobility (like staying in bed most of the time). Following **admission to hospital**, the **patient's** concerns **are concentrated on the** symptoms during **activity**, and anxiety about provoking them, which exerted a strong influence upon their attitudes towards **activity** and behavior. Physical symptoms included breathlessness, dizziness, vertigo, body pains and fatigue. For many of the females in this study, these symptoms used to occur for them during performing housework activity or with everyday activities as walking. As a result physical **activity** usually stopped **with** their onset. This is supported by Smeltzer et al (2018) who stated that classical manifestations of brain tumor are headache, vomiting, dizziness, vertigo, disturbance of vision and disturbance of level of consciousness, these manifestations are exaggerated after admission to hospital ⁽²³⁾.

Once physiological needs are met, one's attention turns to safety and security in order to be free from the threat and emotional harm. Such needs might be fulfilled by: leaving in a safe area, medical insurance, job security, and financial reserves. According to Maslow's hierarchy, if a person feels that he or she is in harm's way,

higher needs will not receive much attention ⁽²⁴⁾. Anxiety experienced by patients undergoing hospitalization for surgery has been viewed as a normal human response to a stressful event. Many patients may experience anxiety caused by rapid deterioration of neurological function and difficulty in expressing their thoughts in the later stages of the disease. The patient may be able to hear and understand the discussions between physicians and their family, and their frustration may be difficult to express ⁽²⁵⁾.

The present paper revealed that female patients were more anxious than males, not because of their tumor but due to their concerns about their children and who will take care of them. This agrees with Castle et al (2016) who ascertained, that female patients have been consistently reported to experience a greater level of anxiety before surgery in comparison to male patients ⁽²⁶⁾. We could explain this attitude primarily by the fact that oriental mothers are firmly attached to their children and grand children even if they were adults. Secondary, most female patients ignore their disease, the hazards of operations which may be more important because if the mother loses her health, she will be deprived of her giving which might be more painful for her. The shock of the diagnosis makes it difficult for the patient and family to absorb and comprehend the tremendous amount of information presented by the medical team. Nurses can assist the family in the integration of this information by encouraging questions and reinforcing information regarding the illness and the plan for treatment. Nursing management of the patient undergoing surgery and diagnostic studies include a large amount of patient/family education and coordination of diagnostic activities. Nurses are instrumental in coordinating the premedication and encouraging the family members to communicate questions and concerns with the medical team ⁽²⁷⁾.

High risk for injury related to seizures, is common in patients with brain tumor. In the present investigations, convulsion caused muscle contraction, tongue biting and loss of consciousness; these make the patient liable to injury and fracture, which affects sense of safety and security for these patients. These seizures can occur at any time and anywhere with or without aura. The risk of injury affects not only safety and security but also affects the self-esteem in the form of disturbance of body image, self-concept and self-respect. According to Westcarth (2017) seizures are common brain tumor symptoms, occurring in (60%) of all brain tumor patients and they may be the first indication of brain tumor ⁽²⁸⁾. In this work, patients were suffering from communication problems as dysarthria, there was difficulty to pursue an interview as they could not speak due to difficulty in articulation. The expression of frustration on their face could be observed. Maintenance of dignity may become problematic in patients with primary brain tumor. The patient expressed lack of communication that enhanced their feeling of depression, hopelessness and a desire for hastened death. So early identification of key elements in the maintenance of dignity is essential, particularly in this group of patients.

Maslow reported that each of us has a core pyramid of hierarchical needs in order to become fully functioning. Any interruption of this pyramid prevents us from achieving our full potential thus leading to dysfunction. The need of self-esteem is the need for self-confidence, self-respect, and recognition. Maslow suggests that satisfying these needs leads to the feelings of self worth. However, inability to satisfy these needs can lead to feelings of weakness, loss of confidence, and helplessness⁽²⁸⁾. Once a person has met the physiological need, safety needs, and self esteem, social needs become important. Social needs are those related to interaction with other people and may include the need for friends, the need for belonging, and the need to give and receive love⁽²⁹⁾.

Social competence it refers to a person's ability to interact effectively with others. Interpersonal relationships assist a person through life experience, both positive and negative. Positive relationships with others require self-concept, social skills, social sensitivity, and acceptance of the need for independence. To interact satisfactory with others, a person must acknowledge and accept his or her limitations and strengths⁽³⁰⁾. Impaired neurological function can limit the ability to perform normal activities because oxygen demand increases during activities. Patients will depend on their family especially on their children to assist them with many functions they can no longer perform. Also patients expressed their concerns about difficulty of moving while asking assistance due to activity restriction. These findings are in accordance with Foltz (2018) who reported that patients with brain tumor feel uncomfortable when their children try to help them in their daily activities and they expressed worry when asking others to help them⁽³¹⁾.

Self-actualization is the summit of Maslow's hierarchy of need. It is the quest of reaching one's full potential as a person. Unlikely lower level need is never fully satisfied; as one grows psychologically there are always new opportunities to continue to grow. Self-actualized people tend to have needs such as trust, justice, wisdom, and meaning⁽³²⁾. Self-actualized persons have frequent occurrences of peak experiences, which are energized moments or profound happiness and harmony. According to Maslow, only a small percentage of the population reaches the level of self-actualization⁽³³⁾.

O'Brien (2015) stated that spiritual dimension may include, but is not limited to, religion. Spiritual needs include finding, meaning, hope, relatedness, forgiveness or acceptance, transcendence and creativity. Self-expression also may be important to spirituality include inner strengths, meaning and purpose, knowing and becoming. Health care systems often give spiritual concerns low priority in care planning and delivery.

This is less true in hospice organizations, where the spiritual component of care is most likely to be recognized and included⁽³⁴⁾. In the current study, most of the patients had good faith and religious beliefs according to them. But they were devoid of the sense

of hope, some of them had on top the drive for revenge from their enemies. They thought that it reflected one of there is human rights. In the same time, they could not hold these enemies responsible for their illness, except one of our patients who got convulsions following a quarrel with his client. He kept repeating damning words for his direct responsibility.

Despite all these frustrating situations the most probably false spiritual status is experienced by most patients, where they express only verbal satisfaction with their conditions while this satisfaction is not mirrored in their behaviors. This could be attributed to the culture belief and religious faith in Allah who has the upper hand in illness and cure.

The maintenance of quality of life remains a key objective in the care of patients with brain tumors. A number of tools are available but all tend to rely on patient reporting. From the work of WHO quality of life (QOL) group, there are a number of key areas that transcend culture, country and beliefs. Perhaps two of the most pertinent here are the ability of patients to maintain the presence of meaningful relationship and the ability to feel light hearted⁽³⁵⁾.

The neurosurgery nurse has a double responsibility towards patients with brain tumors especially that their family members may experience difficulty adjusting to a loved one's diagnosis and are unprepared for the caregiver role. It is the task of the multidisciplinary team not only to recommend appropriate treatment modalities, but also to acknowledge the time when comfort measures are warranted to establish a better quality of life⁽³⁶⁾.

Assessment and care of a patient with a neurological problem constitute one of the biggest challenges for many neurosurgery nurses. In basic nursing education and even in many neurosurgery nursing courses, assessment of the nervous system is frequently covered last.

In addition, the curriculum may not address the nervous system to the depth or complexity of other body systems. It is not uncommon, then, for even the experienced caregiver to feel uncertain when gathering data about the nervous system⁽³⁷⁾.

Conclusion

Identification of patients' problems and analysis of these problems are very important to the nurse to fulfill the required nursing care to provide success for brain tumor operations and either relieve or adapt the patients manifestations to accommodate with their medical condition. Based on the current study we recommend that:

- Nurses should deal with brain tumor patients as a holistic approach.
- The nurse must be knowledgeable about different skills of communication to assist and support the patients to cope with speech difficulties.

- Focused attention should be paid to patient’s health education regarding brain tumors problem as well as general pre and postoperative care.
- Provide the patients enough time by the healthcare professionals to express and discuss their concerns and needs freely.

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The Most Common Types of Cancer Treated by Radiotherapy in Tobruk, Libya

(Original Research Article)

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Abstract: This study concern wth treatment the different types of cancer by radiotherapy, and the most common type of cancer in oncology department of Medical Tobruk Centre in Libya between 2018 to 2021. In recent years, many cases of cancer have been observed in the world, and from this point of view, in this study, we searched for the most cancer in Tobruk Medical Center who received chemotherapy and radiation. Radiation therapy technology, image technology and the application of chemotherapy have evolved in the past two decades. Where radiotherapy has become an essential role and plays an important role in the series of cancer treatment after chemotherapy, and the response of patients to treatment was great, so in this study we tried to shed light on radiotherapy and the patients' at Medical Tobruk Center. In the study included 921 patients who treated by chemotherapy and radiotherap., But only 516 patients completed their follow-up to the oncology center. These patients had different types of cancer it is breast, nasopharyngeal, cervix, uterus, lung, brain and Colorectal. These patients were followed up in the oncology department at Medical Tobruk Center, where they received chemotherapy and radiotherapy. Whereas we

noticed that breast cancer is the most common in the four years, Radiation therapy has a significant role in treating breast cancer in the early stages. Further studies are required to confirm these findings.

Keywords: Oncology department at Medical Tobruk Cancer, Radiotherapy, Tobruk Libya.

1. Introduction

Changes in patterns of treatment and survival in patients with stage-stage lung, nasopharyngeal, cervical, and other non-small cell carcinomas with introduction of body radiotherapy (Dahele, et al., 2020).

Introduction of more advanced radiotherapy techniques for locally advanced breast, nasopharyngeal and cervical cancers is associated with improved quality of life and reduced symptom burden. Radiation therapy with or without chemotherapy is often the treatment of choice for patients with breast, nasopharyngeal, lung, and advanced cervical cancer.

However, it has been associated with significant organ-at-risk (OAR) toxicity, including dry mouth, dysphagia, loss of taste, weight loss, generalized body weakness, and elevated body temperature (Shafiee & Atala 2016).

The current study investigated the hypothesis that gradual reductions in radiotherapy dose improved and reduced symptom burden Final radiation therapy is standard treatment for many patients with different non-small non-small keters.

The results of treatment have improved over the past decades. It has been proven that many effective and safe treatment systems Cancer is a well-known killer of humans worldwide, and its treatments are varied and sporadically successful. (Liu & Yang 2014).

There are four main types of cancer treatments, which are surgery, chemotherapy, radiotherapy, and immunotherapy. Radiotherapy, as a primary treatment strategy, has been proven to be an effective tool in combating with cancer (Merrick et al., 2020).

Radiation therapy is a treatment procedure that uses radiation to kill malignant cells. This treatment targets rapidly reproducing cells such as those in cancer Therefore, when cancer cells are irradiated, there is a lesser effect on more slowly reproducing surrounding healthy cells (Akbari et al., 20124)

Recently, some mathematical models focusing on the treatment of cancer by radiotherapy have been presented and studied (Han et al., 2021). He focused on the dynamic behaviors of normal cells that influence cyclic radiation and establish some conditions on the permanence and extinction of normal and irradiated cells. Moreover, they obtained criteria for the existence and stability of a global convergence of the system's unique positive periodic solutions.

Belostotsky presented a mathematical model to represent the interactions between healthy and cancerous cells exposed to radiation, in which the interactions between healthy and cancerous cells were viewed as competition for bodily resources. Show four different control mechanisms for radiation delivery. They included continuous radiation, continuous radiation proportional to the immediate focus of the cancer, continuous radiation proportional to the ratio of cancer to the concentration of healthy cells, and periodic radiation. He assumed that the effect of radiation on healthy cells in the ideal case is zero and got some sufficient conditions in each case to ensure the cure or treatment of the cancer [12]. Belostotsky and Friedman developed and analyzed a mathematical model of cancer treatment by radiotherapy using control theory, in which radioactivity only affected cancer cells. Later, considering the fact that radiation may also affect healthy cells to some extent during radiotherapy, Friedman and Belostotsky extended the previous study by obfuscating previous models. They considered four types of treatment delivery: continuous, linear, feedback and cyclic, turbulent deliveries. For each case, they set some sufficient conditions for the treatment condition and treatment condition 13. only considered turbulent periodic radiation, investigated periodic radiation, it assumed that the effect of radiation on healthy cells is zero. Hence, the study of periodic radiation under conditions of influence of cancer and healthy cells by radiation is of great importance. Since radiation therapy is actually a mechanism for changing the concentrations of cancer and health cells by harvesting. Hussain (S. A., et al., 2021)

99.9% of patients undergoing BCS without chemotherapy remain compliant with the current quality measure, 25% have delays > 8 weeks to start radiation, which is associated with impaired survival. These data suggest that the current quality measure should be dichotomized into two, with or without chemotherapy, in order to impel prompt radiotherapy initiation and maximize outcomes in all patients (Bleicher et al., 2021). The GLOBOCAN 2018 statistics has estimated that across twenty world regions, there was 18.1 million new cancer cases and 9.6 million cancer deaths in 2018 (Bray et al., 2018). Lung cancer is the most frequent cancer among men, followed by prostate and colorectal cancer for incidence. Among females, breast cancer is the most commonly diagnosed cancer and the leading cause of cancer death (Sung et al., 2021). The most commonly diagnosed cancers worldwide were female breast cancer (2.26 million cases), lung (2.21) and prostate cancers (1.41); the most common causes of cancer death were lung (1.79 million deaths), liver (830000) and stomach cancers (769000) (Ferlay et al., 2021). In this

study, we collected the data of patients with cancer who received chemotherapy in Tobruk and then radiotherapy in Benghazi and returned them to complete the rest of the doses after radiotherapy and follow-up with Tobruk Medical Center.

2. Methods

We analyzed data from the Cancer Registry of Tobruk Medical Center, Department of Oncology, for 921 patients under 65 years of age with clinical stage I of several cancers including cervical, nasopharyngeal, lung and breast cancer from 2018 to 2021. Analyzes focused on patterns of chemotherapy through radiotherapy and mediated OS for patients receiving surgery, radiotherapy, or neither surgery nor radiotherapy.

Types of Cancer and Treatment

- **Breast cancer**

4 cycles adriamycin+cyclophosphamide, 4cycles Taxotare+herceptin, then refere to radiotherapy after finish return back to take remaine cycles of Herceptin.

- **Lung Cancer**

platinum based chemotherapy (cisplatin,carboplatin,)+another type of chemotherapy.

- **Cervical Cancer**

According to the stage. After hysterectomy refer to radiotherapy which two type:-

-external beam radiotherapy

-internal brachytherapy

Some patient was need cycles of chemotherapy as cisplatin avastin 5Fu taxol.

- **Brain Cancer**

focal radiotherapy with chemotherapy may needed As carboplatin,vincristin,avastin

Temozolomide alternative with radiotherapy.

- **NPC**

Patients with early or localized disease may be treated with definitive radiation therapy to the nasopharynx and elective radiation therapy to the neck Chemotherapy and radiation for locally advanced NPC As cisplatin, carboplatin, Gemzar, Taxol.

- Rectal Carcinoma

Radiotherapy was added for adjuvant chemotherapy as Folfox, xeloda, AS for the types of radiotherapy that they use, there are two types:

- External beam radiotherapy
- Internal beam radiotherapy

They used two types D2 and D3.

Data Analysis

Data were analyzed using SPSS (version 23) for Windows (Graduate Pack, version 23) and Intercooled Stata (version 10 for Windows) computer programs.

3. Results And Discussion

Data were collected from 2018 to 2021 were providing at medical tobruk centre, oncology department for pateints with different types of cancer who had treated by chemotherapy and radiotherapy in Tobruk and benghazi total of patient about 516 who have followed as shown in (Table 1).

Table 1 Total Number of Patients with Cancer.

YEARS	BREST	BRAIN	CERVIX	LUNG	NCP	CRP
2018	97	4	3	12	7	33
2019	76	9	4	17	6	47
2020	72	2	2	19	4	35
2021	30	4	3	14	2	14
TOTAL	275	19	12	62	19	129
SEX	Female	Female & male	Female	Male	Female & male	Female &male

In last four year where was the hieghest one is the breast cancer with a total 275 cases of women in last 4 years as shown in (Figure1).

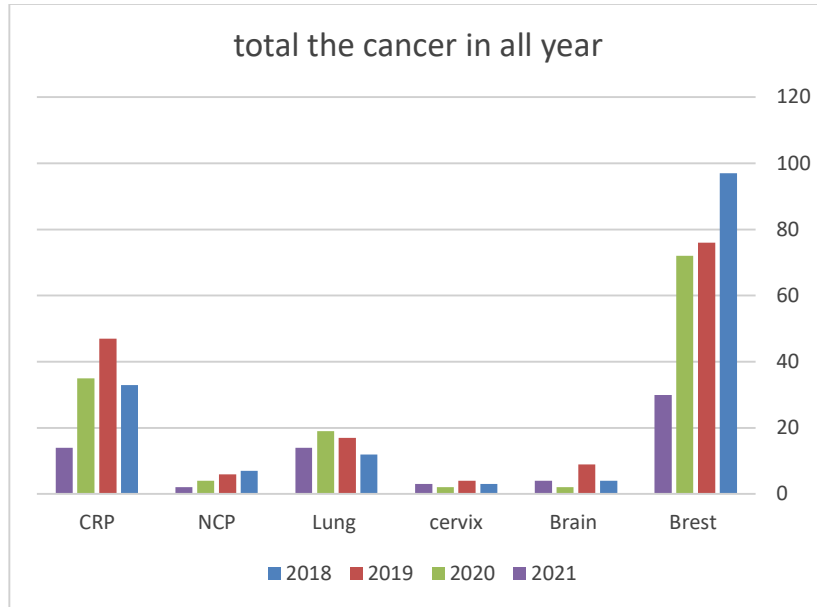
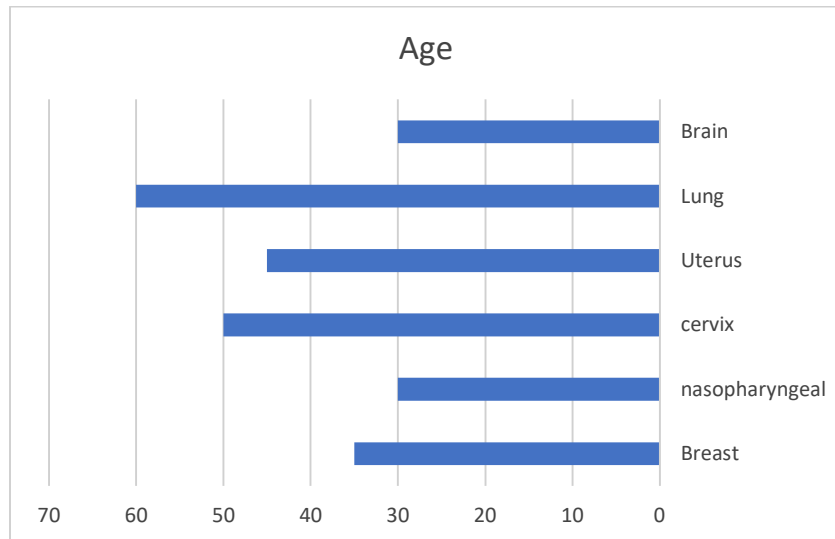


Figure 1. Types of Cancers from 2018 to 2021.

After that the colonrectal. In addition, the patients were in their thirties as in (Figure 2), and this was likely due to the unhealthy diet and the use of contraceptive drugs. They also used chemicals to a large extent compared to the past centuries, when elderly women did not use these preparations.



Figuer 2. Ratio Age to Types of Cancer.

Older men are more likely to have lung cancer, and we can suggest this to smoking, because women in Tobruk do not smoke and young men do not show the risks of smoking in the

beginning. For nasopharyngeal and brain and colorectal cancer, It is different between men and women in average age. Chemotherapy was used in Tobruk and then radiotherapy in Benghazi. The two treatments had a great role in recovery, especially breast cancer in the early stages, but with cases in the late stages and lung cancer did not give any result and it was only for pain relief or as a routine procedure. Ferlay et al., (2021) conducted studies with The most commonly diagnosed cancers were female breast cancer, lung and prostate cancers. the most common causes of cancer death were lung ((Ferlay, J., et al., 2021). That agrees with this paper in many points where the breast cancer was the highest rate, in addition the lung cancer in the third.

Sung et al., (2021) studies about the Lung cancer are the most frequent cancer among men, followed by prostate and colorectal cancer for incidence. Among females, breast cancer is the most commonly diagnosed cancer and the leading cause of cancer death (Sung et al., 2021). This agree with our study: the lung cancer common in men, the colorectal cancer is the second after breast cancer. Conducted studies with breast cancer patients who 25% have delays > 8 weeks to start radiation, which is associated with impaired survival. (Bleicher, et al., 2021). We agree with this study, as some patients with breast cancer in the late cases did not succeed with chemotherapy and radiotherapy. Therefore, we recommend early detection to save time and save patients' lives.

Conclusion

the purpose of this study is to know the effectiveness of chemotherapy and radiotherapy for patients who suffered from cancer and who were treated in Tobruk Medical Center where chemotherapy and radiotherapy played a major role. The earlier the disease was detected, the better the response to treatment, especially in breast, colorectal and nasopharyngeal cancers, but lung cancer and late stages of breast cancer did not give any result for treatment. More studies are needed to confirm these results

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Work-Related Injuries and Safety Concern among Physiotherapists in Libya: An Exploratory Study

(Original Research Article)

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Abstract

The objective of this study was to determine the prevalence of and risk factors for work-related injuries among physiotherapists in Libya. A self-administered questionnaire was sent to 80 physiotherapists in Toubrok city, and neighboring area. Unconditional logistic regression was used to study the association between job exposures and the risk for work-related injuries. The questionnaire was returned by 58 physiotherapists. Of 58 subjects who answered specific questions about work-related injuries, 52 (53.5%) were affected by work-related injuries in at least one body part. Regions most affected were the lower back, the neck, elbows, and knees. For neck pain, associations were found with: manual therapy techniques (adjusted odds ratio [OR]53.90; 95% confidence interval [CI]51.2–13.1); working in awkward or cramped positions (OR54.96; 95% CI51.3–18.7); and high psychological job demands (OR54.34; 95% CI51.2–15.0). For lower back pain, associations were found with working in awkward or cramped positions (adjusted OR56.37; 95% CI51.6–24.7); and kneeling or squatting (adjusted OR54.76; 95% CI51.4–15.9). The majority of the respondents reported work-related injuries. General physical and psychosocial work-related exposures, as well as specific therapy tasks, were strongly associated with work-related injuries. The increased prevalence of symptoms among younger physical therapists in particular underlines the need for them to have at their disposal a range of strategies to reduce risks posed by their work and avoid injury. Most importantly, there is a need for further research to identify aspects of physical therapy practice that place therapists at greatest risk and to develop methods of reducing that risk.

Keywords: Work-Related Injuries, Safety, Physiotherapists, Libya.

Introduction

Work-related injuries is a collective and descriptive term refers to the symptoms caused or aggravated by work and characterized by discomfort, impairment, disability or persistent pain (Sharan, Rajkumar, & Balakrishnan, 2018). Work-related injuries include a wide array of complains that affect muscles, ligaments, joints, and soft tissues, such as shoulder and elbow pain, neck pain, and low back pain, and other body organs and systems. Work-related injuries are among the most common work-related problems that face physiotherapists worldwide. In Europe for instance, estimations suggest that millions of physiotherapists complain of work-related injuries caused by work activities (Anyfantis & Biska, 2018). This number is much higher in the United States of America, and the Eastern Asian countries where the population is high (Vieira et al., 2016). In the middle east, there is not much published data describing these problems but there are indicators that physiotherapists in Egypt, Kuwait and the Kingdom of Saudi Arabia have similar complains as their counterparts elsewhere (Al-Eisa, Buragadda, Shaheen, Ibrahim, & Melam, 2012).

Risk factors can be generally classified into extrinsic and intrinsic factors. Physiotherapists routinely perform manual therapy, such as soft-tissue mobilization, which means that the upper limb is also exposed to risk factors associated with musculoskeletal and neurovascular disorders (Adegoke, Akodu, & Oyeyemi, 2008). In addition, these professionals routinely perform activities that involve transferring a patient (from exercise mat to chair, to parallel bar etc), assisting with activities on the exercise mat, and lifting and using cumbersome equipment (Nyland & Grimmer, 2003). These work tasks put therapists at risk for both acute and cumulative musculoskeletal pain. Extrinsic factors include the physical demands of physiotherapists to perform treatment tasks or to interact with their patients before, during, or after the treatment sessions. Usually physical demands of the physiotherapists during the sessions, include bending, twisting, and carrying heavy objects (patients or equipment). Physical demands of physiotherapist-patient interaction include; turning, positioning, dressing, seating the patient in the bed and/or chair and transferring the patient. There were different tasks: stretcher to bed, bed to chair, bed to treatment room ...etc. (Falavigna et al., 2011).

The primary intrinsic risk factor is obesity of physiotherapists. A recent study was done by Al-Eisa et al. (2012) in Egypt and Saudi Arabia found that nearly 80% of surveyed physiotherapists were obese (Al-Eisa et al., 2012). This high obesity prevalence, however, is alarming because it is much higher than the published rates in western societies such as UK 39% (Glover, 2003), Sweden 26% (Grooten, Wernstedt, & Campo, 2011), and USA 58% (Campo et al., 2008b). The high prevalence of obesity among Arab physiotherapists may be related to a sociocultural factor. Obesity among physiotherapists is closely related to the development of lower back injury due to their genoid somatotype of obesity (Østbye, Dement, & Krause, 2007).

Gynoid somatotype is commonly described as a pear shaped, where the increased accumulation of body fat is found around the waist and hips. Literature reports that physiotherapists' average body mass index is 31.7 kg/m² that exceed the American College of Sports Medicine Guidelines (ACSMG) (Naidoo & Coopoo, 2007).

Naidoo and Coopoo and others correlated the genoid somatotype of obese healthcare professionals to the prevalence of lower back injuries which is supported by many studies (Choobineh, Rajaeefard, & Neghab, 2006; Souliman, Sana I., et al., 2020). The excess body fat around the waist and hip causes anterior pelvic tilt which produces an abnormal force couple relationship between the hip extensors and flexors. Hip flexors became tight while the hip extensors are elongated and weaker (Mansfield & Neumann, 2013).

The Neck was the body part with a high frequency of work-related injuries in many studies. Salik and Ozcan (2004) reported that 26% of their study claimed neck pain or injury in the workplace (Souliman¹, Sanal, et al., 2019). According to Glover et al (2005), 25% of surveyed physiotherapists in the UK reported wrist and hand problems related to work (Glover et al., 2005). Campo et al. (2008) found a strong association between risk factors and work-related injuries of the wrist and hand due to manual physiotherapy techniques. Of the many techniques applied in physiotherapy practice, the most substantial effect was seen with higher levels of soft tissue work, such as massage and joint manipulations (Campo et al., 2008b).

Physiotherapists are exposed daily to electromagnetic radiation by operating shortwave and microwave diathermy units. Recent studies suggest that use of shortwave diathermy is associated with an excess risk of birth defects, prenatal deaths, and late spontaneous abortions among the offspring of exposed female therapists (Ouellet-Hellstrom & Stewart, 1993). Physiotherapists are exposed susceptible to infection with certain types of microbes as skin infection and other.

Materials and Methods

Data were gathered using 4-page, self-report, questionnaires. questionnaires are a commonly used tool in healthcare epidemiology research. Data was collected between January and March 2019.

The researchers randomly selected 88 physiotherapists working in hospitals and clinics in the eastern territory of Libya, mainly in the city of Tobruk. However, to meet the pre-determined sample size requirement. Also collected data in Derna, Al-Baida, Al-Marge, and Benghazi cities. 88 of physiotherapist was selected, 80 of them were determined to be eligible. Seven of them were still trainees or students have been excluded from the study. One physiotherapist was a visitor; therefore, he was excluded. Questionnaires were sent to the 80 physiotherapists who were potentially eligible. Two weeks later, a total of 58 questionnaires were returned to the principal investigators.

The project included licensed physical therapists who were graduated from an accredited university, school or college, and involved in direct patient care at least 1 hour per week at their primary position. The physiotherapists had to return both questionnaires, and they had to reside in Tobruk as a prerequisite for eligibility. Students, trainees, and visitors were excluded from the study. No other exclusion criteria were applied.

The questionnaire was formally pilot tested in 2 phases. The first phase was a panel discussion with 3 physiotherapists. Panel participants were selected by judgment sampling so that they included both expert and novice clinicians. The mean age of panel participants was 34.1 years, and the mean experience was 8.6 years. The panel included 3 qualified clinical physiotherapists (1 from Libya, 1 from Canada, and 1 from Egypt).

In response to comments by panel participants, the scaling of the highest exposure category was changed from a frequency of 20 to 15. Both during the panel discussion and during informal feedback from physiotherapists, a pain level of 4/10 was determined to be a reasonable level to differentiate minor complaints from more serious work-related pain. The second phase was a test-retest reliability comparison with other similar questionnaire found in the literature. Intraclass correlation coefficients (2-way, mixed model for absolute agreement) for test-retest stability of questions related to specific physiotherapy tasks ranged from .80 to .91.35 Questions related to general physical risk factors demonstrated moderate to good reliability.

The project included licensed physical therapists who were graduated from an accredited university, school or college, and involved in direct patient care at least 1 hour per week at their primary position. The physiotherapists had to return both questionnaires, and they had to reside in Tobrok as a prerequisite for eligibility. Students, trainees, and visitors were excluded from the study. No other exclusion criteria were applied.

Data Analysis

Data were analyzed using SPSS (version 4.0.1) for Windows (Graduate Pack, version 14.1) and Intercooled Stata (version 9.2 for Windows) computer programs. Exposure and background data and outcome data were taken from the questionnaire. Descriptive statistics were produced for all background factors, exposure factors, and outcomes. The effect of background factors on safety of workers in physiotherapy settings was analyzed using independent-sample t-tests for continuous variables and the chi-square test of association for categorical variables.

Prevalence (for each body region) was calculated by taking the number of cases in that body region and dividing it by the total number of physiotherapists who responded to the questionnaire. Incidence (for each body region) was calculated by taking the number of cases in that body region and dividing it by the number of physiotherapists who did not have a work-related problem in the same body region for at least 8 weeks prior to baseline.

Results and Discussion

Data were collected between January and March 2019. The Qualtrics software used eliminated the need for data entry, because some of the responses were sent electronically to the researchers as entered by the respondents. Descriptive statistics were then calculated. The overall prevalence and severity of work-related symptoms among the respondents were calculated and presented per group, specialty, practice setting and body part affected by injury. We used general linear models to derive age and gender, adjusted proportion of physiotherapists with work-related injury. The total number of physiotherapists that completed the entire survey was 58 out of 80 questionnaires were distributed. The response rate was

satisfactorily high at 78%. Of which, 31 were female, and 27 were male. The mean age was 33.4 + 8.1 years, with a range of 23 - 52 years. The height was 167.4 + 7.9 cm, and BMI: 32 + 2.6 kg/m². The BMI estimation of the respondents showed that 74% of the participants were overweight or obese, 22% were within the normal weight, and about 4% were underweight. In relation to respondent’s highest physiotherapy training degree, 70% had undergraduate degrees (Bachelor or diploma), 28% had master’s degrees, and 2% had other qualifications including MD, PhD, and other professional degrees. In terms of physical activity and sports, only 12% of the respondents reported doing exercise regularly, and 88% reported minimal or no regular physical activity. The background characteristics of the research subjects are presented in (Table 1).

Table 1 Demographics and Background Characteristics.

VARIABLES	NUMBER	PERCENT
SEX		
Female	31	52.1 %
Male	27	47.9 %
Age In Years (Mean ± SD)		33.4 ± 8.1
Weight In Kg (Mean ± SD)		82 ± 19.5
Height In Cm (Mean ± SD)		167.4 ± 7.9
BMI IN KG/M (MEAN ± SD)		32 ± 2.6
Physiotherapy Specialty		
Musculoskeletal Physiotherapy	18	31.3 %
Pediatrics Physiotherapy	12	20.6 %
Neurological Physiotherapy	19	32.8 %
Sports Injuries And Physiotherapy	7	12.2 %
Geriatrics Physiotherapy	2	3.4 %
Work Experience In Years (Mean ± Sd)		11.6 ± 6.4
Daily Contact Time With Patients In Hours (MEAN ± SD)		8.1 ± 4.7

Work-related injuries experienced by physiotherapists that participated in our study. A Likert scale was used, starting from “no strain” up to “most strain”. About 91% of the respondents experienced a work-related injury. A pseudo-variable called suffer score index was calculated by determining the sum of the Likert answers for each body part affected for each respondent. In figure 1 below it can be seen that most complaints and strain refer to the neck, lower back, shoulders, elbows, and knees as shown in (Fig 1).

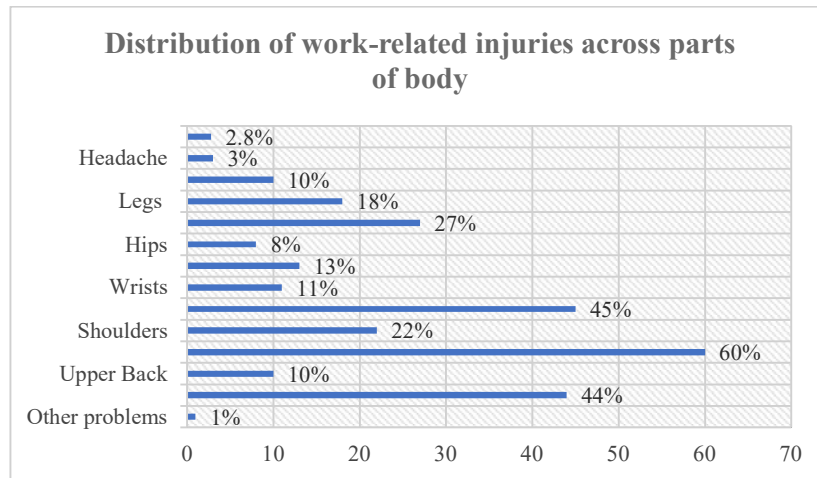


Figure 1 Distribution of Work-Related Injuries across Parts of Body.

linking work-related injuries with particular specialty areas of physical therapy practice. Physiotherapists who had ever worked in public hospital practice, musculoskeletal physiotherapy, or pediatrics had increased odds of reporting work-related injuries in the last 12 months. Physiotherapists currently working in private practice reported less work-related injuries than their counterparts in the public sector. Across all tasks, only three tasks were revealed by chi-square analysis to be related to work-related injuries. Although mobilization and manipulation techniques and other hands-on treatments were associated with increased risk of work-related injuries, the ORs obtained for mobilization and manipulation were generally higher than for other hands-on techniques. Four of the 6 increased ORs for mobilization and manipulation were greater than 2.5, whereas none of those for other hands-on techniques exceeded 2.5. Three of the 6 ORs for other hands-on treatments were less than 2.0. Electrotherapy, cardiothoracic (acute and cardiac rehabilitation), neurological (acute and long-term rehabilitation), hydrotherapy, general and outpatient rehabilitation, and education and training and administration tasks were not significantly associated with the presence of work-related injuries.

Table 2 Linking Work-Related Injuries with Particular Physiotherapy Practice.

WORK ACTIVITY	NUMBER	PERCENT
Manual Therapy Techniques	21	36.2 %
Maintaining A Position For A Long Time	14	24.1 %
Repeated Activities	8	13.8 %
Bending	11	18.9 %
Lifting Heavy Objects	26	13.1
Working In A Bad Position	27	44.8 %
Transferring A Patient	17	29.3 %

Squatting	10	34.4 %
Performing Overhead Activities	7	12 %
Walking	17	29.3 %
Climbing Stairs	34	58.6 %
Reaching	15	25.8 %

Work-related injuries with gender (male vs. female) wehars statistical analysis (Spearman’s rank-order correlation) revealed that there is a significant difference in suffer score index between men and women. About 78% of female respondents reported having at least one work-related injury. Although men have been identified to work more and experience more working hours in a standing position, females appear to have almost double of work-related injuries than their men colleagues due to the structural difference between them. In additional, statistical analysis showed that there is an apparent correlation of gender and musculoskeletal injuries (LBP, Neck pain, Shoulder pain, and elbow pain) when certain acts such as massage are performed as shown in (Figure 2).

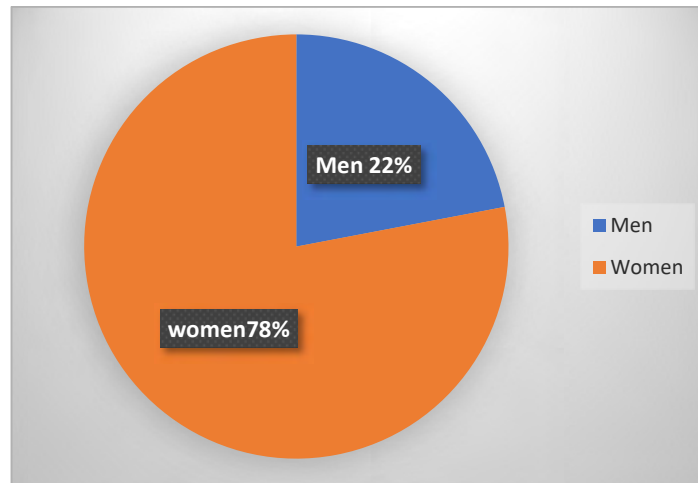


Figure 2. Comparison of Work-Related Injuries between Men and Women.

Work-related injuries and clinical settings wehars respondents who reported their most serious injury (n = 58) were asked in which clinical setting they were working when their symptoms first appeared; those participants who responded were undergone further statistical analyses. Clinical setting was significantly related to respondents’ most serious injury (P < 0.001).

Respondents reported that their most significant injury occurred while working in general or public hospitals(56%), the outpatient clinics (26%), and the inpatients care (10%). The relationship between type of injury (e.g. spinal, upper limb/lower limb problems) and clinical setting was evaluated, and the effect of clinical setting was found to be significant (P < 0.001).

A higher proportion of upper limb injuries occurred among respondents in public hospitals and in outpatient clinics. Of all respondents whose major or most significant injury had been to the wrist or hand, first experienced symptoms while working in public hospitals, or in outpatient clinics.

This increased to 60% for respondents whose most significant injury had been to their lower back. Of respondents reporting low back problems as their most serious injury, outpatient clinics was the setting for first onset of symptoms for 18%, followed by inpatients (17%), elderly care (14%) and orthopedics (11%). As shown (Figure 3).

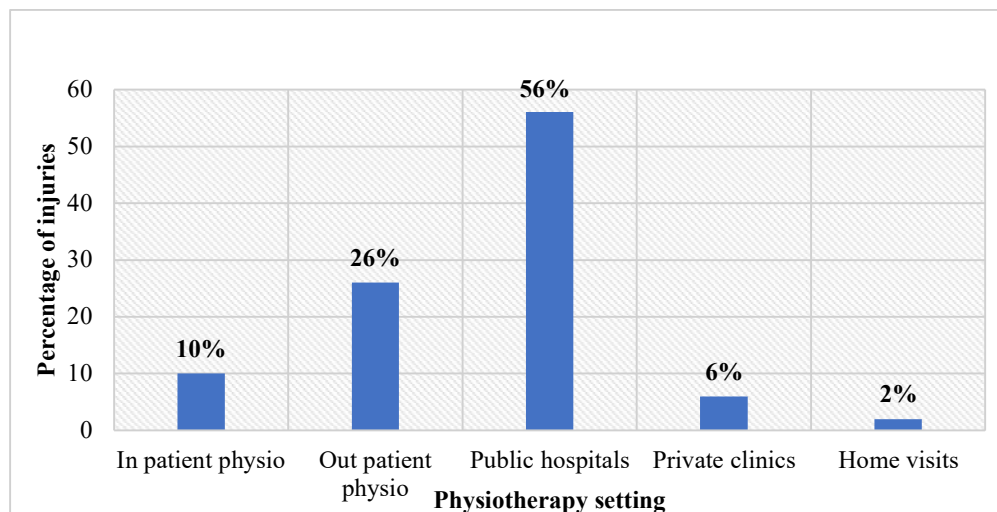


Figure 3 Type of Injury by Clinical Setting.

Holder et al (1999) where's conducted studies at least one-quarter of working professionals are affected by long standing health problems that limit everyday activities while this present studies about 91% of the respondents experienced had a work-related injury. Sharan, Rajkumar, & Balakrishnan, (2018), Al-Eisa, Buragadda, Shaheen, Ibrahim, & Melam, (2012), Campo, Weiser, Koenig, & Nordin, 2008b; Salik & Özcan, (2004) and Vieira et al., (2016) studied work-related injuries include a wide array of complains that affect muscles, ligaments, joints, and soft tissues work-related injuries are among the most common work-related problems that face physiotherapists worldwide that agreement with this study whereas was most common complaint in lower back, shoulder, neck and knee.

Darragh et al. (2009) documented that physiotherapists cite work-related injuries, such as low back pain, upper and lower limbs injuries are the key triggers to premature retirement (Darragh, Huddleston, & King, 2009). In this study about 60% of injuries in lower back.

Cromie et al.,(2000) reported an annual prevalence of low back symptoms of 63%, with 48% of injured therapists reporting the low back to be their most serious work-related problem. Salik and Ozcan (2004) reported that 26% of their study claimed neck pain or injury in the workplace. In this study about 44% had neck injury. According to Glover et al (2005) 25% of surveyed physiotherapists in the UK reported wrist and hand problems related to work (Glover et al., 2005).

In this study about 44% had neck injury. According to Glover et al (2005) 25% of surveyed physiotherapists in the UK reported wrist and hand problems related to work (Glover et al., 2005). In this study about 11% wrist injury and 13% fingers injury. Manual therapy has also been studied as a risk factor for wrist and hand injuries by Wajon et al. and Gyer et al. (Gyer, Michael, & Inklebarger, 2018; Wajon, Ada, & Refshauge, 2007).

According to the literature the work-related activities that most commonly lead to injury in health professionals are lifting heavy equipment and patients, transferring patient, maintaining the same posture for a long period, manual therapy practices, responding to patients' sudden movements, and repeated movements (Anyfantis & Biska, 2018). In this study the Working in a bad Position, manual therapy techniques, transferring a patient, maintaining a position for a long time, and lifeting heavy objects were 44.8 %, 36.2 %,29.3, 24.1 %, and 13.1%, respectively.

Conclusion

The purpose of this study was to establish baseline data on work-related problems experienced by physiotherapists in Libya whereas our questionnaire reveals that the work-related injuries in physiotherapists in Libya are similar to rates reported in other countries.

Physiotherapists in our country suffer similar work-related injuries as their counterparts elsewhere, despite different legal working conditions and cultural differences. This study provides data related to work-related injuries in physiotherapists in Libya. Further studies can be very useful if it researches prevalence of work-related injuries in physiotherapists who have employed different working conditions.

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Assessment of Radiation Protection Procedures Among Radiographers in Radiology Departments in Tobruk City

(Original Research Article)

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Abstract

The aim of the study is to assess the application of radiation protection among radiographers at radiology departments in Tobruk hospitals. A cross-sectional survey was conducted in general and private Tobruk hospitals, 30 radiographers who have been working in radiology departments enrolled in a syndicate of radiographers have participated in this study. Frequency distributions and cross-tabulations were used in the analysis. The results showed that the majority of the radiographers, 16 (51.61%) aged between 31-40 years, and 27 (87.09%), had bachelor's degrees in medical imaging programme. Only 8 (25.80%) underwent a primary examination. 28 (90.32%) answered that there is no radiation protection specialist. 30 (96.77%) do not have a personal dosimeter to monitor their level of radiation exposure. 23 (74.20%) and 26 (87%) answered that calibration of the x-ray machine and radiation survey of the workplace have not been regularly done, respectively. 23 (74.19%) never experienced any practice programme for radiation protection. Most of the radiographers stand usually behind a protective barrier. There is a strong need to reinforce radiation safety rules that should include personal dosimeter monitoring, medical surveillance, and medical intervention. It is suggested that worker education be increased, and short courses such as dosimetry and radiation protection performance are implemented.

Keywords: Radiation Protection, Radiographers, Radiology Department, Tobruk.

Introduction

Radiology plays an important role in disease diagnosis and treatment. The majority of patients who visit hospitals are required to have medical imaging procedures (1). This procedure involving the utilization of ionizing radiation, in a particular x-ray that has potentially hazardous after high doses of radiation or long period exposure (2). There is abundant evidence that even low doses of radiation can result in mutations and cancers due to stochastic and deterministic effects of radiation (3).

The purpose of the National Council on Radiation Protection recommendations is to protect both general public and the radiological team, The most important recommendation are those involving radiation dose limits DLs, which are currently for occupational radiation dose limits

is 50 mSv for stochastic effects of radiation, 150mSv for deterministic effects, the DLs for the extremities are 500 mSv/year (50 rem/yr) and 5mSv/year for public exposures (2,3).

Referring physicians and radiology staff should team up to reduce the radiation risks associated with radiologic exams. Before performing a medical imaging (4), radiation technologist must justify and optimize the exposures of X-ray and they should be know how-to protect themselves and public from radiation exposure risks. This necessitates a sufficient level of understanding of the radiation detrimental effects and how-to mitigate that risks through via kept radiation exposure as low as reasonably achievable (ALARA) and does not exceed dose limits specified for individuals (5).

Several previous studies had assessed radiation protection international radiographers (1,2,5,6,7). However, knowledge, awareness, and attitude toward these applications among Tobruk radiographers have thus far not been assessed. The aim of the study was to assess the application of radiation protection procedures among radiographers (in general or private) health care centers of Tobruk.

Materials And Methods

A Self-Structured Questionnaire

The study was a self-structured questionnaire that was prepared and conducted with a sample of 31 radiographers enrolled in a syndicate of radiographers in Tobruk. Radiographers who have been working in the radiology departments at Tobruk Medical Center (the central government teaching hospital), district, sub-district primary health centers, and non-governmental clinics were invited to participate in this study, which included general X-ray imaging, CT, and fluoroscopy.

The participants were asked to answer questions on the questionnaire, after the aims of the study were explained and immediately collected from the participants, then the data was analyzed later. A demographic features section variables, a general radiation protection section, radiation survey and periodic calibration of equipment section, radiation protection procedures section, and practice of radiation protection were all included in the questionnaire appendix. The participants had instructions to not answer the questionnaire if they had previously filled it out. All questions were in a multiple choice format.

The study questions were selected from previously published questionnaires (1,2,5,6,7,8). The questionnaire was available in Arabic. Structured questionnaires were used to collect data. Frequency distributions and cross tabulations were used for analysis.

Results

Gender and Age Distribution

The results showed that the participants were 13 (41.93%) female and 18 (58.06%) male. As shown in Table-1, 12 (36.70%) were between the ages of 21 and 30, 16 (51.61%) were

between the ages of 31 and 40, 2 (6.45%) were between the ages of 41 and 50, and 1 (3.22%) were between the ages of 51 and 60.

Work Experience and Qualifications

It was found that 11 (7 male, 4 female) (35.48%) of the participants had working experience ranging between 1-5 years, 6 (3 male, 3 female) (19.35%) with experience of 6-10 years, 11 (6 male, 5 female) (35.48) between 11-15 years, and 1 (3.22) between 16-20 years, and 2 (6.45%) had years of work more than 20. A large majority of the radiographers were 27 (87.09%), had bachelor's degrees in medical imaging programme, only 2 (6.45%), had a master's degree or higher, Table -1.

Table-1. Descriptive Demographic Information for Radiographers.

Demographic Profile	n= 31	%
Gender		
Male	18	58.06
Female	13	41.93
Age (in year)		
21-30	12	38.70
31-40	16	51.61
41-50	2	6.45
51-60	1	3.22
Education		
High School	0	0
Bachelor degree	27	87.09
Master or higher	2	6.45
Other	2	6.45
experience (in year)		
1-5	11	35.48
6 – 10	6	19.35
11- 15	11	35.48
16-20	1	3.22
More than 20	2	6.45

Radiation Protection Procedures

28 (90.32%) of the participants did not conduct primitive or periodic medical examinations for the duration of their work, while 3 (9.67%) only got that examination. The great majority 28 (90.32%) answered that there is no health physicist (radiation protection specialist) and 30 (96.77%) do not have a personal dosimeter to monitor their level of radiation exposure. Only 8 (25.80%) of participants underwent a practice programme of radiation protection associated with their organization, while 23 (74.20%) never experienced any practice program for radiation protection, table 2.

Table -2: Primary and Periodic Examination, Radiation Responsible, and Dosimeter Supply

Primitive Medical Examination	Number	%
Yes	3	9.67
No	28	90.32
Periodic Medical Examination		
6- 12 months	2	6.45
7 - 12 months	0	00
1 – 2 years	1	3.22
2 – 5 years	0	00
Never Done	28	90.32
Radiation Protection Responsible		
Yes	3	9.67
No	28	90.32
Supply Radiation Dosimeter		
Yes	1	3.22
No	30	96.77
Practice of Radiation Protection Programme in The Organization		
Yes	8	25.80
No	23	74.20

Survey Radiation and X-ray Units Calibration

It is well known that a survey of radiation and calibration of x-ray machines are necessary to protect workers, especially radiographers, from radiation exposure (9). But found that 23 (74.20%) of the participants answered that there was no periodic radiation survey, while 26 (87%) noticed that all radiation devices were not calibrated, Table-3.

Table-3: Periodic Survey of Radiation and X-ray Units Calibration

Periodic radiation Survey (Done)	number	%
Yes	1	3.22
No	23	74.20
Maybe	7	22.58
Calibration of X-ray Machine (Done)		
Once monthly	2	6.45
1 – 6 months	2	6.45
6 – 12 months	1	3.22
1 – 5 years	0	00
Never Done	26	83.87

Practice of Radiation Protection

Among participants, only 8 (25.80%) of radiographers had undergone a training course in the basics of medical radiation protection, while 23 (74.19%) never experienced any practice program for radiation protection. None of the radiographers were using a dosimeter. As the distance between the source of radiation and the person increases, radiation exposure decreases

rapidly (9). Therefore, a great majority of participants 22 (70.96%) keep a suitable distance between them and the source of radiation, and most of the radiographers usually stand behind a protective barrier. The dose from the radiation source is reduced by minimizing or limiting the exposure time (9). Accordingly, 15 (48.38%) of radiographers reduce the time of exposure, 11 (35.48%) sometimes care, and 5 (16.12%) did not care. 10 (32.25%) always wear a lead apron. On the other hand, 18 (58.06) use it sometimes.

Table- 4: Practice of Radiation Safety

Use of Dosimeter	number	%
Yes	0	0.00
No	31	100
Sometimes	0	0.00
Undergone Training about Radiation Safety		
Yes	8	25.80
No	23	74.19
Increase the Distance from The Source of Radiation		
Yes	16	51.61
No	1	3.22
Sometimes	14	45.16
The distance from X-ray source		
1-2 m	2	6.45
5 m	7	22.58
Behind X-ray control room	22	70.96
Do not care	0	00
Reduce the time Exposure to Radiation		
Yes	15	48.38
No	5	16.12
Sometimes	11	35.48
use of lead apron.		
Yes	10	32.25
No	3	9.67
Sometimes	18	58.06

Discussion

Radiation protection aims to balance between the risks and benefits of ionizing radiation. According to the Recommendations of the International Commission on Radiological Protection (ICRP)(10), medical surveillance of radiation-exposed workers should be based on occupational medicine principles, which aim to "assess workers' health, to aid in ensuring initial and continuing compatibility between workers' health and the conditions of their work; and to provide a baseline of information useful in the case of accidental exposure or occupational disease" (11). Medical surveillance should be tailored to the nature of the job and the health conditions that the worker must meet in order to complete the task effectively (11). Occupational radiation exposure was not measured in all hospitals during the study survey because no one among the radiographers used a dosimeter. In addition to that, medical examinations of workers were not done. Because the severity does not depend on the magnitude

of the absorbed dose and there is no safe threshold below which the risk is zero, increasing exposure to ionizing radiation at low dose rates is known to raise the excess relative rate of cancer death (12). In spite of this, practice and education have a direct impact on reducing the health risks connected with radiation exposure. However, the study showed that the majority of the participants did not practice a radiation protection program, and the percentage of radiographers that had undergone a training course in radiation protection was quite low. Dose limitation for occupationally exposed individuals is required to reduce danger and assure radiographer safety, in addition to implementing the basic principles of radiation protection, maximizing distance, minimizing time, and using shielding.

Conclusion

The present study shows that the majority of the radiographers did not undergo any medical examination or did not practice a radiation safety programme. Therefore, there is a strong need to reinforce radiation safety rules that should include personal dosimeter monitoring, medical surveillance, and medical intervention. Standard operating procedures and radiation safety manuals should be made available to all health facilities. Moreover, specific actions must be set up in order to increase radiation safety and to promote education in radiation protection with the purpose of ensuring radiographers' safety.

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**Results of a Prospective Multicenter Study Evaluating the Incidence of
Postoperative Hypocalcaemia following Total Thyroidectomy
(Original Research Article)**

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Abstract

Postoperative hypocalcaemia is a serious complication following a surgery on thyroid gland and is generally thought of to be due to low parathyroid hormone as a result of inhibition of parathyroid gland function. It can either be transient or permanent, in case of which lifelong calcium supplementation is required. Total thyroidectomy may be associated with potential risk of removal of 2,3 or even 4 parathyroid glands, in addition to the risk of circulatory compromise of the parathyroid glands due to manipulation of its vessels intraoperatively. This is a prospective study conducted for duration of 3 years and includes 100 consenting in patients undergoing total thyroidectomy aimed to evaluate the incidence of hypocalcaemia following total thyroidectomy. Data was collected by meticulous history taking, careful clinical examination, appropriate radiological and haematological investigations, including serum calcium. Follow-up of the cases was done for detection of postoperative hypocalcemia and if present was confirmed by assessing ionized calcium. Postoperative hypocalcemia occurred in 8 (8%) patients confirmed by decrease ionized calcium level. The peak age group in which the patients presented was between 40-60 years (46%). The commonest clinical diagnosis was that of solitary thyroid nodule (50%) followed by multinodular goiter (38%). All of the patients who developed postoperative hypocalcaemia were females and none of them developed symptomatic hypocalcaemia. Although uncommon, post-operative hypocalcaemia is seen following total thyroidectomy. In this study, all of the patients who developed postoperative hypocalcaemia became normocalcemic by postoperative day 3. Following total thyroidectomy postoperative hypocalcaemia is transient and usually requires no treatment.

Keywords: Total Thyroidectomy; Incidence; Postoperative complications; Hypocalcemia; Hypoparathyroidism.

Introduction

Hypocalcemia is a common post-operative complication following thyroid surgeries. It can be symptomatic or asymptomatic and it usually occurs in the first few days after the surgery ^{1,2}. Development of post-operative hypocalcaemia is multifactorial. Factors linked to the development of post-operative hypocalcaemia include surgical technique, iatrogenic parathyroid damage (injury, edema, infarction, ischemia), extent of thyroidectomy, hyperthyroidism, malignancy, patient gender, perioperative serum calcium drop, presence of thyroiditis, diabetes, number of parathyroid glands identified intraoperatively ^{3,4,5}.

In less extensive thyroid surgeries, post-operative hypocalcaemia if present is transient and usually requires no treatment. Acute hypocalcaemia may endanger life. Hence close monitoring in the postoperative period, early identification of signs and symptoms of hypocalcaemia and effective management is crucial in the management of post thyroidectomy hypocalcaemia ⁶.

Hypocalcaemia can be defined as serum calcium level lower than 8.5 mg/dl and ionized calcium level lower than 4.6 mg/dl. Based on symptoms hypocalcaemia can be further classified into: asymptomatic, moderate hypocalcaemia with numbness, tetany, Chovestek's sign, Trousseau's sign, and severe hypocalcaemia with ECG changes (U waves, QT prolongation) or bronchospasm.

With regard to duration: temporary hypocalcaemia which lasts for less than 6 months duration and permanent hypocalcaemia that lasts for more than 6 months. ¹ Asymptomatic hypocalcaemia can be managed by per oral replacement of calcium starting with low dose and titrate according to 24 hours serum calcium assessment.

Moderate hypocalcaemia can be treated in general ward with initial high dose of oral calcium along with calcitriol supplementation (0.5 mcg/day) ². Patients with severe hypocalcaemia should be treated in intensive care unit with intravenous calcium gluconate (10 ml calcium gluconate is diluted in 100ml normal saline and infused over 15 minutes intravenously) with frequent monitoring of serum calcium levels and continuous cardiac monitoring is done. Once normocalcaemia is achieved, switch over to oral calcium supplementation with Vitamin D. ¹

Various studies regarding serial calcium estimation and analysis postoperatively and the prediction value of post thyroidectomy hypocalcaemia show varying results. But the cost factor of the parathormone estimation may necessitate the use of calcium estimation even in small health care delivery systems.

Study conducted by Ancuta Leahu et al shows that patients with positive calcium trend ie, rise of postoperative calcium levels on serial estimation and normocalcaemic pattern excludes hypocalcaemia successfully in 96.2% of patients. The same study shows that the patients with negative calcium trend ie, a serial fall in serum calcium level after thyroid surgeries may result in hypocalcaemia in 51.6% of patients. From these results he concluded that patients with positive calcium trend can be discharged earlier without the fear of hypocalcaemia and patients with negative calcium trends have to be monitored for some more days for hypocalcaemia. ¹

In order to prevent post thyroidectomy hypocalcaemia, the surgeon must have adequate knowledge about surgical anatomy and embryology of thyroid and parathyroid glands. The surgeon must ensure good exposure of the operating field with good light source.⁷ Perfect hemostasis maintained for identification of parathyroids in the operating field with naked eyes.

Meticulous dissection should be done throughout the procedure. Prompt recognition of parathyroids by size, colour and location. In addition to careful identify and protect the blood supply to the parathyroids by ligation of inferior thyroid artery at its terminal branch level. Moreover, avoid parathyroid hematoma and excessive suction in the field.

In case of accidental injury to parathyroid glands where the perfusion of the gland is doubtful resulting in colour change, immediate parathyroid auto-transplantation in the same side sternocleidomastoid must be performed. Close postoperative follow up and early diagnosis and management also play a crucial role in post thyroidectomy hypocalcaemia. ⁵

Methods

Data Collection

All patients above the age of 20 years admitted in male and female surgery wards of multicentres medical hospitals at the western parts of Libya (Derna, Al-Qubba and Umm Ar Rizam) who underwent total and hemi-thyroidectomy from November 2018 till August 2021. This is a prospective study conducted for a duration of 3 years and includes 100 consenting in-patients undergoing total thyroidectomy.

Data were collected by meticulous history taking, careful clinical examination, and appropriate radiological and haematological investigations, including serum calcium level. Follow-up of the cases was done for detection of post-operative hypocalcaemia and if present was confirmed by assessing ionized calcium and parathormone levels. Patients with pre-existing hypocalcaemia and primary parathyroid pathology were excluded from this study.

Results

The present prospective study was done on 100 patients who fit into the inclusion and exclusion criteria and had undergone total thyroidectomy at three Medical centers across eastern part of Libya from November 2018 till August 2021.

In this study the youngest patient was 20 years old whereas the oldest patient was 75 years old. The average age was 42.1 years (Figure 1).

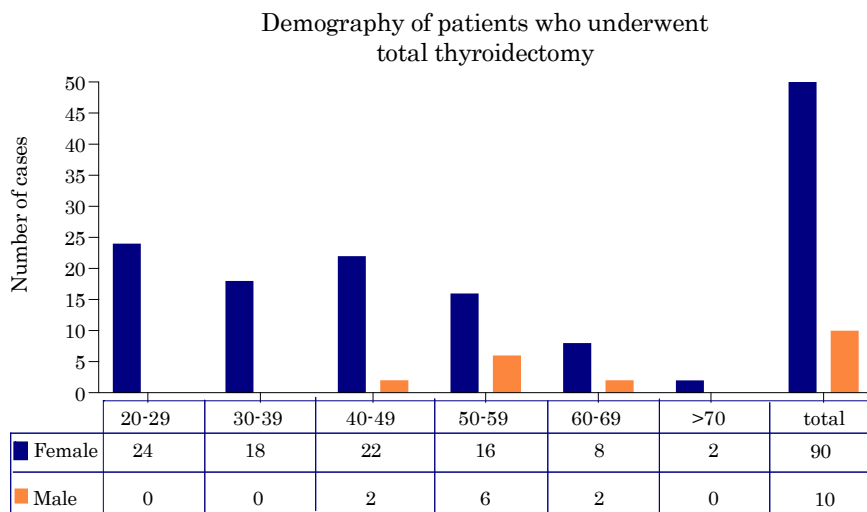


Figure 1: Age Distribution of the Patients in Years.

Out of the 100 patients, studied 90 were female whereas 10 were males with a female to male ratio of 9:1 (Figure 2).

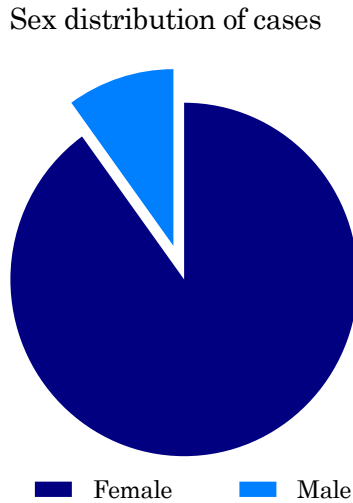


Figure 2: Sex Distribution of the Patients in Years.

Half of the patients had a clinical diagnosis of solitary thyroid nodule while the next most common diagnosis was that of multinodular goitre with 38%. Patients with toxic goitre, colloid goitre and Grave’s disease made up 4% each of the cohort (Figure 3).

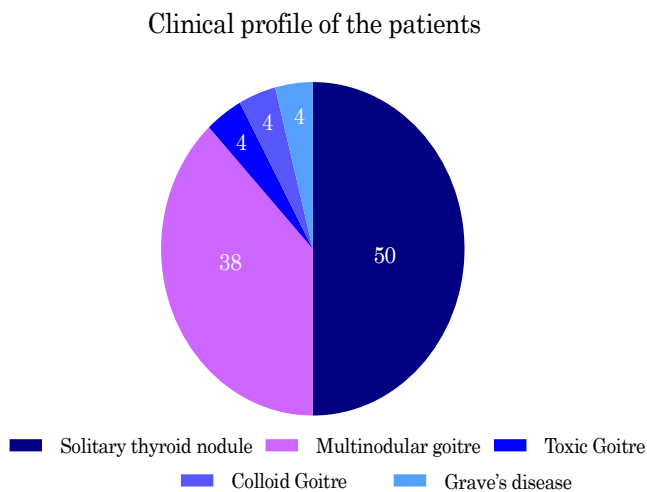


Figure 3: The Clinical Profile of Patients Who Underwent Total Thyroidectomy.

Majority of the patients (86%) had presented with a swelling in the anterior aspect of the neck, the next most common presentation was that of a swelling in the anterior aspect of the neck

associated with pain (9%) (Figure4).

Clinical presentation of the patients

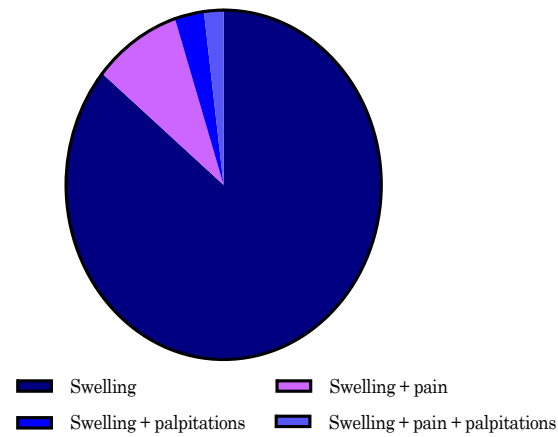


Figure 4: The Clinical Profile of Patients Who Underwent Total Thyroidectomy.

All 100 cases had undergone total thyroidectomy. Most of the patients (86%) had a hospital stay of less than 2 days.

4 patients had an extended postoperative stay of 3-5 days due to other complications like surgical site infection and hematoma formation (Figure 5).

Duration of hospital stay following surgery

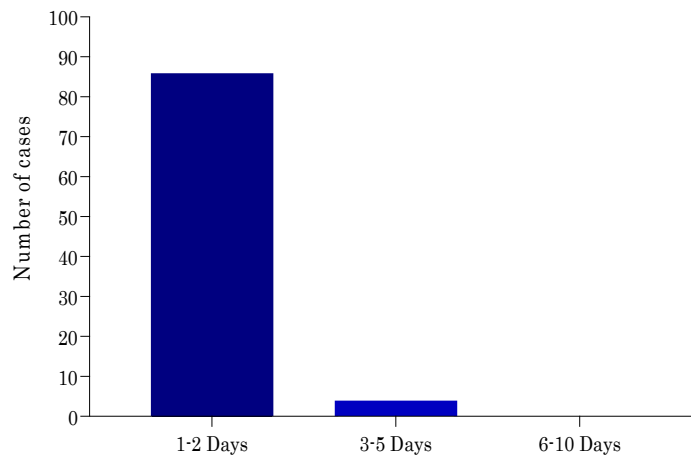


Figure 5: Duration of Hospital Stay following Surgery.

Two of the patients who had hypocalcaemia belonged to the age group of 50-59 years were operated for recurrence (Figure 6).

Out of the 8 patients who had post-operative hypocalcaemia, 6 had undergone total

thyroidectomy and had a clinical diagnosis of multinodular goitre and 2 had undergone total thyroidectomy with a clinical diagnosis of papillary thyroid cancer (Figure 7).

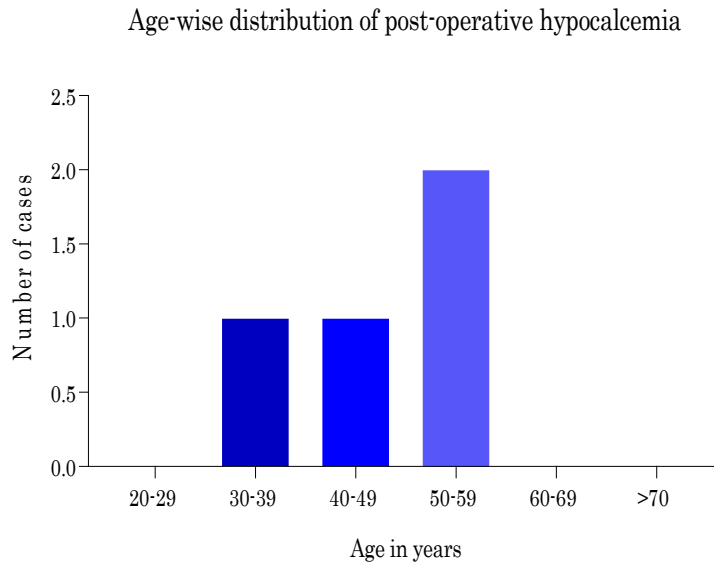


Figure 6: Age Distribution of the Patients in Years.

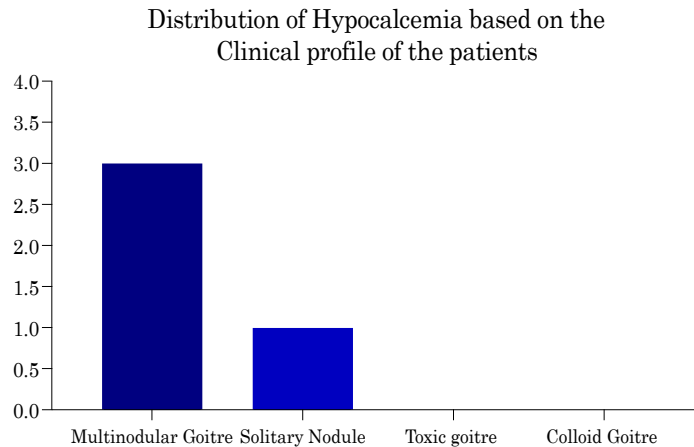


Figure 7: Distribution of Hypocalcemia Based on the Clinical Profile of the Patients

Trend of Hypocalcaemia in the Postoperative Period

Out of the total 100 patients, 8 female patients developed post-operative hypocalcaemia as determined by the corrected calcium levels done on post-operative day 0. This was confirmed by ionized calcium and parathormone levels, which were also found to be low. All 8 of the patients were asymptomatic and their corrected calcium levels normalized by post-operative day 3. None of the patients were treated for their hypocalcaemia (Figure 8). In all of the patients who were diagnosed to have postoperative hypocalcaemia on the basis of corrected calcium levels done on postoperative day 0, both ionized calcium and parathormone were also

decreased.

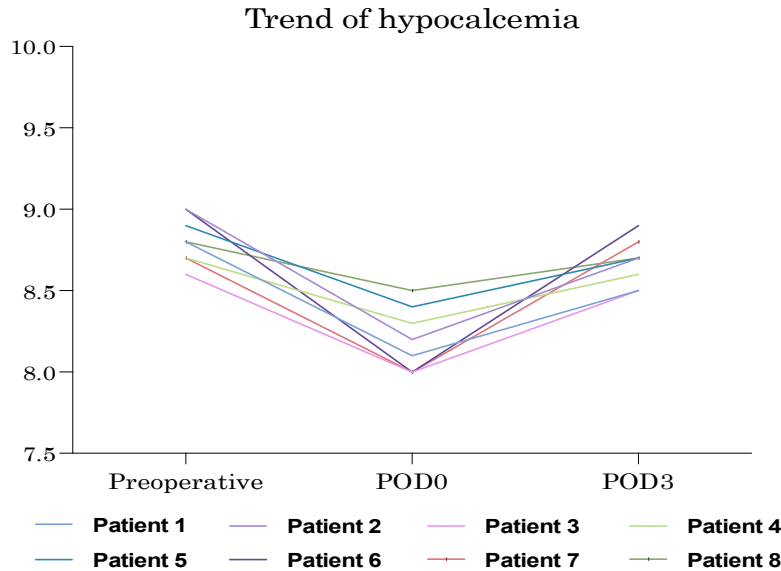


Figure 8: Trend of Hypocalcaemia Based on the Operative Day.

Discussion

Post-thyroidectomy hypocalcaemia is one of the most common complications². According to the literature, post-thyroidectomy hypocalcaemia occurs in 50–68% of patients^{3,4}. In our study, Post-thyroidectomy hypocalcaemia developed in 8% of the patients. This study includes patients with both benign and malignant thyroid conditions. In a study done by Liu et al there was a similar mean age of 46 years in a cohort of patients with benign thyroid diseases⁵. Most of the patients in this study were female with a female to male ratio of 9:1. This is similar to some studies, like that done by Limonard et al⁶, but is slightly different than other series, mostly Western in which the male ratio is slightly higher, but with a female preponderance nonetheless^{7,8}. The effects of female gonadal hormones and X chromosome inactivation on thyroid gland and immune system greatly contribute to the female predilection of autoimmune thyroid disease. The former mainly include prolactin and estrogen. The direct actions of estrogen on the thyroid tissue contribute to the development of thyroid goiter, nodule and cancer in women⁹. The clinical diagnosis of the patients who presented were solitary nodule thyroid (50%), multinodular goitre (38%), toxic goitre (4%), colloid goitre (4%) and Grave's disease (4%). This in contrast to most other studies done, in which multinodular goitre had a higher prevalence^{10,11,12}. This could be explained due to the fact that these studies were done in a predominantly western cohort consisting of Caucasian patients.

In this study out of the total cohort of 50 patients, 4 patients (8%) developed post-operative hypocalcemia on post-operative day 0, as evidenced by the fall in corrected calcium levels.

This was further confirmed by assessing ionized calcium and parathormone levels, both of which were low. By the third post-operative day calcium levels normalized. None of these patients were symptomatic and did not receive calcium correction in any form. In a study done by John et. al. in 1966 a similar trend was observed with a serum calcium falling by the first post-operative day and subsequently normalizing¹³. Hypocalcaemia is a common complication after thyroid surgery. It usually occurs in first days after surgery and it can be symptomatic or asymptomatic. The frequency of transient hyperparathyroidism after thyroid surgery is between 6.9 and 49%. The studies showing lesser incidence of post-operative hypocalcaemia included more patients who had undergone less extensive thyroid surgery whereas those studies which showed higher incidence of hypocalcaemia had included patients who had undergone^{14,15,16,17,18,19} more extensive thyroid surgery. Variability of incidence rates of post-operative hypocalcaemia could also be explained due to different authors applying differing definitions of hypocalcaemia and lack of a single standard definition.

Post-operative hypocalcaemia after thyroid surgery is not properly understood although it is thought to be multifactorial. These factors include surgical technique followed and iatrogenic damage to the parathyroid which can be due to direct injury, edema, infarction or ischemia. Other factors which can lead to hypocalcaemia include extent of thyroidectomy, hyperthyroidism, malignancy, patient gender, perioperative serum calcium drop, presence of thyroiditis and number of identified parathyroid glands intraoperatively. Post-operative hypocalcaemia may be attributed to temporary hypoparathyroidism caused by reversible ischemia to the parathyroid glands or hypothermia to the glands. Most authors believe that post thyroidectomy hypoparathyroidism occurs because of ischemia secondary to ligation of inferior thyroid artery. This is a logical inference, as the blood supply to parathyroid glands comes mainly from this vessel.^{20,21,22} post-operative hypocalcaemia may also result from non-specific hemodilution that occurs due to stress of surgery.^{23,24,25} Some studies have shown that a release of calcitonin in the immediate post-operative period could explain the causation of transient hypocalcaemia, whereas a few other studies have refuted this. It has been suggested that when subtotal thyroidectomy is done in patients with hyperthyroidism, post-operative hypocalcaemia may result due to sudden reversal of negative bone and calcium balance (hungry bone syndrome).²⁶ But all of the patients who undergo thyroid surgery are rendered euthyroid hence their osteodystrophy would have been corrected, hence going against the above hypothesis. However in this study we were unable to fully study the relationship between hyperthyroidism and post-operative hypocalcaemia.

Another suggested cause of post-operative hypocalcaemia includes unilateral absence of parathyroid glands or the presence of one gland on one side, with inadvertent removal of the parathyroid glands present on the other side. This is seen in Lobdell-DiGeorge syndrome which can present with approximately 38 anomalous combinations. But this is a rare case and the hypocalcaemia in this case would either be transient or permanent hypocalcaemia depending upon whether the intact lobe has a single or no parathyroids.²⁷ Most studies underline the significance of expertise and surgeon's experience. Hypocalcaemia in the post-operative period

was more commonly seen in the female gender.^{13,15,28,29} Although other studies showed that gender has no significant effect on the incidence of hypocalcaemia.^{19,30,31} In our study all of the patients who developed hypocalcaemia were female.

According to literature gender has been identified as a significant risk factor for hypocalcaemia. Many previous studies tried to explain the higher prevalence of post-operative hypocalcaemia in females; they suggested that the disparity could be due to the effects of sex steroids on PTH secretion, genetic variation among cell-signaling pathways or anatomic differences that can cause more frequent iatrogenic damages because of a more diminutive operative field.³² Some studies identified low preoperative level of serum calcium as a risk factor for the development of transient hypocalcaemia.^{33,34,35,36} Whereas in this study, no such difference has been identified between mean preoperative serum calcium level in early hypocalcaemia group and in normocalcemic group.

In this study, hyperthyroidism did not appear to be significantly related to the development of post-operative transient hypocalcaemia. This is corroborated by the studies done by Ozemir et al in 2016 and Noureldine et al in 2014.^{37,38} On the other hand in a few other studies hyperthyroidisms has been linked to the development of post-operative hypocalcaemia.^{39,40,41} This could be due to the larger size of thyroid gland in thyrotoxicosis which makes operating on it a much more challenging prospect. In this study all the 8 the hypocalcaemia patients who had undergone total thyroidectomy had substantially large multinodular goitres. The extent of thyroidectomy and the surgical technique followed are invariably linked to parathyroid injury, edema, infarction, ischemia or incidental parathyroidectomy.^{14,41,42} Trying to identify the recurrent laryngeal nerve and dissection around the parathyroid glands lead to edematous venous congestion. Another cause of venous congestion is ligation of thyroid veins. Eventually venous stasis reduces parathyroid function and may lead to transient hypocalcaemia.²⁰ In this study the incidence of transient hypocalcaemia was much lower than other studies since the cohort consisted only of patients who had undergone less extensive thyroid surgery. The importance of intra operative identification of all 4 parathyroid glands is controversial. Some authors recommend routine physical identification and preservation of as many of parathyroid glands as possible.⁴⁰ Other authors have questioned this strategy.^{21,33,43,44,45} To avoid potential injury to the parathyroid glands, every surgeon must be thoroughly aware of their anatomic complexity that contributes to difficulty of identification and possible injury. Strict adherence to capsular dissection represents the optimum method for safe preservation of parathyroid glands without necessitating their systemic identification. Distal ligation of all terminal branches of the superior and inferior thyroid arteries, close to the thyroid capsule, enables reliable separation of all tissues carrying parathyroid gland away from the thyroid surface. Continued dissection in this tissue, with the aim to identify all parathyroid glands may increase the risk of their mechanical injury or devascularization.

In this study all of the patients who developed post-operative hypocalcaemia showed a fall in parathormone levels. Similar trend was seen in the studies conducted previously.^{41,42,43} Graff et al have suggested in their study that a single early post-operative intact parathormone measurement may be the most cost effective screening tool for hypocalcaemia and combined with the serum calcium measurement on post-operative day 0 increases the specificity of detecting post-operative hypocalcaemia.⁴²

Thyroid surgery may compromise the parathyroid function either by direct trauma or by impairment of blood flow. This in turns leads to fall in the serum parathormone levels, which leads to hypocalcaemia. Detection of hypocalcaemia was based on clinical observation of signs and symptoms connected to the fall in calcium levels that are usually seen hours after surgery. But now with advent of newer specific immunoassays that can accurately determine the circulating levels of parathormone, post-operative measurement of parathormone levels can be used as an early predictor of post-operative hypocalcaemia. Parathormone has a very short half-life of 3-5 minutes hence a drop in parathormone levels can be observed immediately after the surgery.

Conclusion

Development of postoperative hypocalcaemia is multifactorial. Factors linked to the development of post operative hypocalcaemia include surgical technique, iatrogenic parathyroid damage (injury, edema, infarction, ischemia), extent of thyroidectomy, hyperthyroidism, malignancy, patient gender, perioperative serum calcium drop, presence of thyroiditis, diabetes, number of parathyroid glands identified intraoperatively. The incidence of benign thyroid disorders is higher in females than in males. The peak age group in which the patients presented was between 40-60 years. The commonest clinical diagnosis was that of solitary thyroid nodule followed by multinodular goitre. All the patients who developed post-operative hypocalcaemia were female. None of the patients were symptomatic. By the post-operative day 3, calcium levels had normalized. The overall incidence rate of postoperative hypocalcaemia in patient who had undergone total thyroidectomy was found to be 8%.

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Relationship between Environmental Pollution and Different Diseases

(Original Research Article)

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Abstract

Environmental pollution effects on public health. It is **aimed** to found out the relationship between Environmental Pollution and Different Diseases. **Method** was cross-sectional survey from different hospital and polyclinic in Derna city. **Results show** the young ages (> 1 year - 10 years) have high frequency and percent 146 (48.7%) in infected by different diseases, followed by)21 year – 30 year (by 66(22.0 %), S.D(1.24), Mean(2.10), The percent of infected

male was 200 (66.7 %) higher than females 100(33.3 %), SD was (0.472), Mean(1.33), the percent of West Accumulation 262(87%), SD(0.33315), mean (1.1267). As for the Insect distribution was 261 (87.0%), the water source the highest percent was for Center Of City by 61(20.3%), followed by plastic tanks 48(16.0%), Metal tanks 46(15.3%), Well 53(17.7%), Mean, (3.3167) SD(1.45031). the tuburcoloisus was have a high percent by 83(27.7%), followed by lice 49(16.3 %), followed by Hepatitis A infection by 48(16%) Chronic Granulomatous Disease (CGD) 34 (11.3 %), Rabbis, 32(10.7 %) ,Typhus 13(4.3 %), and (Hepatitis B , 7(2.3%) , Hepatitis C,6 (2.0%), the Std. Deviation was(3.178), Mean (7.87), The percent of infected Libyan 267(89.0%) was higher than other nationality by 28(12.7 %), Std. Deviation was (0.315), Mean (1.11). P-Value for Living Place, Water Source, west Accumulation and Insect Distribution was < 0.000. The results confirmed that the prevalence of different diseases is closely related with the current environmental situation and The Relationship between Diseases and Living Place, Water Source, and Waste Accumulation & Insect Distribution.

Keywords: Pollution, Chronic Granulomatous Disease, Typhus, Tuburcoloisus, Hepatitis.

Abbreviations:

ID MMEs: Infectious Disease Marine Mammal Species.

LMICs: Low Middle-Income Countries.

TB: Tuberculosis.

HAV/HEV: Hepatitis A and E.

DALY: Disability-Adjusted Life Years.

Introduction

The burden of disease and death attributable to environmental pollution is becoming a public health challenge worldwide, especially in developing countries, the kidney is vulnerable to environmental pollutants because most environmental toxins are concentrated by the kidney during filtration. Given the high mortality and morbidity of kidney disease, environmental risk factors and their effect on kidney disease need to be identified. In this Review, we highlight epidemiological evidence for the association between kidney disease and environmental pollutants, including air pollution, heavy metal pollution and other environmental risk factors.(Xu et al., 2018), Infectious disease-induced MMEs (ID MMEs) have not been reported ubiquitously among marine mammal species, indicating that intrinsic (host) and/or extrinsic (environmental) ecological factors may influence this heterogeneity.(Sanderson and Alexander, 2020), The synthesis of evidence linking 133 diseases and injuries, or their groupings, to the environment has been reviewed

to provide an overall picture of the disease burden that could be prevented through healthier environments.(Prüss-Üstün et al., 2016),

Current and future diagnostic molecular techniques offer new opportunities to identify tools for the management and possible treatment of diseases in imperiled species.(Aguirre and Tabor, 2008), Environmental exposures can dramatically influence the phenotype of allergic diseases, including atopic eczema, food allergy, asthma, and allergic rhinitis , These diseases now affect approximately 20% of the population worldwide, (JCI - Environmental exposures and mechanisms in allergy and asthma development, no date), increasing respiratory illnesses have been observed in urban centers due to diminished air quality. This study evaluated associations between urban air pollutants in the Eastern Caribbean nation of St. Kitts-Nevis during drought and lung function among residents previously at risk for chikungunya infection. (Whittaker et al., 2018), There is more and more empirical research on public health problems caused by environmental problems, but most existing literature focuses on the consequences of air pollution such as mortality , public health and individual health of employees , and the impact of air pollution on government expenditures and personal medical expenditures (Sun et al., 2020). Environmental exposure to pollution from hazardous waste sites is an understudied contributor to the global burden of disease. Increasing industrial development, urbanization and socioeconomic forces in Latin America have contributed to an increase in environmental pollution and the negative health effects resulting from exposure, (Caravanos et al., 2016), Heavy metals are normally occurring elements that have a density at least 5 times higher than of water. Their plentiful domestic, industrial, agricultural and technological usages have led to their widespread distribution in the environment; raising worries over their possible impacts on human health and the environment. The toxicity of heavy metals relies on numerous factors including the dose, method of exposure, and chemical types.(Hassaan, El Nemr and Madkour, 2016). Exposures to environmental pollutants during windows of developmental vulnerability in early life can cause disease and death in infancy and childhood as well as chronic, non-communicable diseases that may manifest at any point across the life span. Patterns of pollution and pollution-related disease change as countries move through economic development. Environmental pollution is now recognized as a major cause of morbidity and mortality in low- and middle-income countries (LMICs). According to the World Health Organization, pollution is responsible for 8.9 million deaths around the world each year; of these, 94% (8.4 million) are in LMICs. Toxic chemical pollution is growing into a major threat to children's health in LMICs. The disease and disability caused by environmental pollution have great economic costs, and these costs can undercut trajectories of national development.

To combat pollution, improved programs of public health and environmental protection are needed in countries at every level of development. Pollution control strategies and technologies that have been developed in high-income countries must

now be transferred to LMICs to assist these emerging economies to avoid the mistakes of the past. A new international clearinghouse is needed to define and track the health effects of pollution, quantify the economic costs of these effects, and direct much needed attention to environmental pollution as a risk factor for disease. (Suk William A. et al., 2016), Tuberculosis (TB) is an airborne communicable disease plaguing human populations since antiquity. TB continues to be a major public health problem globally and India has one of the largest numbers of TB cases in the world. The risk of progression from exposure to tuberculosis bacilli to the development of active disease is a two-stage process governed by both exogenous and endogenous risk factors. Exogenous factors play a key role in accelerating the progression from exposure to infection, whereas endogenous factors lead in progression from infection to active TB disease. Socioeconomic factors are also shown to increase the susceptibility to infection. (Srivastava, Kant and Verma, 2015), less area which infected, was the center of city that the source water from the city's main source (steam plant). This means that water and its sources has a significant role in the pathogenesis of several parasites and other diseases.(Eljamay, 2018), Anthropogenic land use changes drive a range of infectious disease outbreaks and emergence events and modify the transmission of endemic infections. These drivers include agricultural encroachment, deforestation, road construction, dam building, irrigation, wetland modification, mining, the concentration or expansion of urban environments, coastal zone degradation, and other activities. (Patz Jonathan A. et al., 2004) A number of scientific studies have shown that swimmers swallow significant amounts of polluted seawater and can become ill with gastrointestinal and respiratory diseases from the pathogens they ingest. Based on risk assessments from the World Health Organization (WHO) and academic research sources the present study has made an estimate that globally, each year, there are in excess of 120 million cases of gastrointestinal disease and in excess of 50 million cases of more severe respiratory diseases caused by swimming and bathing in wastewater-polluted coastal waters. Filter-feeding shellfish/bivalves, which are often harvested from wastewater-polluted areas of the sea, can effectively filter out and concentrate the microbial pathogens in the seawater.It can be roughly estimated that annually there are some 4 million cases of infectious hepatitis A and E (HAV/HEV), with some 40 thousand deaths and 40 thousand cases of long-term disability, mainly chronic liver damage, from consuming raw or lightly steamed filter-feeding shellfish /molluscs harvested globally from polluted coastal waters. The total global health impact of the thalassogenic diseases—human infectious diseases associated with pathogenic microorganisms from land-based wastewater pollution of the seas—is estimated to be about 3 million ‘disability-adjusted life years’ (DALY)/year, with an estimated economic loss of some 12 billion dollars per year.(Shuval, 2003).

Methods

Study Design

A cross – sectional study design was used to conduct the study. The target population focused on different ages from different population. Data collected from hospital recorders, and questionnaire. The tuberculosis data collected from 2014 to January 2019. This study was conducted during the period from 01\ 2017 to 01\ 2019. The study was conducted from different polyclinic Elheraish, Elshahel, Shaiha polyclinic, (Elsaifa privet clinic), Martouba, in Derna city.-++

Statistical Analysis

The frequency and descriptive data was given as a mean ± standard deviation (SD). The Statistical package for the Social Science (SPSS) version 26 under Microsoft Windows was used for data analysis, correlation, X2, and P-Value.

Table (1). Illustrated the Demographics and Background Characteristic, frequency, percent, mean & SD.

Demographic parameters	Frequen cy	Percent %	Mean	SD
Gender				
Male	200	66.7	1.33	0.472
Female	100	33.3		
Nationality				
Libyan	267	89.0	1.11	0.313
Non Libyan	33	11.0		
West Accumulation				
Yes	262	87.3	1.126	0.3331
No	38	12.7	7	5
Insect accumulation				
Yes	261	87	1.130	0.3368
No	39	13	0	7
Age				
> 1 year - 10	146	48.7		
11 - 20 years	39	13.0		
21 - 30 years	66	22.0	2.10	1.241
31 - 40 years	38	12.7		
41 - 50 years	11	3.7		
Water Source				
Plastic Tanks	48	16.0		
Metal Tanks	46	15.3	3.316	1.4503
Center Of City	61	20.3	7	1
Well	53	17.7		

Diseases				
Viral gastroenteritis (stomach flu)	14	4.7		
Meningitis	3	1.0		
Chronic Granulomatous Disease	34	11.3		
Jundus	4	1.3		
Hepatitis B	7	2.3		
Hepatitis C	6	2.0		
Typhus	13	4.3	8.69	3.469
whipping cuph	2	0.7		
Tuburcoloisus	83	27.7		
Rabbis	32	10.7		
Lice	49	16.3		
Mountain Fever	5	1.7		
Hepatitis A	48	16.0		
Living Place				
City Center	42	14.0		
Shaiha	34	11.3		
Elsahel	123	41.0		
Bab-Tubrouk	35	11.7	3.370	1.6478
Elfataih	25	8.3	0	7
Karsa	20	6.7		
Martuba	21	7.0		
Total	300	100.0		

In table (2) the p-value = 0.000 > 1 for Diseases & Living Place, Water Source, Wast Accumulation,& Insect Distribution that indicate to there was relationship between Diseases & Living Place, Water Source, Nationality & Wast Accumulation. Also result in figure (1, 2, 3, 4 ,& 5) It is apparent the relationship between Diseases & Living Place, Water Source, Nationality & Wast Accumulation, the study agree with pervious study as in the (Kumar, Meena and Verma, 2019), which, providing knowledge to the public of Pakistan regarding the adverse effects that water pollution is having on the human health and welfare in Pakistan and moreover, the negative consequences that Pakistani economy faces due to the deteriorating condition of water resources in the country, (Sun *et al.*, 2020), which prove that Given the high level of the nation’s economic development and the results of efficiency in water pollution and water diseases, improving the efficiency and quality of wastewater treatment in China is regarded as an important factor for achieving the strategic goal of green growth.(JCI - Environmental exposures and mechanisms in allergy and asthma development, 2020), (Aguirre and Tabor, 2008) which find out that the Disease can be catastrophic to a diminished stressed population, becoming in some instances the leading factor of local, regional, and global extinctions.

The strategies of the new field of conservation medicine include long-term monitoring, health assessment, and interventions to protect species at risk. Particularly must minimize the threat of any potentially catastrophic disease outbreaks resulting from anthropogenic changes to the environment. Current and future diagnostic molecular techniques offer new opportunities to

identify tools for the management and possible treatment of diseases in imperiled species.(Shuval, 2003) .

This study agrees with .Environmental pollutants, including metals, air pollutant, phthalate and melamine can potentially increase the risk of CKD or accelerate its progression. (Tsai *et al.*, 2021), also described the importance of flies in relation to disease.In Table (2) the p-value = 0.000 > 1 for Diseases & Living Place, Water Source, & Waste Accumulation, from the obtained result in the table (2) prove that there was relationship between Diseases & Living Place, Water Source, Nationality, Waste Accumulation, & Insect Distribution

Table (2). The Relationship between Diseases and Living Place, Water Source, Waste Accumulation and Insect Distribution

P-Value.	X ²	
0.000	318.713	Diseases
0.000	183.933	Living Place
0.000	23.567	Water Source
0.000	167.253	West Accumulation
0.000	39.009	Insect Distribution
0.000	182.520	Nationality

It is apparent from the result in figure (1, 2, 3, and 4) the relationship between Diseases & Living Place, Water Source, Nationality, West Accumulation, and Insect Distribution.

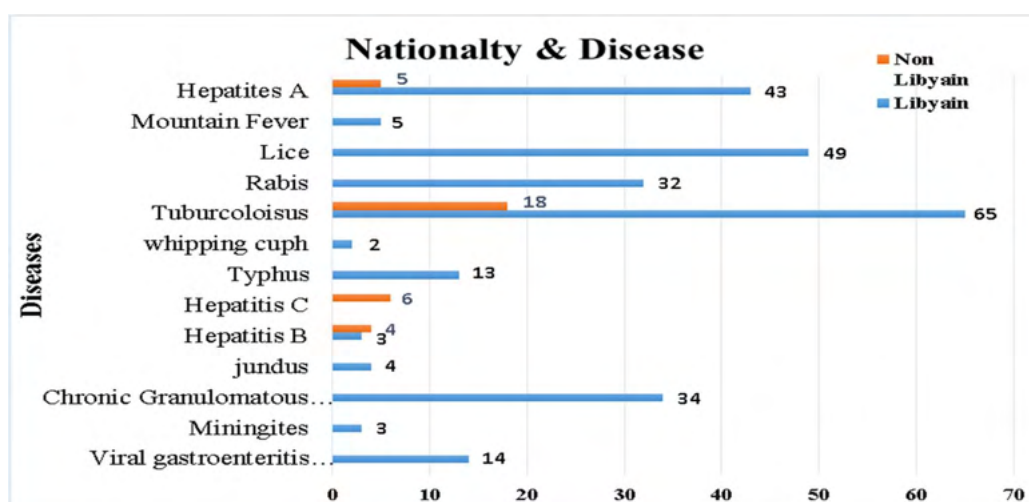


Figure (1). The Relationship between Diseases and Nationality.

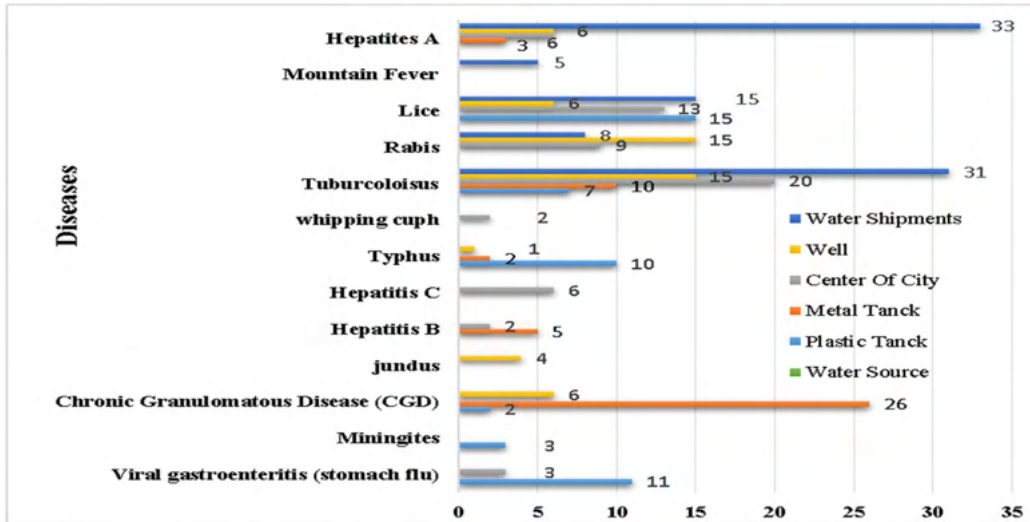


Figure (2). The Relationship between Diseases and Water Source.

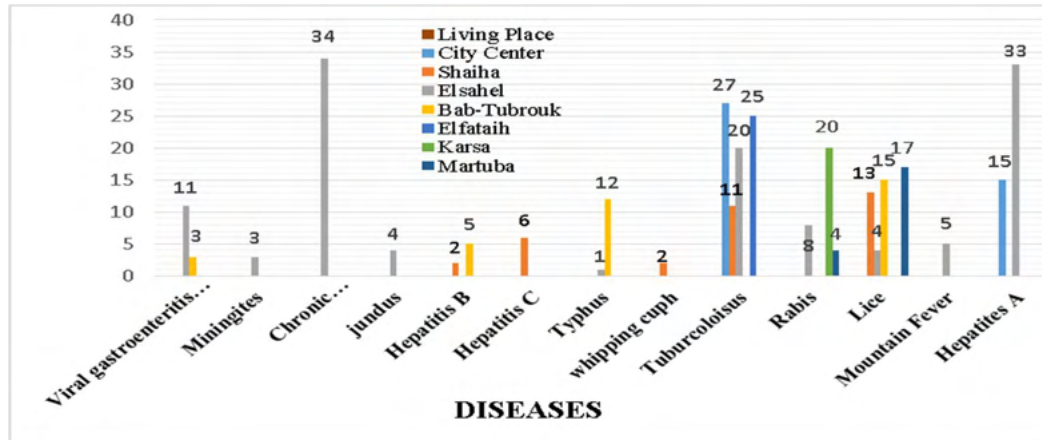


Figure (3). The Relationship between Diseases and Living Place.

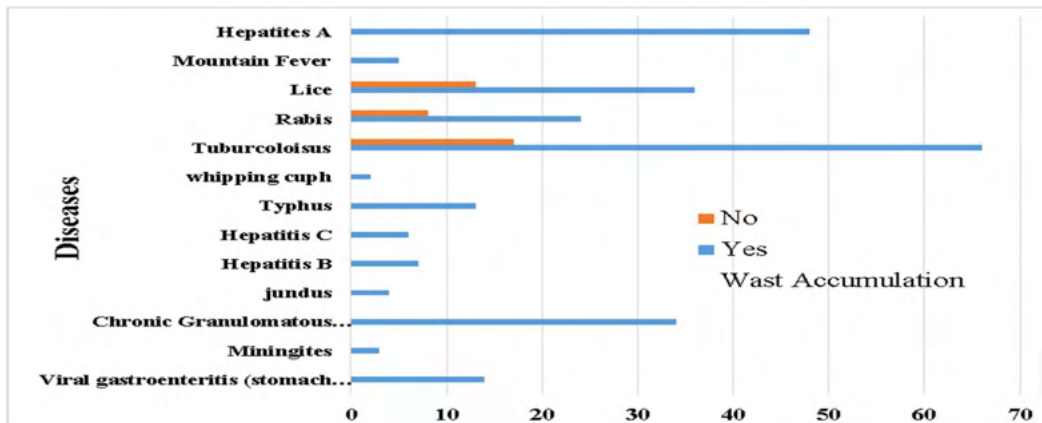


Figure (4). The Relationship between Diseases and West Accumulation.

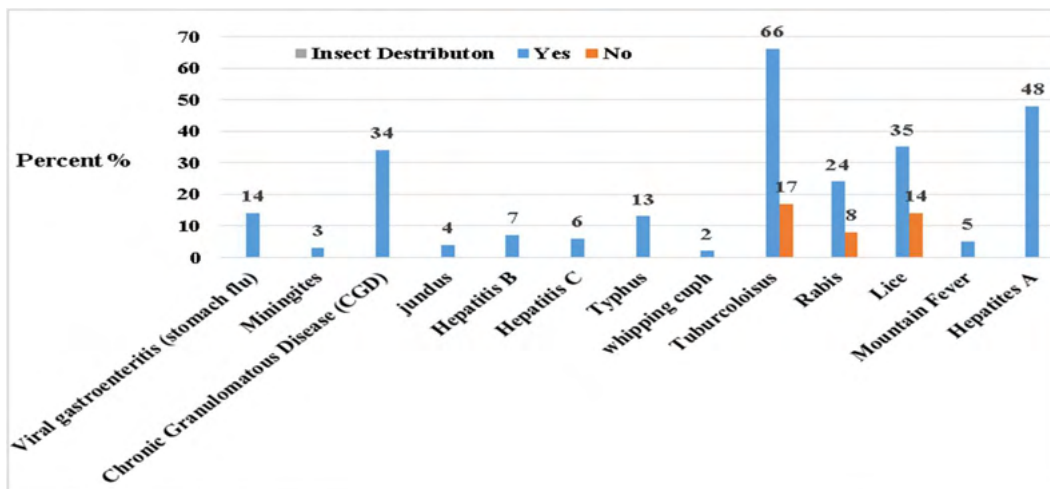


Figure (5). The Relationship between Diseases and Insect Distribution.

All the publications mentioned above give indirect evidence for the transmission by flies of the causative organisms of diarrhea and related diseases. (Wolff and Van Zijl, 1969), Arthropod vectors are responsible for the transmission of many infectious diseases. Currently, more than three billion people living in endemic areas are exposed to vector-borne pathogens.

Substantial differences in the biology of arthropod vectors make it extremely challenging to predict the incidence of vector-borne diseases in the future. (Wilke, Beier and Benelli, 2019), Despite the critical role that contact between hosts and vectors, through vector bites, plays in driving vector-borne disease (VBD) transmission, transmission risk is primarily studied through the lens of vector density and overlooks host–vector contact dynamics.(Thongsripong *et al.*, 2021), (Suleman, Darko and Agyemang-Duah, 2015).

Rotten organic materials pose great public health risks, including serving as breeding grounds for disease vectors. “Improper solid waste disposal leads to substantial negative environmental impacts (for example, pollution of air, soil and water, and generation of greenhouse gases from landfills), and health and safety problems (such as diseases spread by insects and rodents attracted by garbage heaps, and diseases associated with different forms of pollution, the final disposal sites from the houses showed that, residents living closer to open dump sites have contracted related diseases such as malaria skin infections among others as result of improper refuse disposal.

It is therefore recommended that final disposal sites for solid wastes should be sited outside residential area, especially the open dumpsites to avoid proliferation pest and diseases. It is further recommended that residents in the area should insist on using mosquito nets to avoid

being biting by mosquitoes. In like manner, the district assembly in the study area should provide health education to the people on how to live in good health. Significantly, if the recommendations of this study are considered and implemented, there is a high tendency of improving the solid waste disposal situation and health risks among residents in the Sawaba community to have a clean environment. (Suleman, Darko and Agyemang-Duah, 2015), Social insects are an ideal system to study the potential role of social network plasticity in disease defense.

The networks of social and physical interactions of insect, vertebrate, and human societies share many properties that are known to influence disease spread, (Stroeymeyt *et al.*, 2018), Adult house flies, *Musca domestica* L., are mechanical vectors of more than 100 devastating diseases that have severe consequences for human and animal health. House fly larvae play a vital role as decomposers of animal wastes, and thus live in intimate association with many animal pathogens. (Scott *et al.*, 2014), Inadequate collection and improper disposal of municipal waste have a direct negative impact on cities. Disease occurrence in Obio-Akpor (Port Harcourt metropolis, Nigeria) was suspected and linked to the proliferation of dumpsites and proximity to residential households. Evidence showed frequent incidence of diseases outbreak coupled with the topographic coastal nature and the morphological propelling dynamics of sediments transport in the area assisting the situation. (Okpara, Kharlamova and Grachev, 2021), the findings revealed that increasing age was associated with an increased likelihood of having both knowledge and positive attitude associated with human activities on mosquito species. Results further indicated that increase in age was associated with decreased likelihood of participants practicing human activities that contribute to breeding of mosquito species. Findings also revealed that males were 7.026 times more likely to have knowledge associated with human activities on mosquito breeding than their female counterparts (Nzewuihe *et al.*, 2021).

The differences between prevalence of symptoms between two groups were significant in all parts of body except knees. The study found that solid waste workers have more musculoskeletal disorders than general population. Meanwhile these symptoms were more common among foreign workers. The risk of disease was increased with the increasing years of working as solid waste worker and smoking. they didn't find relationship between musculoskeletal disorders and education or marriage status of workers. (Mehrdad *et al.*, 2008).

There were significant differences in the effect of workers' length of employment, injured part of body, type of accident, agency of accident, and collection process. Results show that most injuries occur in workers in their 50s and older. This study also shows that 51.4% of injuries occur at businesses with 49 employees or fewer. Injuries to waste collectors happen most often when workers are electrocuted after slipping on the ground. The second most prevalent form of injury is falling, which usually happens when workers hang from the rear of the truck during transportation or otherwise slip and fall from the truck. Work-related illnesses amongst waste collectors are mostly musculoskeletal conditions due to damaging postures.

These findings will be instructive in devising policies and guidelines for preventing workplace injuries and work-related illnesses of HWCs.(Jeong, Lee and Lee, 2016), house flies, *Musca domestica* (Diptera: Muscidae), require a message with evolving (sensu changing over time) information content. Gravid females reportedly deploy a pheromone that induces concerted oviposition so that many even-aged larvae ameliorate the resource, such as animal manure. However, continued oviposition by late-arriving females may result in age disparity and cannibalism of larval offspring.(Lam *et al.*, 2007), Exposures may occur *via* a range of pathways and exposure processes. Individual pollutants may be implicated in a wide range of health effects, whereas few diseases are directly attributable to single pollutants. Long latency times, the effects of cumulative exposures, and multiple exposures to different pollutants which might act synergistically all create difficulties in unravelling associations between environmental pollution and health. Nevertheless, in recent years, several attempts have been made to assess the global burden of disease as a result of environmental pollution, either in terms of mortality or disability-adjusted life years (DALYs).

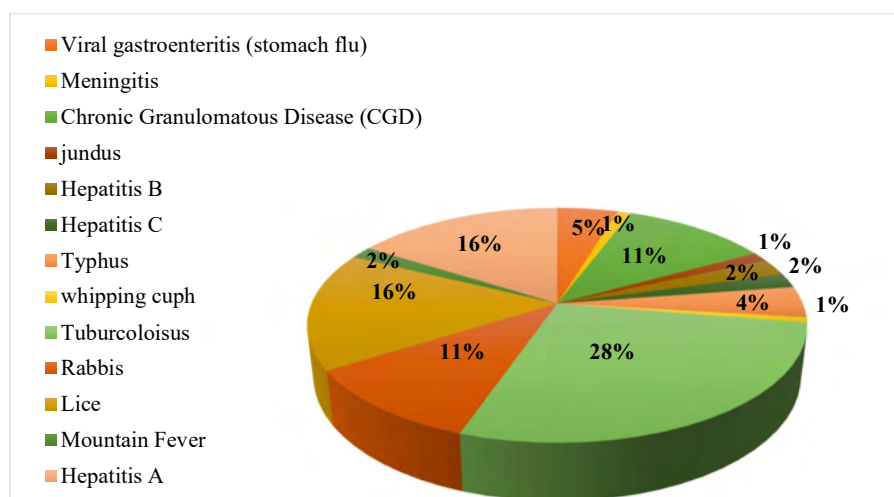


Figure (6). Percentage of Disease Distribution.

About 8–9% of the total disease burden may be attributed to pollution, but considerably more in developing countries. Unsafe water, poor sanitation and poor hygiene are seen to be the major sources of exposure, along with indoor air pollution.(Briggs, 2003). Insect vectors of human diseases are embedded within complex ecological communities. Their interactions with other species, particularly alternative hosts, have important consequences for disease transmission and dynamics., Blood-sucking insects are important vectors of disease, with biting Diptera (flies) alone transmitting diseases that cause an estimated 700 000 human deaths a year. Insect vectors also bite nonhuman hosts, linking them into host-biting networks. While the major vectors of prominent diseases, such as malaria, yellow fever, dengue, and Zika, are intensively studied, there has been limited focus on the wider interactions of biting insects with nonhuman hosts. Drawing on network analysis and visualisation approaches from food-web ecology, we discuss the value of a network perspective for understanding host–insect–disease interactions, with a focus on Diptera vectors. Potential applications include highlighting

pathways of disease transmission, highlighting reservoirs of infection, and identifying emerging and previously unrecognised vectors. (Bellekom, Hackett and Lewis, 2021).

There is evidence that climate change is increasing the frequency of vector-borne diseases and may contribute to increasing the virulence of their pathogens, there are very few studies conducted in Haiti on the relationship between climate change and vector-borne diseases. The purpose of this chapter is to define the interrelationships between climate change and vector-borne diseases in Haiti by identifying avenues of research to better understand the effects of climate change on public health and to make appropriate recommendations to decision-makers to ensure proper management. (Balthazard-Accou *et al.*, 2021). There are two diseases concerning which the evidence against the house fly seems to be decidedly incriminating. These two diseases are typhoid fever and the diarrhoeal disease of infancy. In the matter of typhoid fever, Dr. Terry, health officer of Jacksonville, Fla., has greatly reduced the death rate by cleaning up vacant lots, by screening privies and outside toilets and by other methods directed not only toward the elimination of flybreeding nuisances, but also toward the destruction of fly-infecting nuisances. The contrast to Jacksonville and other southern communities, which northern cities make by the comparative absence of privies, vacant lot contamination, etc., makes it likely that this method of transmission of typhoid fever is comparatively rare in these better sanitated communities. (Armstrong, 1914).

Conclusion

The results confirmed that the prevalence of different diseases is closely related with the current environmental situation and The Relationship between Diseases & Living Place, Water Source, and Waste Accumulation & Insect Distribution.

Acknowledgement

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The Importance of Natural (Inherited) and Acquired Immunity in Combating COVID-19

(Original Research Article)

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Abstract

The current study included conducting a questionnaire regarding the comparison between natural and acquired immunity. It also indicates the importance of taking vaccines against the Covid-19 virus. The questionnaire was distributed to a sample size of 150 people from the medical and nursing staff in three Libyan hospitals including Al Wahda Teaching Hospital in Derna, Umm Al Razm General Hospital and Gubba General Hospital. The study performed during the period from 11/10/2020 to 11/10/2021. It has been shown that acquired immunity is the best in resisting the virus and recovering from it, and taking the vaccine in two doses is the best to make the body more immune. Also, the Chinese vaccines were the least types of vaccines in terms of side effects. Results found that the age group (1-10) years was having the most immune and considered the least in terms of death rate. While, the age group (66-98) was the most vulnerable age group to infection with the virus, and considered the most death rate groups.

Keywords: Acquired Immunity, Natural Immunity, Vaccines, Al Wahda Teaching Hospital, Umm Al Razm General Hospital, Gubba General Hospital.

Introduction

The immune system is a complex network of barriers, organs, cellular elements, and chemical molecules that interact to defend the body [Huang et al:2020,1021]. It is designed to attack and destroy a wide range of antigens (parts of the body of microbes that trigger an immune reaction) and pathogens, foreign or foreign (ie, those from outside the body)[Banks et al:2020,1478].

Therefore, it must be able to distinguish between the tissues and cells of the self on the one hand and anything from outside the body on the other, which is medically known as “self-tolerance” and having this ability prevents the immune system from attacking the tissues and cells of the body by mistake [Robertson et al:2020,903], which occurs in cases of autoimmune disease disorders.

The immune system is actually made up of two distinct systems: the congenital immune system and the acquired immune system, and they work in concert all the time [Sagan et al:2021,26].

The congenital immune system includes a series of non-specific (physical and chemical) barriers, along with cellular and molecular elements that have been deployed and pre-positioned to prevent and/or rapidly neutralize microbial infection at the site of its entry into the body[Yoshikawa et al:2020,98]. As these physical and chemical defenses are the most primitive forms of congenital immunity, whose abilities may be disturbed in certain health conditions.

For example, the skin has a primary role in providing physical protection, but its burns, wounds, or as a result of inserting an intravenous catheter, facilitates microbes entry into the body. Also, the respiratory system has multiple forms to provide physical protection, such as the mucous coating and cilia (Mucociliary) in the lining of the airways, which hinder microbes from sticking to the surfaces of cells and facilitate their expulsion by sneezing or coughing [Kam et al:2020,20].

But smoking and air pollution impair those abilities. As for the acquired immune system, it constantly evolves and adapts (acquired) with each time exposure to pathogens that may invade the body at intervals and under successive circumstances.

The traits of acquired immunity include: diversity, memory, mobility, flexibility, self-discrimination, repetition, and specificity. Diversity refers to the ability of the immune system to respond to many different pathogens or strains of pathogens [Zhou et al: 2020,1057]. And the feature of "immunological memory" provides the ability to respond faster and more powerfully in subsequent confrontation with the same microbe if it occurs [Castro:2020,564].

The "mobility" capabilities of the components of the immune system enable local immune reactions against microbes at the site of their entry to provide broader immune responses.

Discrimination between self versus non-self tissues and cells helps prevent damage to the body's cells by the immune system. Redundancy refers to the ability of the immune system to produce components with similar biological effects from multiple immune cell lines, such as inflammatory cytokines (proteins produced by the body that act as messages to cells to trigger immune reactions). It also doubles the cellular components of the immune system to amplify the size and capacity of the immune response against microbes [Paules et al:2020,20].

The current study aims to compare natural (inherited) and acquired immunity in the prevention of Covid-19 virus, and the second goal is to demonstrate the effectiveness of taking vaccine doses to prevent the virus or to relieve symptoms of infection.

The importance of this study is evidenced by the fact that it is recent and new with regard to the study area and sample, and because it focuses on the emerging Covid-19 virus.

Materials and Methods

The Descriptive Study Design

The research was conducted in three hospitals affiliated with the Ministry of Higher Education, namely: Al Wahda Teaching Hospital in Derna, Umm Al Razm General Hospital, and Gubba General Hospital. The data was collected during the period from 11/10/2020 to 11/10/2021.

About 150 individuals were selected for this study. Approximately, 50 individuals were selected from each hospital, including 25 doctors and 25 nurses. The questionnaire consisted of two parts:

- Part one included various questions asked to doctors and nurses in hospitals including the effectiveness of acquired and natural immunity, the effectiveness of the vaccine, and the types of vaccines taken.
- Part two included questions about the symptoms of the vaccine, the most resistant age to the virus through natural immunity, the most age group had a high death rate...).

The questionnaire was distributed to the sample members such as doctors and nurses in hospitals in order to fill the required information for the present study purpose.

The questionnaires were collected and classified. The statistical tables were used according to the appropriate statistical programs.

Questionnaire			
Gender : Male: <input type="checkbox"/> female: <input type="checkbox"/>			
Age: / Marital status: Single : <input type="checkbox"/> married: <input type="checkbox"/>			
Educational level:		/ Occupation:	
-Put the answer in the form of a sign:v / ×			
N	Questions	v	×
1	Does natural immunity play a role in preventing covid-19?		
2	Does acquired immunity play an important role in preventing COVID-19?		
3	Is taking the vaccine stronger than the natural immunity?		
4	Are vaccines against COVID-19 a stronger and longer-lasting protection?		
5	Does taking the vaccine make a person immune to infection with the Covid 19 virus?		
6	Is taking two doses of the vaccine better than taking one dose?		
7	Are mixed vaccines (combining two types of vaccine) effective and better than the unmixed vaccine?		
8	Are the symptoms resulting from taking the vaccine dangerous and intolerable?		
9	Do the symptoms resulting from taking the vaccine differ from one person to another according to the natural immunity?		
10	Does eating vitamin C, fruits, hot soup and food enhance natural immunity to prevent the virus or relieve its symptoms?		
11	Were the people who come to hospitals when they are infected who did not receive the vaccine?		
12	Is a person who has been vaccinated at risk of contracting COVID-19 again?		
13	Which of the following is the best vaccine against COVID-19?		
	Pfizer BioNTech <input type="radio"/> Sinovac <input type="radio"/> Janssen <input type="radio"/> Sinopharm <input type="radio"/>		
	AstraZeneca <input type="radio"/> Moderna <input type="radio"/> Sputnik <input type="radio"/> CanSino <input type="radio"/>		

Form (1): The Questions in Questionnaire Form 1.

N	Questions	strong	moderate	mild
*	What were the symptoms of the vaccine?			
1	Pfizer BioNTech			
2	Sinovac			
3	Janssen			
4	Sinopharm			
5	AstraZeneca			
6	Moderna			
7	Sputnik			
8	CanSino			
*	What age groups are the most immune and resistant to the virus and the a high death rate ?	Put the answer(v)		
		most immune and resistant	high death rate	
1	1-10 y			
2	11-18 y			
3	19-25 y			
4	26-35 y			
5	36-65 y			
6	66-98 y			

Form (2): The Questions in Questionnaire 2.

Results

According to Table (1), natural immunity constituted 46% of the ability to confront the Covid 19 virus, while acquired immunity played the most important role by 100% in confronting and recovering from the Covid 19 virus. It has clarified the important role of immunity acquired through taking the vaccine, and according to Table (1), the vaccine constitutes 90% of the success in recovering from the Covid 19 virus, and the study also showed that taking the vaccine is better than relying on natural immunity in people.

Table (1): The Frequency and Relative Distribution.

N	Questions	Frequency (n=150)	percentage (%)
1	Does natural immunity play a role in preventing covid-19?	69	46
2	Does acquired immunity play an important role in preventing COVID-19?	150	100
3	Is taking the vaccine stronger than the natural immunity?	135	90
4	Are vaccines against COVID-19 a stronger and longer-lasting protection?	98	65.33
5	Does taking the vaccine make a person immune to infection with the Covid 19 virus?	141	94
6	Is taking two doses of the vaccine better than taking one dose?	150	100
7	Are mixed vaccines (combining two types of vaccine) effective and better than the unmixed vaccine?	18	12
8	Are the symptoms resulting from taking the vaccine dangerous and intolerable?	28	18.66
9	Do the symptoms resulting from taking the vaccine differ from one person to another according to the natural immunity?	92	61.33
10	Does eating vitamin C, fruits, hot soup and food enhance natural immunity to prevent the virus or relieve its symptoms?	79	52.66
11	Were the people who come to hospitals when they are infected who did not receive the vaccine?	135	90
12	Is a person who has been vaccinated at risk of contracting COVID-19 again?	123	82

The study also showed that 90% of people who were vaccinated with the vaccine have exceeded the risk of contracting the virus, Covid 19, and even if they contract it, symptoms will be very mild. The study showed, according to Table (1), that people who took two doses of the vaccine succeeded in preventing infection with the virus by 100%, compared to those who took only one dose. As for the effectiveness of mixed vaccines, and here we mean the combination of two vaccines at the same time, their success rate in curing the virus was very weak, only 12%. According to Table (1), the side effects of taking vaccinations were minor and did not exceed the degree of severity of 18.66%. The study also showed, according to Table (1), that taking vitamin C, hot soup and healthy food contributes by 55.66% to strengthening the natural immunity to fight the Covid-19 virus. The study indicated a very important thing, which is that 90 % of patients who attended the three hospitals (Al Wahda Teaching - Gubba General - Umm Al Razm General) were those who did not take any type of available vaccine.

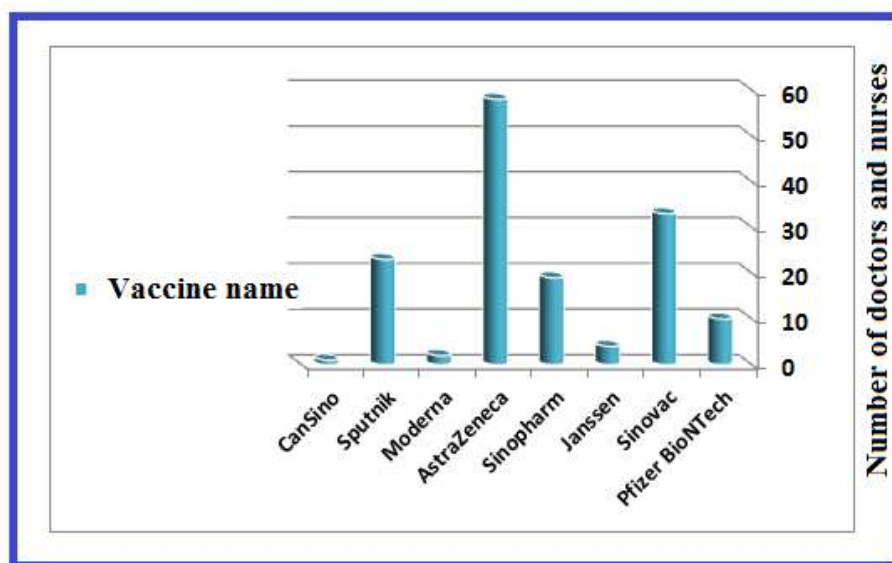


Figure (1): The most Important Vaccines Preferred by the Medical Staff.

The study showed, as shown in Figure (1), that the best type of vaccine was the AstraZeneca vaccine, Since the previous vaccine is effective and the people who received it were perfectly prevented from infection, but one of the most important problems of this vaccine is in the age groups less than 40 years, as those who are in the young age of those who received the vaccine were exposed to sudden blood clots, while its symptoms were moderate In elderly people over 50 years old.

The Chinese vaccine, Sinovac, came in second place in terms of preference, especially since people accepted this vaccine greatly and the numbers that got it were large, while in the third place came the Russian vaccine Sputnik, The Chinese vaccine, Sinopharm, came in fourth place.

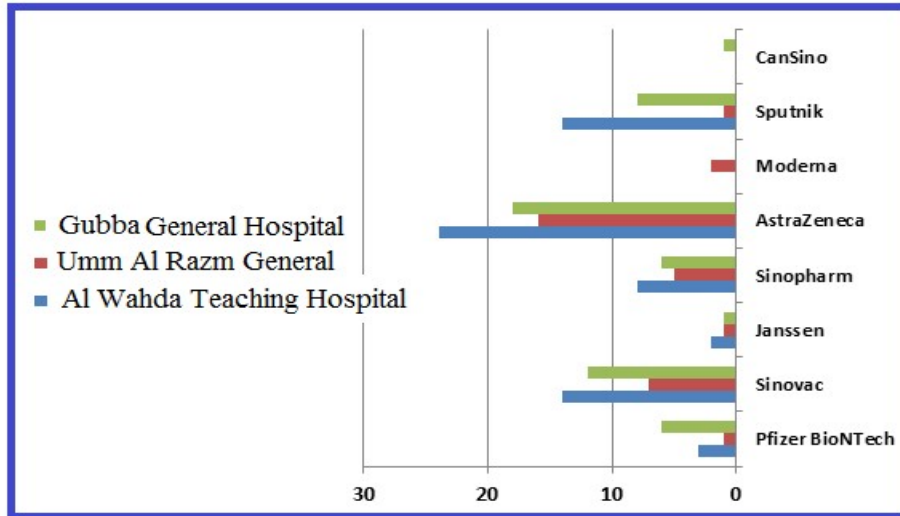


Figure (2): Priority Distribution of Vaccines in the Three Libyan hospitals.

It was also shown from Figure (2) that the priority list for vaccines in the Libyan hospitals in which the questionnaire was distributed was as follows: First came the vaccine AstraZeneca vaccine, Which had the advantage in the three hospitals, Followed by the two vaccines (Sinovac-Sputnik) in Al Wahda Teaching Hospital in Derna, then the vaccine (Sinovac) in Gubba General Hospital, next is the (Sputnik) vaccine at Gubba General Hospitalas well, Finally a vaccine (Sinopharm) in Al Wahda Teaching Hospital in Derna.

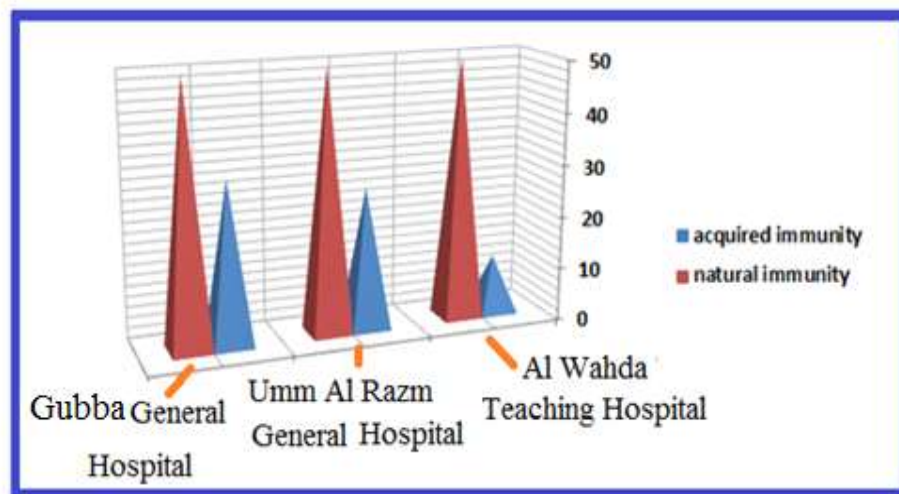


Figure (3): The Advantage of Natural and Acquired Immunity against COVID-19.

Through Figure (3), we find that the doctors and nurses in the three hospitals have unanimously agreed that the immunity acquired through the vaccine is the best and most successful in resisting the Covid-19 virus than natural immunity, which plays a simple and unreliable role in the subject of treatment.

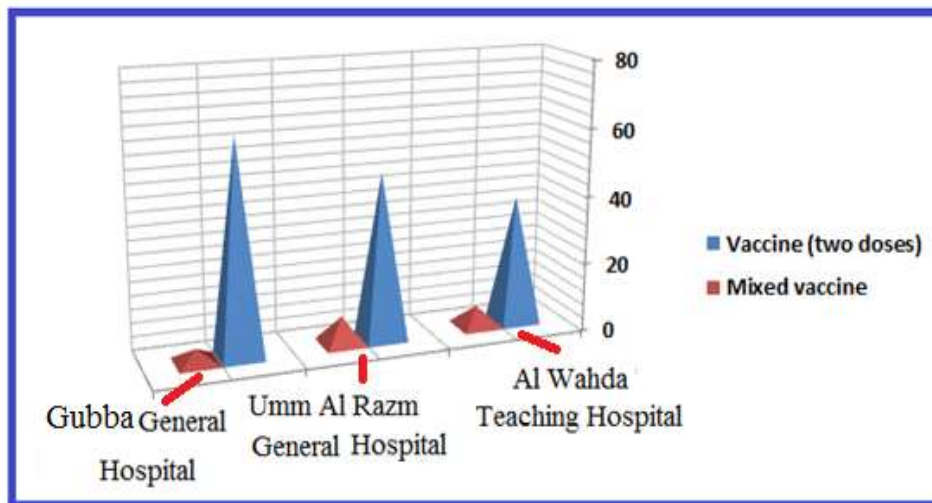


Figure (4): The Importance of the Vaccine (Two Doses) and Mixed Vaccines.

Figure (4): shows that the use of the two-dose vaccine is the best and most effective in vaccinating against the virus, while the mixed vaccines have not yet proven effective in preventing Covid-19.

Table (2): The Severity of Symptoms Caused by the Eight Virus Vaccines.

vaccine	strong	moderate	mild
Pfizer BioNTech		√	
Sinovac			√
Janssen	√		
Sinopharm			√
AstraZeneca		√	
Moderna	√		
Sputnik		√	
CanSino		√	

It has been shown through the study that the least vaccines in terms of the severity of the symptoms of infection are the Chinese vaccines Sinopharm-Sinovac, It was also found that the most severe vaccines in terms of the severity of the symptoms of infection with the virus are the American vaccines, Moderna-Janssen.

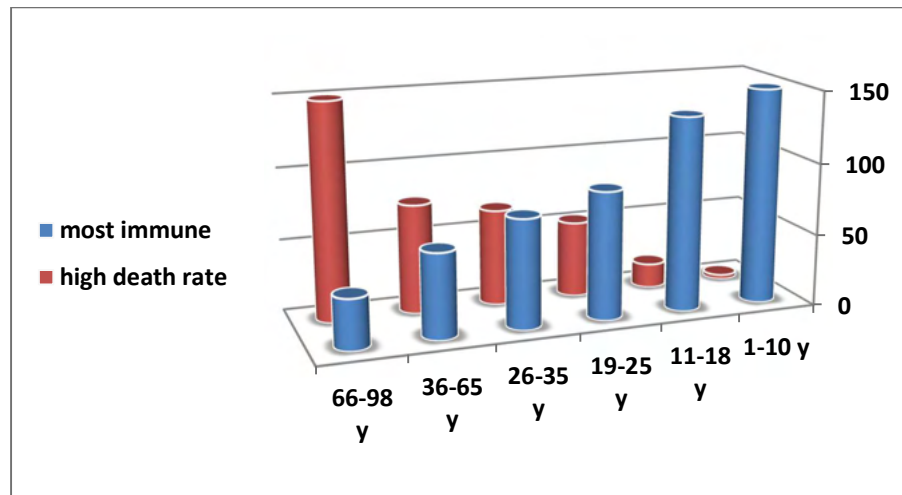


Figure (5): Immunity and Mortality by Age Group of People.

Figure (5): indicated that the age groups whose ages ranged between (1-10) are the most immune and resistant to the Covid 19 virus and at the same time are the least age groups with the number of deaths, while it was found that the age groups (66-98) are the least immune among the age groups with the highest mortality rate.

Discussion

The study has proven that acquired immunity has proven 100% effective in the body’s resistance to the virus and in healing it by taking vaccinations **Table (1)**, and the contribution of natural immunity was weak in resisting the Covid 19 virus, especially since natural (inherited) immunity is related to the genes of each person and varies from person to person[Zhou et al:2020,1057]. For another, and according to the age group, while we found that the acquired immunity was more effective because the vaccine contains the same virus, but to a reduced degree[Parohan et al:2020,1420]. This allows the white blood cells and the immune system in the body to recognize the patterns of the virus and eliminate them if the body is exposed to the virus again, and perhaps infection and what happens after infection is very dynamic.” There are two main arms of the innate immune system[Houghton et al:2020,579], which is the body’s first line of defense, Once the body detects a foreign intruder, key molecules, such as interferon and pro-inflammatory cytokines, launch a widespread attack[Huang et al:2020,1020]. Perhaps the most effective and good vaccines that gave excellent results in confronting and preventing the virus in the three Libyan hospitals included in the study was the British vaccine AstraZeneca **Figure (1)**,Followed by the Chinese vaccine

Sinovac,[Stein et al:2020,430] Then the Russian vaccine Sputnik, The reason for the effectiveness of previous vaccines is that they provided people with long-term immunity to the virus, and even people who took those vaccines and were infected with the virus again, they had very mild and negligible symptoms of the virus, especially the Chinese vaccines[Banks et al:2020,1478].

Perhaps the vaccines that dominated in the three Syrian **Figure(2)** were First came the vaccine AstraZeneca vaccine, Which had the advantage in the three hospitals[Robertson et al:2020,903], Followed by the two vaccines (Sinovac-Sputnik) in Al Wahda Teaching Hospital in Derna, then the vaccine (Sinovac) in Gubba General Hospital, next is the (Sputnik) vaccine at Gubba General Hospital as well, Finally a vaccine (Sinopharm) in Al Wahda Teaching Hospital in Derna, the reason for this is that these vaccines are the only ones that entered the three Libyan hospitals, and they were free through the World Health Organization as free aid, except for some people who received other vaccines during their stay outside the country[Bhopal et al:2021,13].

It has been shown from Figure (3) that acquired immunity is the best in achieving successful prevention from the effects of the virus and infection, because this immunity comes through vaccines that strengthen the first lines of defense in the body's immune system[Banks et al:2020,1479].

The study also showed that the two-dose vaccine proved a clear success in the three hospitals (Figure 4) in which the study was conducted. Very, because the vaccine has prepared the immune system in advance and the body's first line of defense to attack and eliminate the virus instead of attacking the body's own immune cells[Huang et al:2020,1022].

It has been shown through the study **Table (2)** that the least vaccines in terms of the severity of the symptoms of infection are the Chinese vaccines Sinopharm-Sinovac, This is due to the fact that the Chinese vaccine contains a dead virus, so the symptoms are mild and do not exceed the feeling of pain at the place of the needle or a slight rise in temperature[Sadinsky et al:2020,1015].

According to the questionnaire and according to **Figure (5)**, the age group from (1-10) years is the most immune age group and resistance to infection with the virus, meaning that the natural (inherited) immunity of children of those age groups is strong, meaning that children are better off than adults thanks to Powerful "first responder" immune cells diminish with age [Sagan et al:2021,26]. These cells are the body's first line of defense. Once the body detects a foreign intruder, key molecules, such as interferon and pro-inflammatory cytokines, launch a widespread attack.

The previous category of children is also considered a carrier and carrier of the virus, and symptoms may not appear on them, and here lies the danger [Castro:2020,566]. As for adults in the age group of people aged between (66-98) years, according to **Figure (5)**, these are the

most vulnerable to infection with the virus because of their weak natural immunity[Yoshikowa et al:2020,98], As their immune cells, which are the first line of defense, have become old, and people of the previous age group, most of them suffer from chronic diseases such as high arterial pressure, diabetes, asthma, chronic neurological diseases with age [Kam et al:2020,20], heart diseases, and therefore all of these things It contributes in one way or another to weakening their immunity and thus being greatly affected by the virus[Castro:2020,564]. Therefore, the deaths from the virus were the largest among the age group (66-98) years compared to the rest of the other groups, and the age group (1-10) years was The age group had the lowest mortality rate[Paules et al:2020,20].

Conclusion

Immunity differs from person acquired, which arises by receiving the Covid-19 vaccine, is the best to confront the virus and prevent infection, while natural (inherited) immunity varies from person to person according to the nature and age of the person and is stronger in the younger age groups, as is the case when children.

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