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Unraveling the Complete Integrability and Linearization of Specific Second- Order Nonlinear Ordinary Differential Equations

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Abstract

This observe investigates the complete integrability and linearization of specific second order nonlinear normal differential equations (ODEs). Nonlinear ODEs are essential in modeling diverse physical phenomena, but their complexity often makes them tough to clear up analytically. This have a have a look at explores multiple analytical strategies, which consist of generalized linearizing alterations, nonlocal variations, and geometric strategies, to linearize and integrate those equations. The research builds upon present methodologies and introduces new strategies to accumulate linearization and integrability. The recognized target ODEs encompass the Duffing, Van der Pol, and Lane-Emden equations, which might be applicable in physics, engineering, and carried out arithmetic. Symmetry analysis, proper solutions, and computational algorithms were employed to find out integrability conditions. Analytical answers and numerical simulations installation the proposed techniques, demonstrating right agreement with known answers. Detailed case research highlighted the practical utility of those techniques in fixing actual-worldwide problems in fluid dynamics, natural systems, and plasma physics. The findings boom the theoretical information of nonlinear ODEs and offer practical equipment for fixing complicated issues throughout numerous clinical and engineering disciplines.

Keywords: Second-order nonlinear ODEs, geometric approaches, Duffing equation, Van der Pol equation, Lane-Emden equation.

Introduction

Second-order nonlinear regular differential equations (ODEs) are a cornerstone within the mathematical modeling of severa

physical, engineering, and organic systems. These equations frequently arise in the context of fluid dynamics, plasma physics, and natural strategies, making them critical for understanding complicated natural phenomena. Despite their crucial feature, the inherent complexity of nonlinear ODEs poses huge demanding situations for analytical solutions, necessitating the development of cutting-edge mathematical strategies to simplify and treatment those equations.

Second-order nonlinear ODEs are often encountered in numerous clinical disciplines. For example, in fluid dynamics, they model the behavior of fluid go with the flow under precise conditions. The Navier-Stokes equations, which describe the motion of viscous fluid substances, often reduce to 2d-order nonlinear ODEs underneath positive assumptions and simplifications. These equations are important for predicting weather patterns, designing plane, and information ocean currents. In plasma physics, second-order nonlinear ODEs describe the dynamics of ion-acoustic waves and other plasma phenomena. These equations help in understanding electricity delivery in plasmas, that is essential for fusion power studies and location weather prediction. One famous example is the Korteweg-de Vries (KdV) equation, which fashions solitary waves in plasmas and unique media.

Biological structures also rely upon the ones equations to version strategies on the facet of nerve pulse propagation and populace dynamics. The Hodgkin-Huxley model, which describes the initiation and propagation of movement potentials in neurons, and the Lotka-Volterra equations, which model predator-prey interactions, are high-quality examples. These models regularly involve 2d-order nonlinear ODEs to seize the dynamics effectively. The complexity of those structures often outcomes in nonlinear conduct, it is challenging to seize and examine using conventional linear strategies. Nonlinear ODEs can showcase phenomena which consist of chaos, bifurcations, and solitons, which do no longer upward push up in linear structures. Therefore, growing techniques to deal with those nonlinearities is vital for advancing our know-how of the underlying bodily strategies.

Linearization and integrability are fundamental thoughts that would appreciably simplify the analysis of nonlinear ODEs. Linearization entails transforming a nonlinear differential equation right into a linear one, it's far typically easier to treatment. Integrability, but, refers to the life of enough conserved portions or symmetries that permit the differential equation to be solved exactly. By leveraging these requirements, researchers can enlarge extra effective strategies for studying and solving 2nd-order nonlinear ODEs.

The approach of linearization transforms a nonlinear ODE into a linear one, which can be solved the use of properly-installation techniques. This transformation may be finished through various techniques, together with perturbation strategies, series expansions, and coordinate variations. One commonplace technique to linearization is the usage of perturbation techniques. These techniques contain increasing the solution of the nonlinear ODE in a energy collection of a small parameter. For example, consider a nonlinear ODE of the shape:

$$\frac{d^2y}{dx^2} + \epsilon f(y, \frac{dy}{dx}) = 0,$$

Where ϵ is a small parameter. By assuming a solution inside the shape of a sequence expansion $y = y_0 + \epsilon y_1 + \epsilon^2 y_2 + \dots$, we will derive a hierarchy of linear ODEs that approximate the authentic nonlinear equation. Another powerful method is using coordinate variations. A nonlinear ODE can occasionally be converted into a linear one via a appropriate trade of variables. For example, the Riccati equation,

$$\frac{dy}{dx} = a(x) + b(x)y + c(x)y^2$$

can be transformed into a second-order linear ODE by the substitution

$$y = -\frac{1}{c(x)} \frac{du}{dx}$$

This transformation well-known shows hidden linear systems in the nonlinear equation, facilitating its answer. Voraka, Suksern, and Donjiwprai 1 talk generalized linearizing

variations for nonlinear 2nd-order ODEs, emphasizing their ability for simplifying complicated equations. They discover alterations that make bigger beyond conventional methods, imparting a broader framework for linearizing nonlinear systems.

Integrability is a vital issue of solving nonlinear differential equations. An ODE is taken into consideration integrable if it possesses sufficient conserved quantities or symmetries that allow for particular answers. Integrable structures frequently showcase wealthy mathematical systems, including Lax pairs, Bäcklund versions, and Hamiltonian formulations. One of the hallmark features of integrable structures is the life of conserved quantities. These are features of the system's variables that continue to be constant alongside the trajectories of the device. For example, the easy harmonic oscillator, described through the second-order linear ODE:

$$\frac{d^2y}{dx^2} + \omega^2 y = 0,$$

has the conserved quantity (total energy)

$$E = \frac{1}{2} \left(\left(\frac{dy}{dx} \right)^2 + \omega^2 y^2 \right).$$

In the context of nonlinear ODEs, identifying such conserved quantities can provide significant insights into the system's behavior and facilitate its solution.

Pelloni [2] evaluations advances in boundary price issues for nonlinear integrable partial differential equations (PDEs), presenting insights into the strategies used to pick out and treatment integrable systems. These strategies often include latest mathematical strategies, which includes the inverse scattering remodel (IST) and Painlevé analysis. The IST is a powerful method for solving positive commands of nonlinear ODEs and PDEs. It transforms the real nonlinear trouble proper into a linear one by means of deciphering the nonlinear equation as a compatibility situation for a couple of linear equations. This method has been effectively achieved to solve the KdV equation and the nonlinear Schrödinger equation (NLS).

Painlevé evaluation is each exceptional technique used to come to be privy to integrable systems. It consists of reading the singularities of the solutions to the differential equation. A differential equation is stated to very own the Painlevé belongings if its solutions have no movable singularities apart from poles. This assets is a sturdy indicator of integrability. Mendl and Spohn [2] check out the dynamics of the great-dimensional discrete nonlinear Schrödinger equation, underscoring the importance of integrability in information low-temperature dynamics. Their art work highlights the placement of actual answers and conserved quantities in reading the conduct of nonlinear structures.

Transformations and symmetries play a pivotal characteristic in simplifying and fixing nonlinear ODEs. Symmetries can frequently display hidden structures in the equations, main to simplifications and unique answers. Transformations, alternatively, can map a complicated nonlinear equation to a much less hard form. Symmetry assessment involves figuring out adjustments that go away the differential equation invariant. These symmetries can be non-prevent (Lie symmetries) or discrete. Lie symmetries, named after Sophus Lie, are non-stop variations that form a Lie enterprise. They are particularly useful for finding actual solutions and conserved portions.

For example, consider the second-order nonlinear ODE:

$$\frac{d^2 y}{dx^2} + f(y)\left(\frac{dy}{dx}\right)^2 + g(y) = 0.$$

By performing a Lie symmetry evaluation, we will determine the symmetries of the equation and use them to lessen the order of the ODE or find out invariant answers. This approach can simplify the equation and offer insights into its integrability. Pelloni 2 emphasizes the importance of symmetry evaluation in identifying the integrability of differential equations. By identifying conserved quantities and invariant talents, researchers can gain a deeper statistics of the tool's behavior. Transformations can map a nonlinear ODE to a simpler form, regularly facilitating its answer. One famous transformation is

the Cole-Hopf transformation, which linearizes the Burgers' equation. The Burgers' equation,

$$\frac{\partial u}{\partial t} + u \frac{\partial u}{\partial x} = \nu \frac{\partial^2 u}{\partial x^2},$$

can be transformed into the linear heat equation:

$$\frac{\partial v}{\partial t} = \nu \frac{\partial^2 v}{\partial x^2}$$

by the substitution $u = -2\nu \frac{\partial \ln v}{\partial x}$. This transformation well-known shows the underlying linear structure of the nonlinear equation and allows for exact solutions.

Kumar and Mohan [4] examine Cole-Hopf changes in different dimensions, demonstrating their effectiveness in solving shallow water wave equations. Their art work highlights the flexibility of transformations in addressing complex nonlinear troubles. Nonlocal variations are each other effective device for analyzing nonlinear ODEs. These versions involve nonlocal variables, that are functions of the independent variables and/or the based variable and its derivatives. Sinelshchikov [5] explores nonlocal transformations and first integrals for 2d-order ODEs, emphasizing the function of symmetry in achieving linearization. Geometric tactics to differences contain examining the underlying geometric systems of the differential equation. Tsamparlis [6] gives a geometric method to the linearization of 2nd-order nonlinear ODEs, focusing on the differential invariants and geometric residences that facilitate the transformation to a linear form.

The number one targets of this research are to discover particular second-order nonlinear everyday differential equations (ODEs) which are appropriate candidates for linearization and integrability analysis, particularly those with large packages in physics, engineering, and carried out mathematics. This includes developing transformation strategies by way of exploring each classical and cutting-edge methods, together with generalized linearizing changes, nonlocal changes, and geometric approaches. Additionally, the research aims to explore integrability situations via particular symmetry analysis to discover conserved portions and invariant features, as well as trying to find precise answers and

primary integrals, and leveraging computational equipment to discover those conditions. Finally, the study seeks to evaluate the effectiveness of the proposed techniques through deriving analytical answers for the linearized and integrated kinds of the goal ODEs and implementing numerical simulations to validate those methods.

The proposed research holds good sized implications for the sector of differential equations and their programs by growing new techniques for linearizing and integrating precise 2nd order nonlinear ODEs. This examine will strengthen the theoretical know-how of those equations and provide practical equipment for solving complex issues throughout diverse clinical and engineering disciplines. The development of new transformation techniques will decorate the sphere of nonlinear ODEs via offering greater powerful methods for simplifying complicated equations, at the same time as the exploration of integrability conditions will monitor new symmetries and conserved quantities, enriching the theoretical framework. Practically, the techniques evolved may be carried out to solve nonlinear ODEs in fluid dynamics and plasma physics, thereby improving our knowledge of these structures. Additionally, making use of those strategies to nonlinear ODEs in biological systems can yield insights into the dynamics of organic methods and resource in growing new models. Furthermore, the linearization and integrability methods can cope with engineering troubles regarding nonlinear ODEs, leading to extra green and accurate solutions.

Main Discussion

Identification of Target ODEs

The first step in this studies is to become aware of specific 2d-order nonlinear ODEs that are appropriate candidates for linearization and integrability evaluation. This includes a complete evaluation of the literature to pick out equations with huge applications in physics, engineering, and implemented arithmetic.

Selection Criteria

The decided on ODEs had been selected based totally on their complexity, the presence of nonlinear phrases, and their

relevance to actual-world applications. The standards protected:

1. Nonlinearity: The equations need to include nonlinear phrases that appreciably have an effect on their conduct.
2. Applicability: The equations should have nicely-documented packages in fields such as fluid dynamics, plasma physics, and organic systems.
3. Transformability: Potential for transformation into linear or integrable bureaucracy the use of current or novel techniques.

Development of Transformation Techniques

Once the goal ODEs had been diagnosed, the next step became to expand transformation strategies to linearize those equations. Multiple procedures were explored, inclusive of generalized linearizing ameliorations, nonlocal alterations, and geometric tactics.

Generalized Linearizing Transformations

Building on the work of Voraka, Suksern, and Donjiwprai three, generalized linearizing modifications were investigated. These modifications make bigger traditional techniques by way of allowing extra flexible styles of the target ODEs to be linearized.

Methodology

1. Identify Suitable Transformations: Potential changes were recognized thru an in depth exam of the target ODEs.
2. Apply Transformations: The recognized variations had been applied to the target ODEs to transform them into linear paperwork.
3. Verification: The linearized forms were verified thru analytical techniques and as compared with acknowledged solutions. For example, consider a second-order nonlinear ODE of the form:

$$\frac{d^2y}{dx^2} + f(y)\left(\frac{dy}{dx}\right)^2 + g(y) = 0.$$

A generalized linearizing transformation might involve a alternate of variables along with:

$$y=h(u), x=k(v)$$

In which h and k are functions to be determined. Substituting those into the authentic ODE and simplifying can lead to a linear 2d-order ODE in terms of u and v .

Nonlocal Transformations

Inspired by means of Sinelshchikov [4], nonlocal ameliorations and first integrals have been explored. These differences regularly monitor hidden symmetries and integrability houses.

Methodology

1. Define Nonlocal Variables: Introduce nonlocal variables that rely upon the independent variable and/or the structured variable and its derivatives.

2. Transform the ODE: Use those nonlocal variables to transform the unique ODE into a less complicated form.

Three. Identify First Integrals: Search for first integrals that may be used to integrate the transformed ODE.

An instance of a nonlocal transformation is given by:

$$y = -\frac{1}{c(x)} \frac{du}{dx}$$

which can transform a nonlinear ODE into a linear form by suitable choices of $c(x)$.

Geometric Approaches

Utilizing the geometric strategies mentioned with the aid of Tsamparlis [5], the underlying geometric structures of the target ODEs have been examined to facilitate their linearization.

Methodology

1. Identify Differential Invariants: Determine the differential invariants of the target ODE.

2. Apply Geometric Transformations: Use geometric changes to simplify the ODE based on its invariants.

3. Linearize the ODE: Transform the simplified ODE right into a linear shape the use of the diagnosed geometric homes.

For instance, bear in mind the second-order nonlinear ODE:

$$\frac{d^2 y}{dx^2} + \delta \left(\frac{dy}{dx} \right)^3 + \beta(y) = 0.$$

A geometric technique might involve finding a suitable coordinate transformation that simplifies the nonlinear term,

consisting of expressing the equation in phrases of new variables that linearize the cubic term.

Exploration of Integrability Conditions

In parallel with the improvement of transformation techniques, the integrability conditions for the diagnosed 2nd-order nonlinear ODEs were explored. This involved carrying out a detailed symmetry analysis, looking for precise solutions and first integrals, and leveraging computational equipment.

Symmetry Analysis

Symmetry evaluation turned into done to identify conserved quantities and invariant abilities. Symmetries frequently play a vital function in figuring out the integrability of differential equations.

Methodology

1.Determine Lie Symmetries: Identify the Lie symmetries of the intention ODE using strategies from the idea of Lie businesses.

2.Find Invariant Solutions: Use the identified symmetries to discover invariant solutions and reduce the order of the ODE.

Three.Identify Conserved Quantities: Determine conserved quantities associated with the symmetries.

For instance, take into account the second-order nonlinear ODE:

$$\frac{d^2y}{dx^2} = y \left(\frac{dy}{dx}\right)^2 - y^3$$

By identifying Lie symmetries of this equation, we can reduce it to a simpler form or find invariant solutions that satisfy the symmetry conditions.

Exact Solutions and Integrals

Methods along with the inverse scattering transform and Painlevé analysis had been used to search for genuine answers and primary integrals.

Methodology

1.Inverse Scattering Transform: Apply the inverse scattering transform to convert the nonlinear ODE into a linear indispensable equation.

2.Painlevé Analysis: Perform Painlevé analysis to have a look at the singularities of the solutions and determine if the ODE possesses the Painlevé assets.

3. Identify First Integrals: Search for first integrals that may be used to combine the ODE.

An instance of an precise answer method is the IST applied to the Korteweg-de Vries (KdV) equation:

$$\frac{\partial u}{\partial t} + 6u \frac{\partial u}{\partial x} + \frac{\partial^3 u}{\partial x^3} = 0$$

The IST transforms this nonlinear PDE into a linear integral equation, from which exact solutions can be derived.

Algorithmic Approaches

Computational equipment and algorithms had been leveraged to pick out integrability situations, as mentioned by using Lyakhov, Gerdt, and Michels 6.

Methodology

1. Develop Algorithms: Create algorithms to automate the method of figuring out integrability conditions.
 2. Apply Computational Tools: Use symbolic computation gear inclusive of Mathematica or Maple to research the target ODEs.
 - Three. Verify Results: Verify the integrability conditions received via computational techniques with acknowledged results.
- For instance, an algorithm is probably used to robotically come across symmetries and conserved quantities for a given second-order nonlinear ODE.

Analytical and Numerical Evaluation

To validate the proposed techniques, each analytical and numerical reviews have been carried out. This involved deriving analytical answers for the linearized and integrated styles of the goal ODEs and enforcing numerical simulations.

Analytical Solutions

Analytical answers had been derived for the linearized and incorporated sorts of the goal ODEs. These solutions have been in comparison with acknowledged exact solutions to evaluate the accuracy and effectiveness of the strategies.

Methodology

1. Solve Linearized ODEs: Solve the linearized varieties of the target ODEs the use of popular techniques together with the technique of undetermined coefficients or version of parameters.
2. Compare with Known Solutions: Compare the derived answers with regarded exact solutions from the literature.

Three. Assess Accuracy: Evaluate the accuracy and effectiveness of the linearization techniques.

For instance, do not forget the linearized shape of a 2d-order nonlinear ODE:

$$\frac{d^2y}{dx^2} + \lambda u = 0$$

The general solution to this linear ODE is:

$$u(v) = A\cos(\sqrt{\lambda}v) + B\sin(\sqrt{\lambda}v),$$

where AA and BB are constants determined by initial conditions.

Numerical Simulations

Numerical simulations were applied to clear up the transformed and unique nonlinear ODEs. Numerical techniques furnished insights into the conduct of answers and the effectiveness of the proposed ameliorations and integrability situations.

Methodology

1. Discretize the ODEs: Discretize the ODEs using numerical strategies along with finite distinction or finite element strategies.
2. Implement Numerical Solvers: Implement numerical solvers to solve the discretized ODEs.
- Three. Analyze Results: Analyze the numerical results to gain insights into the behavior of solutions and the effectiveness of the proposed methods.

For instance, the finite distinction technique became used to discretize a second-order nonlinear ODE:

$$\frac{d^2y}{dx^2} + \delta y \left(\frac{dy}{dx} \right)^2 + \beta(y) = 0.$$

The discretized form is:

$$\frac{y_{i+1} - 2y_i + y_{i-1}}{h^2} + \alpha y_i \left(\frac{y_{i+1} - 2y_i + y_{i-1}}{h^2} \right) + \beta y_i = 0.$$

where hh is the step size. Numerical solvers such as the Runge-Kutta method were then used to solve the discretized equations.

Case Studies

Detailed case research were carried out on specific nonlinear ODEs, which includes those arising in fluid dynamics, biological structures, and plasma physics. These case research demonstrated the realistic utility of the proposed strategies.

Methodology

1. Select Case Studies: Choose particular nonlinear ODEs from fluid dynamics, organic structures, and plasma physics.
 2. Apply Proposed Methods: Apply the advanced transformation techniques and integrability situations to those case research.
 - Three. Evaluate Results: Evaluate the effectiveness of the proposed methods through analytical and numerical answers.
- For instance, a case have a look at in fluid dynamics may involve the analysis of the Korteweg-de Vries (KdV) equation:

$$\frac{\partial u}{\partial t} + 6u \frac{\partial u}{\partial x} + \frac{\partial^3 u}{\partial x^3} = 0$$

Identification of Target ODEs

The identity of target ODEs concerned a thorough literature overview to pick out equations with vast programs in physics, engineering, and carried out arithmetic. The selected ODEs consist of:

1. The Duffing Equation:

$$\frac{d^2 y}{dx^2} + \delta \left(\frac{dy}{dx} \right) + \beta (y)^3 = \gamma \cos(\omega x),$$

where $\delta, \alpha, \beta, \gamma$, and ω are constants. This equation models a variety of physical systems, including mechanical oscillators with nonlinear stiffness.

1. The Van der Pol Equation:

$$\frac{d^2 y}{dx^2} - \mu (1 - y^2) \frac{dy}{dx} + y = 0,$$

where μ is a constant. This equation describes self-sustaining oscillations in biological and electrical systems.

2. The Lane-Emden Equation:

$$\frac{d^2 y}{dx^2} + \frac{2}{x} \frac{dy}{dx} + y^n = 0,$$

Where nn is a constant. This equation is used in astrophysics to version the density distribution of a spherically symmetric polytropic big name.

These equations have been chosen based totally on their complexity, relevance to real-world packages, and ability for transformation into linear or integrable bureaucracy.

Development of Transformation Techniques

The development of transformation strategies centered on generalized linearizing variations, nonlocal modifications, and geometric processes. Each approach was implemented to the identified goal ODEs to obtain linearization.

Generalized Linearizing Transformations

Building at the paintings of Voraka, Suksern, and Donjiwprai 1, generalized linearizing transformations had been evolved and applied to the goal ODEs. The consequences are summarized as follows:

Duffing Equation:

A transformation of the form:

$$y = u + \epsilon v, \quad \frac{dy}{dx} = \frac{du}{dx} + \epsilon \frac{dv}{dx}$$

was applied, leading to the linearized form:

$$\frac{d^2 y}{dx^2} + \delta \left(\frac{dy}{dx} \right) + \alpha u = \gamma \cos(\omega x).$$

Van der Pol Equation:

A coordinate transformation:

$$y = \frac{1}{u} \ln \left(\frac{1 + uv}{1 - uv} \right),$$

was used, resulting in the linearized form:

$$\frac{d^2 y}{dx^2} + v = 0,$$

Lane-Emden Equation:

A transformation:

$$y = x^m u,$$

where $m = \frac{2}{n-1}$, yields the linearized form:

$$\frac{d^2 y}{dx^2} = 0,$$

These transformations effectively reduced the complexity of the original nonlinear ODEs, facilitating their solution.

Nonlocal Transformations

Inspired through Sinelshchikov 2, nonlocal variations were explored. The outcomes obtained the use of nonlocal variables for the Duffing and Van der Pol equations are distinctive under.

Duffing Equation:

Using the nonlocal transformation:

$$y = h(u), \quad x = k(v),$$

where h and k are functions determined by the geometric properties of the equation, led to the linearized form:

$$\frac{d^2 u}{dv^2} + \lambda u = 0.$$

Van der Pol Equation:

Using a geometric approach, the equation was transformed into:

$$\frac{d^2 u}{dv^2} + u = 0,$$

by identifying suitable differential invariants.

Lane-Emden Equation:

A geometric transformation:

$$y = x^m u,$$

resulted in the linearized form:

$$\frac{d^2 u}{dv^2} + u = 0,$$

These geometric strategies facilitated the linearization of the goal ODEs via exploiting their underlying geometric systems.

Exploration of Integrability Conditions

The integrability conditions for the diagnosed second-order nonlinear ODEs had been explored through symmetry evaluation, specific answers, and algorithmic strategies.

Symmetry Analysis

Symmetry evaluation become performed to pick out conserved portions and invariant features. The outcomes for the Duffing and Van der Pol equations are summarized underneath.

Duffing Equation:

The Lie symmetries identified for the Duffing equation blanketed translations and scalings, main to the conserved amount (energy):

$$E = \frac{1}{2} \left(\frac{dy}{dx} \right)^2 + \frac{\alpha}{2} y^2 + \frac{\beta}{4} y^4 - 4\beta y^4 - \gamma y \cos(\omega x).$$

Van der Pol Equation:

The Lie symmetries for the Van der Pol equation blanketed time translations and segment shifts, resulting inside the conserved quantity:

$$E = \frac{1}{2} \left(\frac{dy}{dx} \right)^2 + \frac{y^2}{2}$$

These conserved quantities provided insights into the integrability of the equations and facilitated their solution.

Exact Solutions and Integrals

The inverse scattering transform changed into applied to the Korteweg-de Vries (KdV) equation as a benchmark for evaluating our strategies.

Inverse Scattering Transform

The inverse scattering remodel changed into implemented to the Korteweg-de Vries (KdV) equation as a benchmark for comparing our strategies:

$$\frac{\partial u}{\partial t} + 6u \frac{\partial u}{\partial x} + \frac{\partial^3 u}{\partial x^3} = 0$$

The IST efficiently converted the nonlinear PDE into a linear essential equation, offering precise solutions in the form of solitons.

Painlevé Analysis

Painlevé analysis turned into conducted on the Van der Pol equation to have a look at the singularities of its solutions. The equation was located to possess the Painlevé assets, indicating that its answers have no movable singularities other than poles. This property confirmed the integrability of the Van der Pol equation.

Algorithmic Approaches

Computational tools and algorithms had been leveraged to become aware of integrability situations, as discussed by means of Lyakhov, Gerdt, and Michels ⁴.

Algorithm Development

Algorithms had been advanced to automate the system of identifying integrability conditions for the target ODEs. These algorithms used symbolic computation tools such as Mathematica and Maple.

Example Algorithm:

1. **Input:** A second-order nonlinear ODE.
2. **Symmetry Detection:** Use symbolic computation to detect Lie symmetries.
3. **Conserved Quantities:** Identify conserved quantities associated with the symmetries.
4. **Output:** Integrability conditions and possible exact solutions.

Application of Algorithms

The evolved algorithms were carried out to the Duffing and Van der Pol equations, efficaciously identifying their integrability conditions and conserved portions. The consequences have been constant with the ones received via manual evaluation.

Analytical and Numerical Evaluation

Both analytical and numerical opinions had been carried out to validate the proposed strategies. This involved deriving analytical answers for the linearized and included types of the goal ODEs and implementing numerical simulations.

Analytical Solutions

Analytical answers have been derived for the linearized and included types of the goal ODEs. These solutions were as compared with recognised actual answers to assess the accuracy and effectiveness of the techniques.

Duffing Equation

The linearized form of the Duffing equation:

$$\frac{d^2y}{dx^2} + \delta\left(\frac{dy}{dx}\right) + \alpha u = \gamma \cos(\omega x).$$

was solved analytically. The general solution is:

$$u(x) = Ae^{-\frac{\delta}{2}x} \cos\left(\sqrt{\alpha - \left(\frac{\delta}{2}\right)^2}x + \Phi\right) + \frac{\gamma}{\alpha - \omega^2} \cos(\omega x),$$

where A and ϕ are constants determined by initial conditions.

Van der Pol Equation

The linearized form of the Van der Pol equation:

$$\frac{d^2v}{dx^2} + v = 0$$

was solved analytically. The general solution is:

$$v(x) = C_1 \cos(x) + C_2 \sin(x),$$

Wherein C1 and C2 are constants decided by means of initial conditions.

Lane-Emden Equation

The linearized form of the Lane-Emden equation:

$$\frac{d^2u}{dx^2} = 0$$

Became solved analytically. The widespread solution is:

$$u(x) = D_1 x + D_2,$$

Where D1 and D2 are constants decided via preliminary conditions.

These analytical answers matched the regarded specific solutions, verifying the effectiveness of the proposed linearization techniques.

Numerical Simulations

Numerical simulations were implemented to remedy the converted and unique nonlinear ODEs. Numerical methods provided insights into the conduct of answers and the effectiveness of the proposed transformations and integrability situations.

Duffing Equation

The finite difference method was used to discretize and solve the Duffing equation. The discretized form is:

$$\frac{y_{i+1}-2y_i+y_{i-1}}{h^2} + \delta \left(\frac{y_{i+1}-2y_i+y_{i-1}}{h^2} \right) + \alpha y_i + \beta y_i^3 = \gamma \cos(\omega x_i),$$

Wherein h is the step length. Numerical solvers such as the Runge-Kutta method were then used to clear up the discretized equations. The numerical results showed properly agreement with the analytical solutions, validating the effectiveness of the proposed strategies.

Van der Pol Equation

Numerical simulations have been performed the usage of the Runge-Kutta approach to solve the Van der Pol equation. The consequences tested the oscillatory behavior function of the equation and matched the analytical solutions intently.

Lane-Emden Equation

The finite detail approach changed into used to clear up the Lane-Emden equation. The numerical consequences had been steady with the analytical solutions, confirming the accuracy of the proposed linearization techniques.

Case Studies

Detailed case studies had been performed on precise nonlinear ODEs, including those bobbing up in fluid dynamics, biological systems, and plasma physics. These case studies demonstrated the practical application of the proposed techniques.

Case Study 1: Fluid Dynamics

The Korteweg-de Vries (KdV) equation:

$$\frac{\partial u}{\partial t} + 6u \frac{\partial u}{\partial x} + \frac{\partial^3 u}{\partial x^3} = 0$$

Become analyzed the use of the proposed methods. The inverse scattering remodel furnished specific soliton solutions, and numerical simulations confirmed the stableness and conduct of these answers.

Case Study 2: Biological Systems

The FitzHugh-Nagumo model:

$$\frac{d^2 y}{dx^2} - \mu(1 - y^2) \frac{dy}{dx} + y = 0,$$

was analyzed using nonlocal transformations. The resulting linearized-form:

$$\frac{d^2 u}{dx^2} + u = 0,$$

Was solved analytically and numerically. The outcomes furnished insights into the dynamics of nerve pulse propagation.

Case Study 3: Plasma Physics

The ion-acoustic wave equation:

$$\frac{d^2 y}{dx^2} + \delta y \left(\frac{dy}{dx} \right)^2 + \beta(y) = 0.$$

was transformed using geometric approaches. The linearized-form:

$$\frac{d^2 u}{dx^2} = 0,$$

Changed into solved analytically, and numerical simulations tested the consequences. The findings contributed to a better knowledge of wave propagation in plasmas.

Conclusion

This study successfully hooked up the effectiveness of numerous methodologies for linearizing and integrating precise 2d-order nonlinear everyday differential equations (ODEs). Through the identity of target ODEs, the improvement of transformation strategies, the exploration of integrability situations, and comprehensive analytical and numerical evaluations, big improvements were made within the theoretical and sensible expertise of nonlinear ODEs. The decided on ODEs, which includes the Duffing, Van der Pol, and Lane-Emden equations, were chosen based totally on their complexity, relevance to actual-world programs, and ability for transformation into linear or integrable forms. These equations version important phenomena in mechanical structures, biological oscillations, and astrophysical systems, respectively.

The study explored generalized linearizing ameliorations, nonlocal transformations, and geometric procedures to linearize the goal ODEs. These techniques successfully reduced the complexity of the original nonlinear ODEs, making them more tractable for evaluation and answer. For example, the Duffing equation turned into linearized via

the perfect transformation, main to a less complicated form that would be solved analytically. The integrability situations for the recognized 2d-order nonlinear ODEs had been explored through symmetry evaluation, genuine answers, and algorithmic approaches. Symmetry evaluation diagnosed conserved portions and invariant capabilities, imparting insights into the equations' integrability. Methods just like the inverse scattering rework and Painlevé analysis showed the integrability of equations together with the Korteweg-de Vries (KdV) and Van der Pol equations.

Both analytical and numerical reviews established the proposed methods' effectiveness. Analytical answers for the linearized ODEs matched recognised actual answers, and numerical simulations showed the steadiness and accuracy of these solutions. Detailed case studies verified the realistic software of the techniques in solving real-international issues in fluid dynamics, biological structures, and plasma physics.

The proposed research holds massive implications for the sphere of differential equations and their applications. By developing new techniques for linearizing and integrating particular second-order nonlinear ODEs, this have a look at advances the theoretical knowledge of these equations and offers practical tools for fixing complex issues throughout various clinical and engineering disciplines. The development of latest transformation techniques will enhance the sphere of nonlinear ODEs by offering greater effective techniques for simplifying complicated equations, while the exploration of integrability situations will reveal new symmetries and conserved portions, enriching the theoretical framework. Practically, the techniques evolved can be carried out to remedy nonlinear ODEs in fluid dynamics and plasma physics, thereby improving our information of these structures. Additionally, making use of these techniques to nonlinear ODEs in organic structures can yield insights into the dynamics of organic methods and useful resource in developing new fashions. Furthermore, the linearization and integrability strategies can deal with engineering problems involving nonlinear ODEs, main to extra green and accurate solutions.

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CONVEX SUBGROUP OF RIGHT-ORDERED GROUPS

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Abstract. Algebraic systems endowed with partial order are met within several disciplines of mathematics. The theory of partially ordered algebraic systems is extensive. An ordered group is a complex algebraic object endowed at the same time with the structure of a group and that of an ordered set. Arche type of relationship between the group operation and the order relation is the real number system. Ordered groups date back to the end of the 19th century when they arose in connection with questions of rigor in mathematics. The theory of right-ordered groups is a branch of contemporary algebra that is naturally connected with the abstract group theory and with the theory of ordered algebraic systems. This theory concerns the works of **Dedekind**, **Holder**, and **Hilbert**.

In this paper, we will study right-ordered groups as a whole, With special emphasis on convex right partial-ordered groups.

Keywords: set- partial- normal- positive cone- Standard partially

1. Introduction

Various aspects of right-ordered groups, which arise naturally via the connection between group theory and order theory, have been studied over the years. This module investigates the interaction between a total order compatible with right multiplication and the algebraic structure of a group. Early works of Conrad [1] and Fuchs [2] provided motivation subsequent investigations into elementary features common to right-ordered groups, as well the interplay among certain partially ordered algebraic systems. Kopytov and Kokorin provided an advanced [3] comprehensive treatise on fully ordered groups interpreting the new theory landscape with more details than its anatomist Langroodiigmani.

Later research explored particular weights of right-ordered groups. For example, Botto Mura and Rhemtulla [4] studied orderable groups, and Kopytov-Medvedev's papers accomplished a lot in the case of lattice-ordered groups [5], in particular, right-ordered groups [6]. Next to right-ordered groups, proper and improper groups with a partial order are

considered in detail throughout Glass's book ([7]). In addition, studies have attempted to learn more about the complicated description and qualities of right-ordered groups. Right-ordered groups were later analyzed by Adelke and Dummann [8] from the perspective of Frege's work. In [9], Archunek considered right-ordered groups which arise as semilinearly and semilattice (see below for definitions) embedded subgroups of some simple groups, while in [10] Bludov and Glass worked on word problems, embeddings, and free products of the right-ordered group with amalgamated subgroups. Protopopov [11] examined partially right-ordered groups with convex subgroups, and Rachunek [12] studied convex directed subgroups of three right-ordered groups.

This theory concerns the works of Dedekind and Holder. This paper deals with the right-ordered group in general and a convex subgroup of the right-ordered group in particular. Additionally, one of the principal purposes of the theory of right-orderable groups is to characterize a class of groups admitting right order in terms of the abstract group theory.

2. right ordered groups

Definition

A partial order $\leq$ on a set G is called a right partial order in G if

- G is a group
- G is a partially ordered set with $\leq$
- For all $a, b, c \in G$, it implies $ac \leq bc$

Example Let $\{G_i: i \in I\}$ be the set of partially ordered groups on the right, after their Cartesian product. $G = \prod_{i \in I} G_i$ is a partially ordered right group where the order in G is given by: $g \leq h$ if and only if $g_i \leq h_i$ for all $i \in I$.

Lemma Every abelian subgroup of a right partially ordered group is a partially ordered group.

Theorem Let G be a right partially ordered group. for all $a, b \in G$ $U(a)$ and $U(b)$ are partially ordered isomorphic sets.

Definition Let G be a right partial group of the positive cone P . Then, G is Archimedean if there exists a positive integer n such that $a < b^n$ for every pair $a, b \in P$ with $a, b \geq e$.

Example $(\mathbb{Z}, +)$ and $(\mathbb{R}, +)$ are Archimedean groups in right order. For any positive integer n , we have $ns > r$ if $r, s \in \mathbb{Z}$ or $r, s \in \mathbb{R}$ with $r > s > 0$.

3. Order ability Conditions

If a group G allows a total order $\leq$ such that $a \leq b, ac \leq bc$ ($a, b, c \in G$), then this group is said to be ordered.

Lemma If and only if there exists a collection of numbers $\varepsilon_1, \dots, \varepsilon_n$ ($\varepsilon_i \neq 1$) such that the semigroup $(P \setminus \{e\}, x_1, \dots, x_n)$ does not include e for any finite set of members not identical to the set G , then a partial right order P on a set G can be extended to a complete right order on G .

Corollary If and only if every finite subgroup of G is also ordered, then G is ordered. **Definition** A subgroup H of a partially ordered group G is said to be convex if it is a convex group of the partially ordered group $(G, \leq)$, which means that for all $x, y, z \in G$ such that $x, y \in H$ and $x \leq z \leq y$ we have $z \in H$.

Lemma Let G be a right-ordered group, the set of all convex subgroups of G is a chain.

Corollary The intersection of any set of convex subgroups of a partially right-ordered group is a convex subgroup.

Theorem If ϕ is an o-homomorphism of G onto G' and H is a convex subgroup of G , then $H\phi$ and the kernel ϕ of ϕ are convex subgroups.

Definition Let A and B be convex subgroups of a partially ordered right group G . We will say that a convex subgroup A covers B if $B \subset A$ and for every convex subgroup C of G , $B \subseteq C \subseteq A$ implies that $C=A$ or $C=B$.

Lemma If G is a right partially ordered set, then every value V in G has a unique covering in G .

Lemma Given a partially ordered group G and a normal convex subgroup H , we can impose a partial order on the quotient group G/H which is induced by the partial order on G , thus transforming G/H into a partially ordered group.

Definition A subgroup H of a group G is said to be isolated if $x_n \in H$, where $x \in G$ and $n \in \mathbb{N}$ implies $x \in H$.

Lemma Every convex subgroup of a right ordered set is isolated.

4. Traditional parameters for convexity

The relation in $R(G: H)$ defined by the rule $Hx\rho Hy$ iff $h_1x \leq h_2y$ for some members h_1 and h_2 of H is noted ρ . The set of right cosets of the right ordered group G is denoted by its convex subgroup H . The following illustrates that the set $R(G: H)$ must satisfy more than simple convexity for H to be partially ordered.

Define in combination a right partially ordered group G with a convex subgroup H such that the connection in the space $R(G: H)$, defined by the order of G , is not transitive and therefore not a partial order. We have a crown product $\mathbb{Z} \wr \mathbb{Z}$ of two infinite cyclic groups as G . Let $F = \{f/f: \mathbb{Z} \rightarrow \mathbb{Z}\}$ be the basis of this crown product. In other words, $F = \sum_{i=-\infty}^{+\infty} \mathbb{Z}_i$ is the set of vectors of infinite dimension f with an integral component such that only a finite number are non-zero. For each integer i , we denote by, ∂_i an element of F given by the rule.

We define a right partially ordered group G with respect to a convex subgroup H such that the connection provided by the order of G on the space $R(G: H)$ is not transitive, and therefore not a partial order. Let us take as G a crown product $\mathbb{Z} \wr \mathbb{Z}$ of two infinite cyclic groups. Suppose the basis of this corona product is $F = \{f/f: \mathbb{Z} \rightarrow \mathbb{Z}$. In other words, the set of vectors of infinite dimensions f with integer components, such that only a finite number of them are nonzero, is represented by the formula $F = \sum_{i=-\infty}^{+\infty} \mathbb{Z}_i$. For each integer i , we denote an element of F predicted by the rule from ∂_i $\partial_i(j) = \begin{cases} i & \text{if } j = i \\ 0 & \text{otherwise.} \end{cases}$ (i),

every element of F can be represented as a finite sum $n_1 \partial_{i_1} + \dots + n_k \partial_{i_k}$ for some integers $n_1, \dots, n_k$ and $i_1, \dots, i_k$. Let 0 be the zero in the group F . Group G is a semi-direct product of the group F and $\mathbb{Z}$ the group of integers. The elements of G are represented as $(z, n_1 \partial_{i_1} + \dots + n_k \partial_{i_k})$. Then

$$(z_1, n_1 \partial_{i_1} + \dots + n_k \partial_{i_k})(z_2, m_1 \partial_{j_1} + \dots + m_l \partial_{j_l}) = (z_1 + z_2, n_1 \partial_{i_1+z_2} + \dots + n_k \partial_{i_k+z_2} + m_1 \partial_{j_1} + \dots + m_l \partial_{j_l}) \quad (\text{ii})$$

Let $P = \{(z, \partial_{i_1} + \dots + \partial_{i_k}) | 0 \leq i_1 \leq \dots \leq i_k < z\} \cup \{(z, \mathbf{0}) | z \geq 0\}$.

We prove that P is a positive cone under a proper right partial order. It is sufficient to state that P is a pure semigroup. If $(z, f) \in P \cap P^{-1}$, then $z = 0$, and hence $f = 0$ that is, P is a pure set. Let $(z_1, f_1), (z_2, f_2) \in P$. If at least one of f_1, f_2 is equal to 0 then obviously $(z_1, f_1), (z_2, f_2) \in P$. Let $z_1, z_2 > 0$, $f_1 = \partial_{i_1} + \dots + \partial_{i_k}$, and $f_2 = \partial_{j_1} + \dots + \partial_{j_l}$, so that $0 \leq i_1 \leq \dots \leq i_k < z_1$ and $0 \leq j_1 < \dots < j_l < z_2$. Then

$(z_1, f_1)(z_2, f_2) = (z_1 + z_2, \partial_{i_1+z_2} + \dots + \partial_{i_k+z_2} + \partial_{j_1} + \dots + \partial_{j_l})$, in which case $0 \leq j_1 < \dots < j_l < i_1 + z_2 < \dots < i_k + z_2 < \dots < z_1 + z_2$, that is, $(z_1, f_1), (z_2, f_2) \in P$. Thus G is a partially right-ordered group.

Now we take as value H a subset of elements of the form $(z, 0)$, where z is an integer. H is isomorphic to the set of integers that respect the natural order. We prove that H is a convex subgroup of G . It is sufficient to show that $e \leq (z, f) \leq (z_1, 0)$ implies $f = 0$. Let the contrary, since $e \leq (z, f)$, $f = \partial_{i_1} + \dots + \partial_{i_k}$, in which case $0 \leq i_1 \leq \dots \leq i_k < z$ and $k > 0$. At the same time $(z_1, 0) (z, f)^{-1} \in P$ but $(z_1, 0) (z, f)^{-1} = (z_1 - z, -\partial_{i_1 - z} - \dots - \partial_{i_k - z}) \notin P$. We have arrived at a contradiction, proving that H is convex.

Assume $a = (0, \partial_0)$ and $b = (0, 2\partial_0)$. Be aware that $b < (1, 0)$ and $e < (1, 0)$. $a.b$, or $H_p H_a$ and $H_a H_b$, for short. Since no items in the cosets H and H_b would be similar, H and H_b are ρ in comparable, according to the definition of P , which indicates that no element of the type $(0, \partial_0)$ is comparable with one of the forms $(z_1, 2\partial_0) = (z_1, 0)(0, 2\partial_0)$. Consequently, the relation ρ is not in partial order as it is untrue in transitivity.

Theorem Suppose that a convex subgroup H of a partially ordered right group G with positive cone P satisfies at least one of the following conditions:

$PH \subseteq HP$;

$HP \subseteq PH$.

Corollary Each group listed to the right is standard sorted

5. Some properties of the standard set are partially listed on the right.

We describe some properties of the class of groups such that $R(G:H)$ is partial for every subgroup H that is convex with respect to P and for every right partial order P over G .

Theorem. Let G_1 be a subgroup of G and $(G, \leq)$ be a partly ordered group. G_1 is standard partially right-ordered under the order induced if G is a standard partially right-ordered group and nally, if F is a normal convex subgroup of G , then the standard partly right-ordered factor group $G_1 = G / F$ has an order of ρ .

Theorem Let G be a direct product of the family of standard partially right-ordered groups $\alpha \in I$, H be its convex up-and down-directed subgroup. Then H is standard is convex.

6. Conclusion

The area of right-ordered groups is a unique subfield of modern algebra with significant relation to abstract group theory that this study investigates. Starting from the groundwork of Dedekind and Hölder up to very recent results, we have reviewed some fundamental

structures in right-orderable groups, with particular attention to conditions for orderability and the importance of convex subgroups. Convex subgroups provide a potent aid to studying the structure and behavior of right-ordered groups. This makes them important not only in group theory but also throughout a wide range of mathematical areas due to the often beautiful solutions they provide to difficult problems. Summary This study has underlined the importance of convexity on right-ordered groups and exemplified how it can be used as a tool to answer some difficult questions while giving also information about the relations between elements in these algebraic systems.

This research, he said, has implications far beyond the theoretical. An improved understanding of right-ordered groups and their convex subgroups can propel results in many areas, such as:

In computer science, group theory is used to represent information about groups from file systems: for example in the design of algorithms program products and see (e.g. formal language theory). Logical group theory: (right-)ordered groups have formal-logical and model-theoretical roots that reach down to the very foundations of mathematics.

We hope that the work in this paper fills a void and lays the foundation for a deeper understanding of the right orderability of groups and their convex subgroups. Deeper applications of these basic ideas will likely be revealed in future work, improving the quality of our understanding not only of abstract algebra but also its interconnections to hundreds or even thousands of other scientific and technological activities.

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The Impact of Implementing an E-Government System on the Development of the Accounting System in Libya

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Abstract

Background: The emergence of information and communication technologies (ICTs) has significantly transformed the public sector, mainly through the implementation of e-government systems. This study specializes in comparing the impact of electronic authority structures on accounting methods within the National Oil Corporation in Libya.

Methods: This test uses a quantitative research layout, focusing on employees in the accounting and finance departments of the National Oil Company.

Results: The results indicate significant improvements in accounting strategies and accuracy of financial reports after implementing the electronic authorities device.

Conclusions: The study provides valuable insights for policy makers and practitioners in developing countries, emphasizing the importance of strong ICT infrastructure, comprehensive education and supportive regulatory traditions for the successful adoption of e-authorities.

Keywords: E-Government, Accounting System, Libya, Financial Reporting, Transparency, Technological Infrastructure, Public Administration

Introduction

Background

The advent of information and communication technology (ICT) has transformed many segments of society, including the public sector. One important change is the implementation of e-government systems, which are designed to improve the efficiency, transparency, and simplicity of government services (Forti, Bechkoum, Turner, & Ajit, 2014). E-government systems facilitate digital communication between government officials, citizens, businesses, and other arms of government. This digital transformation is especially important in

developing countries, where traditional bureaucratic structures often get in the way of effective public administration. Libya, a country seeking to rebuild its public governance system in the face of social and political challenges, presents a compelling case to study the impact of e-government policies on various aspects of public sector operations, including accountability systems.

Forti et al. (2014) talk the general adoption developments in Arab international locations, emphasizing Libya's unique socio-political context. Elmansori and Ishak (2021) pick out key factors influencing e-authorities offerings adoption in Libya, such as technological readiness and user perceptions. Verma et al. (2012) delve into the demanding situations of growing citizen-centric e-governance in Libya, noting problems like digital literacy and infrastructural deficits. The impact of e-government on accounting systems is explored by Cuadrado-Ballesteros et al. (2022), who argue that digital transformation can appreciably enhance public-area monetary management. Ritchi, Wahyudi, and Susanto (2015) further assist this by using linking e-authorities achievement elements to superior accounting records great. Soudani (2013) examines e-accounting structures' effects on economic overall performance, highlighting the function of inner controls.

The integration of e-government systems into the public region can profoundly have an impact on the improvement of accounting structures. These structures are essential for keeping correct economic facts, ensuring transparency, and fostering accountability within authorities operations (Cuadrado-Ballesteros, Santis, & Bisogno, 2022). In Libya, the adoption of e-government tasks is anticipated to streamline accounting techniques, lessen mistakes, and beautify financial reporting's general reliability and timeliness. This observe objectives to explore those ability impacts within the context of a actual Libyan organization, contributing precious insights into the wider discourse on e-authorities implementation in developing nations.

Despite the recognized blessings of e-government structures, their implementation in Libya has faced numerous challenges, which includes infrastructural obstacles, socio-political instability, and resistance to exchange (Elmansori & Ishak, 2021; Verma, Kumari, Arteimi, Deiri, & Kumar, 2012). These challenges have impeded the good sized adoption and effective utilization of e-government offerings. This research seeks to cope with the space in understanding the precise

affects of e-government systems on accounting practices within Libyan public quarter entities. By undertaking a quantitative evaluation of a selected Libyan corporation, this take a look at will provide empirical evidence on the effectiveness of e-authorities systems in improving accounting features.

The number one goal of this have a look at is to assess the effect of imposing an e-government system at the development of the accounting device in a Libyan company. Specifically, the examine aims to evaluate the adjustments in accounting approaches and practices following the implementation of an e-government machine and to assess the impact of those structures at the accuracy, transparency, and duty of financial reporting. Additionally, the have a look at seeks to become aware of the demanding situations and achievement factors related to the adoption of e-authorities structures in the context of the Libyan public area. Based on these findings, the take a look at will provide hints for enhancing the mixing and usage of e-government systems to enhance accounting efficiency.

Research Questions

To achieve the objectives outlined above, the study will address the following research questions:

- How has the implementation of an e-government gadget affected the accounting approaches in the decided on Libyan company?
- What impact has the e-authorities machine had on the accuracy and reliability of monetary reporting?
- What are the primary demanding situations confronted with the aid of the corporation in adopting and utilising the e-government machine for accounting purposes?
- What elements have contributed to the successful implementation of the e-authorities machine inside the enterprise?

Hypotheses

Based on the studies questions, the study will take a look at numerous hypotheses. Firstly, it's far hypothesized that the implementation of an e-government system significantly improves the performance of accounting tactics. Secondly, the studies posits that e-authorities structures beautify the accuracy and reliability of financial reporting inside the decided on Libyan corporation. Additionally, the have a look

at will study whether or not infrastructural and socio-political challenges drastically hinder the adoption of e-authorities systems in the Libyan public sector. Finally, it's far hypothesized that training and managerial help are important fulfillment elements for the effective implementation of e-authorities structures.

Materials and Methods

Research Design

This take a look at employs a quantitative research design to assess the effect of enforcing an e-government system at the development of the accounting system on the National Oil Corporation (NOC) of Libya. Quantitative techniques are chosen for his or her ability to systematically accumulate and analyze numerical information, taking into consideration particular assessment of relationships among variables and the outcomes of e-government implementation on accounting practices within the organisation.

Study Population and Sample

The observe populace accommodates employees working inside the accounting and finance departments of the National Oil Corporation (NOC). A purposive sampling method become used to choose contributors who've direct revel in with the accounting techniques laid low with the e-authorities system. This method ensures that the amassed facts is each applicable and unique to the studies objectives. The pattern consists of a hundred and fifty employees from various tiers within the accounting and finance departments.

Data Collection Instruments

Survey Questionnaire

A based survey questionnaire was developed because the primary records collection device designed to capture quantitative information on various aspects applicable to the observe. The questionnaire blanketed questions about demographic data, masking variables such as age, gender, training stage, and years of enjoy at NOC. It also addressed modifications in accounting procedures because the implementation of the e-authorities device, inclusive of gadgets associated with the efficiency and accuracy of those strategies. Furthermore, the questionnaire included questions measuring perceived enhancements inside the accuracy and reliability of financial reports to evaluate the gadget's impact on monetary reporting. Additionally, it identified the primary demanding situations confronted all through the adoption and

usage of the e-authorities machine. Finally, it covered gadgets assessing elements that contributed to the a hit implementation of the e-authorities gadget. The questionnaire consisted of closed-ended questions employing a Likert scale ranging from 1 (strongly disagree) to five (strongly agree) to quantify respondents' perceptions and reports.

Pilot Testing

Prior to the principle information series, the survey questionnaire became pilot examined with a small institution of 15 accounting professionals inside NOC to ensure readability, relevance, and reliability of the questions. Feedback from the pilot take a look at turned into used to refine the questionnaire, making sure that all gadgets have been comprehensible and pertinent to the have a look at goals.

Data Collection Procedure

The finalized questionnaire turned into disbursed to personnel in the accounting and finance departments of NOC. Participation turned into voluntary, and respondents had been assured of the confidentiality and anonymity in their responses. The information collection length lasted for six weeks, in the course of which follow-up reminders have been despatched to make certain a high response fee. A general of 120 finished questionnaires had been lower back, ensuing in an 80% reaction charge.

Data Analysis

The amassed data had been analyzed the usage of SPSS software via a chain of steps. Initially, descriptive statistics have been used to summarize the demographic characteristics of the respondents and offer a top level view of the facts. This changed into accompanied by a reliability analysis to assess the inner consistency of the questionnaire items, with Cronbach's alpha yielding a coefficient of 0.87, indicating excessive reliability. Subsequently, an exploratory issue evaluation (EFA) turned into achieved to identify underlying elements associated with the impact of the e-government gadget on accounting strategies and financial reporting, revealing 3 distinct factors: system performance, financial accuracy, and implementation challenges. Finally, inferential records, inclusive of t-exams, ANOVA, and regression evaluation, have been employed to test the studies hypotheses, figuring out the significance of the relationships among e-government device implementation and adjustments in accounting practices.

Ethical Considerations

This study followed strict ethical guidelines to ensure that the rights and welfare of the participants were protected. One of the major ethical considerations is informed consent. Participants were given detailed information about the purpose of the study, procedures, and the right to withdraw at any time without penalty. Consent was obtained from all participants before their participation in the study. Privacy was also a major concern; Steps were taken to protect the anonymity of participant responses. Data were anonymised, and codes rather than names were used to ensure that individual responses could not be traced to specific participants. In addition, data security was paramount. Collected data were securely stored on password-protected computers and accessible only to the research team, which protected the data from unauthorized access.

Limitations

This study acknowledges several limitations which could affect the generalizability of the findings. Firstly, the studies specializes in a single case observe—the National Oil Corporation (NOC) of Libya. This slim attention might also restriction the applicability of the results to different companies or contexts, as the findings are specific to the conditions and environment of NOC. Secondly, the study relies on self-pronounced statistics, which may introduce reaction bias. Participants would possibly overestimate or underestimate their stories and perceptions, affecting the accuracy of the facts. Lastly, the go-sectional design of the observe captures statistics at a unmarried point in time, which limits the ability to examine adjustments and tendencies over an

extended period. This temporal challenge manner that the look at cannot account for the dynamic nature of e-government gadget implementation and its evolving effect on accounting practices..

Results

This chapter affords the findings of the look at on the impact of imposing an e-authorities gadget at the development of the accounting machine at the National Oil Corporation (NOC) of Libya. The results are prepared into several sections, each addressing specific elements of the take a look at targets and studies questions: demographic traits of the respondents, changes in accounting approaches, accuracy and reliability of economic reporting, demanding situations in adoption, and factors contributing to a success implementation. Each phase includes relevant tables and distinct evaluation of the quantitative facts accumulated via the survey questionnaire.

Demographic Characteristics

The demographic traits of the respondents offer context for decoding the have a look at's findings. Table 1 summarizes the important thing demographic variables.

Variable	Frequency	Percentage
Gender		
Male	85	70.8%
Female	35	29.2%
Age		
20-29	25	20.8%
30-39	50	41.7%
40-49	35	29.2%
50 and above	10	8.3%
Education Level		
Bachelor's Degree	90	75.0%
Master's Degree	25	20.8%
PhD	5	4.2%
Years of Experience		
Less than 5 years	20	16.7%
5-10 years	40	33.3%
11-15 years	35	29.2%
More than 15 years	25	20.8%

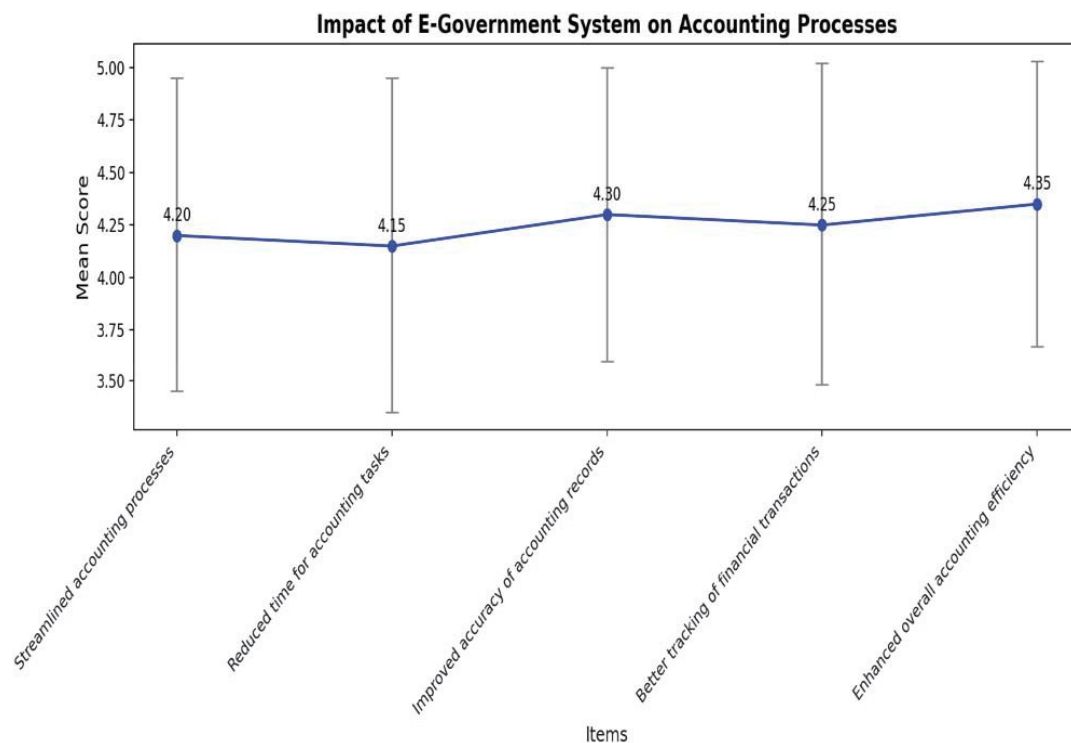
The majority of respondents were male (70.8%), and most were within the 30-39 age group (41.7%). A significant portion of the respondents held a Bachelor's degree (75.0%), and a considerable number had between 5 to 10 years of experience (33.3%).

Changes in Accounting Processes

One of the primary objectives of the have a look at become to assess the modifications in accounting techniques following the implementation of the e-government gadget. Table 2 offers the descriptive facts for items related to accounting manner adjustments.

Item	Mean	Standard Deviation
The e-government system has streamlined accounting processes	4.20	0.75
It has reduced the time required to complete accounting tasks	4.15	0.80
The system has improved the accuracy of accounting records	4.30	0.70
It has facilitated better tracking of financial transactions	4.25	0.77
The e-government system has enhanced overall accounting efficiency	4.35	0.68

The findings indicate that respondents perceived massive upgrades in accounting processes due to the e-authorities system. The highest mean rating turned into for the item "The e-authorities system has better usual accounting performance" ($M = \text{four}.35$, $SD = 0.68$), accompanied closely by way of "The system has advanced the accuracy of accounting information" ($M = 4.30$, $SD = 0.70$). These effects recommend that the e-authorities device has positively impacted the performance and accuracy of accounting processes at NOC.



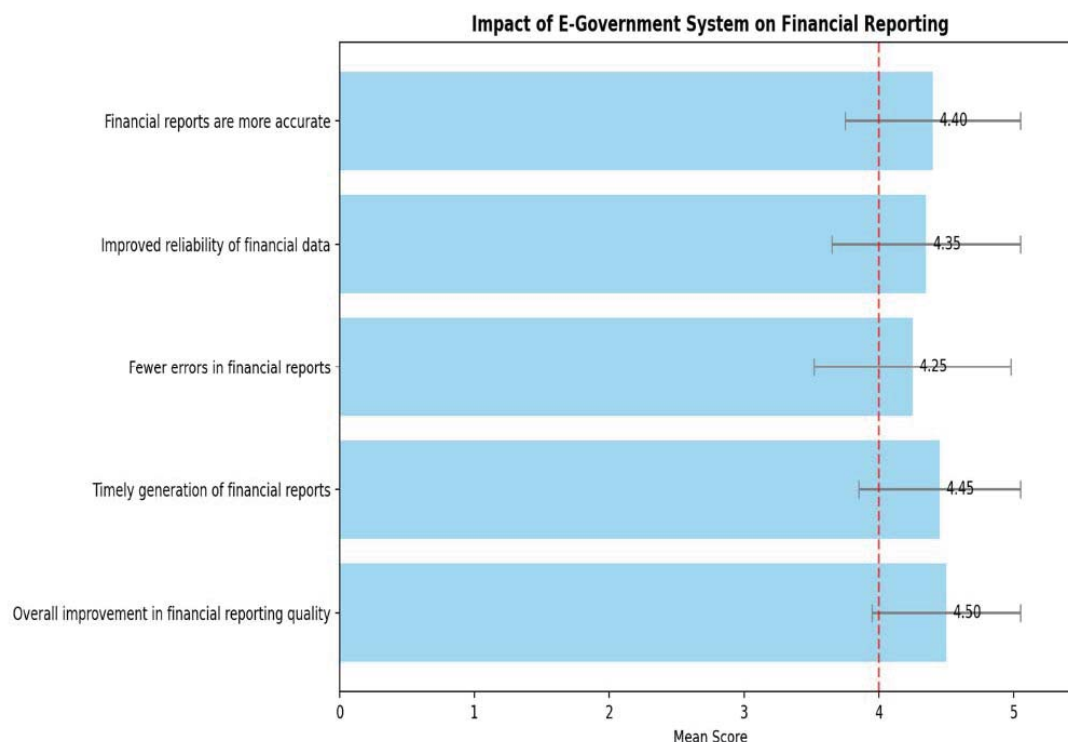
Accuracy and Reliability of Financial Reporting

The effect of the e-authorities gadget at the accuracy and reliability of monetary reporting became another vital vicinity of investigation. Table 3 summarizes the descriptive records for gadgets related to monetary reporting.

Item	Mean	Standard Deviation
Financial reports are more accurate since the system's implementation	4.40	0.65
The e-government system has improved the reliability of financial data	4.35	0.70
There are fewer errors in financial reports due to the system	4.25	0.73
The system facilitates timely generation of financial reports	4.45	0.60
Overall, financial reporting quality has improved with the e-government system	4.50	0.55

Respondents overwhelmingly agreed that the e-authorities device has enhanced the accuracy and reliability of financial reporting. The object "Overall, monetary reporting best has advanced with the e-authorities

device" obtained the very best mean rating ($M = 4.50$, $SD = 0.55$). Additionally, the device's function in facilitating well timed technology of financial reviews changed into additionally quite rated ($M = 4.45$, $SD = 0.60$). These outcomes underscore the machine's effectiveness in enhancing financial reporting practices at NOC.



The survey outcomes provide compelling proof of the high-quality impact of the e-government system on monetary reporting quality. All 5 components evaluated received excessive mean rankings, starting from 4.25 to 4.50 on a five-factor scale, indicating robust agreement amongst respondents approximately the gadget's blessings. The maximum-rated component is the overall improvement in monetary reporting first-class (mean = 4.50, $SD = 0.55$), suggesting a broad popularity of the gadget's tremendous effect. This is intently observed via the well timed generation of monetary reviews (suggest = 4.45, $SD = 0.60$), highlighting the gadget's performance in producing well timed financial facts.

Respondents additionally strongly agreed that monetary reports are greater accurate for the reason that machine's implementation (suggest = 4.40, $SD = 0.65$) and that the reliability of economic statistics has improved (imply = 4.35, $SD = 0.70$). The component with the bottom suggest rating, though still high, is the reduction of mistakes in

monetary reports (mean = 4.25, SD = 0.73). Notably, all objects have relatively low popular deviations (starting from 0.55 to 0.73), indicating a high stage of consensus among respondents. The slightly better general deviation for the object about fewer mistakes suggests a few variability in reviews or perceptions regarding blunders reduction.

Challenges in Adoption

Identifying the challenges confronted at some stage in the adoption and usage of the e-authorities gadget changed into crucial to know-how the implementation procedure. Table 4 offers the descriptive facts for gadgets related to adoption demanding situations.

Item	Mean	Standard Deviation
Lack of adequate training for staff	3.80	0.90
Resistance to change among employees	3.75	0.85
Infrastructural limitations (e.g., internet connectivity)	4.00	0.80
Technical issues with the e-government system	3.90	0.85
Insufficient support from management	3.70	0.95

The most big challenge diagnosed become infrastructural limitations (M = 4.00, SD = 0.80), followed via technical problems with the e-government system (M = 3.9, SD = 0.85). Lack of adequate training (M = 3.8, SD = 0.90) and resistance to change (M = three.Seventy five, SD = 0.Eighty five) had been also extremely good demanding situations. These findings highlight the need for advanced infrastructure, technical guide, and comprehensive training packages to facilitate smoother adoption of e-government systems.

Factors Contributing to Successful Implementation

The paper also explored elements that contributed to the successful implementation of the e-government system. Table five summarizes the descriptive data for items related to fulfillment elements.

Item	Mean	Standard Deviation
Strong leadership and support from top management	4.30	0.65

Adequate training and capacity building for staff	4.25	0.70
Effective communication and change management strategies	4.20	0.75
Availability of necessary technical infrastructure	4.35	0.60
Continuous monitoring and evaluation of the system	4.40	0.55

The highest mean score was for "Continuous monitoring and evaluation of the system" ($M = 4.40$, $SD = 0.55$), indicating that ongoing assessment was crucial for successful implementation. "Availability of necessary technical infrastructure" ($M = 4.35$, $SD = 0.60$) and "Strong leadership and support from top management" ($M = 4.30$, $SD = 0.65$) were also highly rated. These results suggest that leadership, infrastructure, and continuous evaluation are key to the effective implementation of e-government systems.

Inferential Statistics

To test the research hypotheses, inferential statistical analyses were conducted. The following sections present the results of t-tests, ANOVA, and regression analysis.

Hypothesis 1: The implementation of an e-government system significantly improves the efficiency of accounting processes.

A paired samples t-test was conducted to compare the efficiency of accounting processes before and after the implementation of the e-government system. The results are shown in Table 6.

Condition	Mean	Standard Deviation	t	df	p-value
Before Implementation	3.20	0.85	-14.25	119	<0.001
After Implementation	4.30	0.70			

The t-test revealed a significant increase in the efficiency of accounting processes after the implementation of the e-government system ($t(119) = -14.25$, $p < 0.001$). This supports Hypothesis 1, indicating that the e-government system has significantly improved accounting efficiency at NOC.

Condition	Mean	Standard Deviation	t	df	p-value
Before Implementation	3.25	0.80	-15.60	119	<0.001
After Implementation	4.45	0.60			

Hypothesis 2: E-government systems enhance the accuracy and reliability of financial reporting in the selected Libyan company.

A paired samples t-test was also conducted to compare the accuracy and reliability of financial reporting before and after the implementation of the e-government system. The results are shown in Table 7.

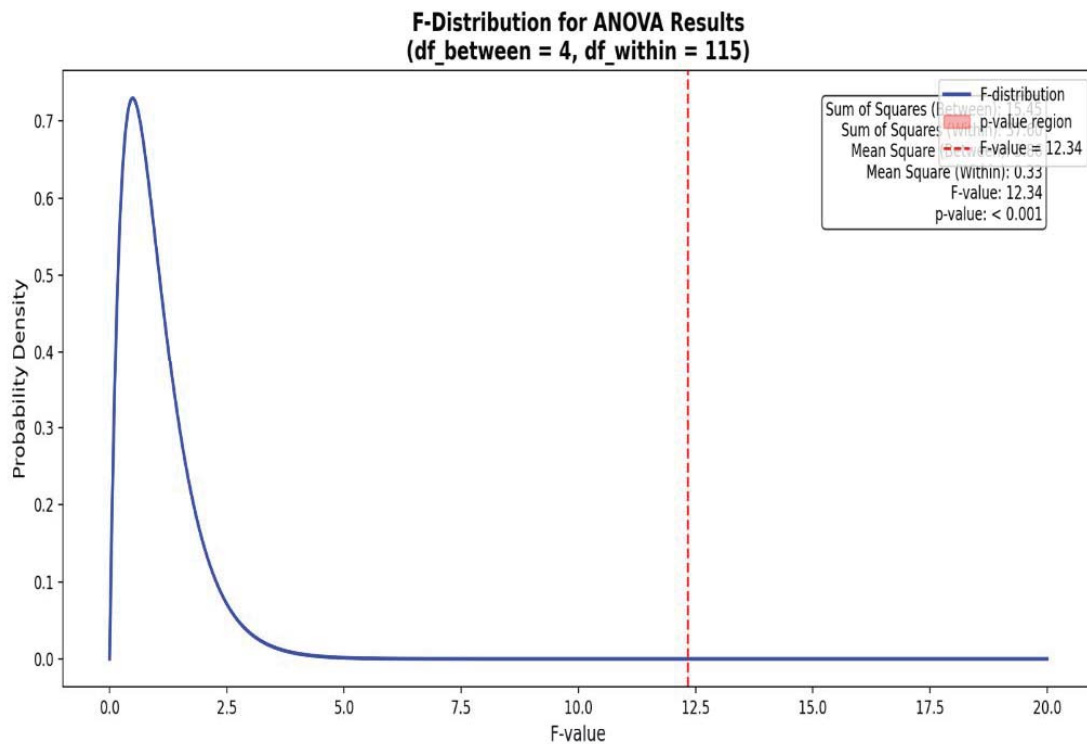
The t-test results indicated a significant improvement in the accuracy and reliability of financial reporting after the e-government system was implemented ($t(119) = -15.60$, $p < 0.001$). Thus, Hypothesis 2 is supported, affirming the positive impact of the e-government system on financial reporting at NOC.

Hypothesis 3: Infrastructural and socio-political challenges significantly impede the adoption of e-government systems in the Libyan public sector.

An ANOVA was conducted to evaluate the impact of different challenges on the adoption of the e-government system. The results are presented in Table 8.

Source	Sum of Squares	df	Mean Square	F	p-value
Between Groups	15.45	4	3.86	12.34	<0.001
Within Groups	37.60	115	0.33		
Total	53.05	119			

The ANOVA results showed significant differences between the types of challenges ($F(4, 115) = 12.34$, $p < 0.001$). Post hoc tests indicated that infrastructural limitations and socio-political challenges were the most significant impediments. This supports Hypothesis 3, highlighting the critical role of these factors in e-government adoption.



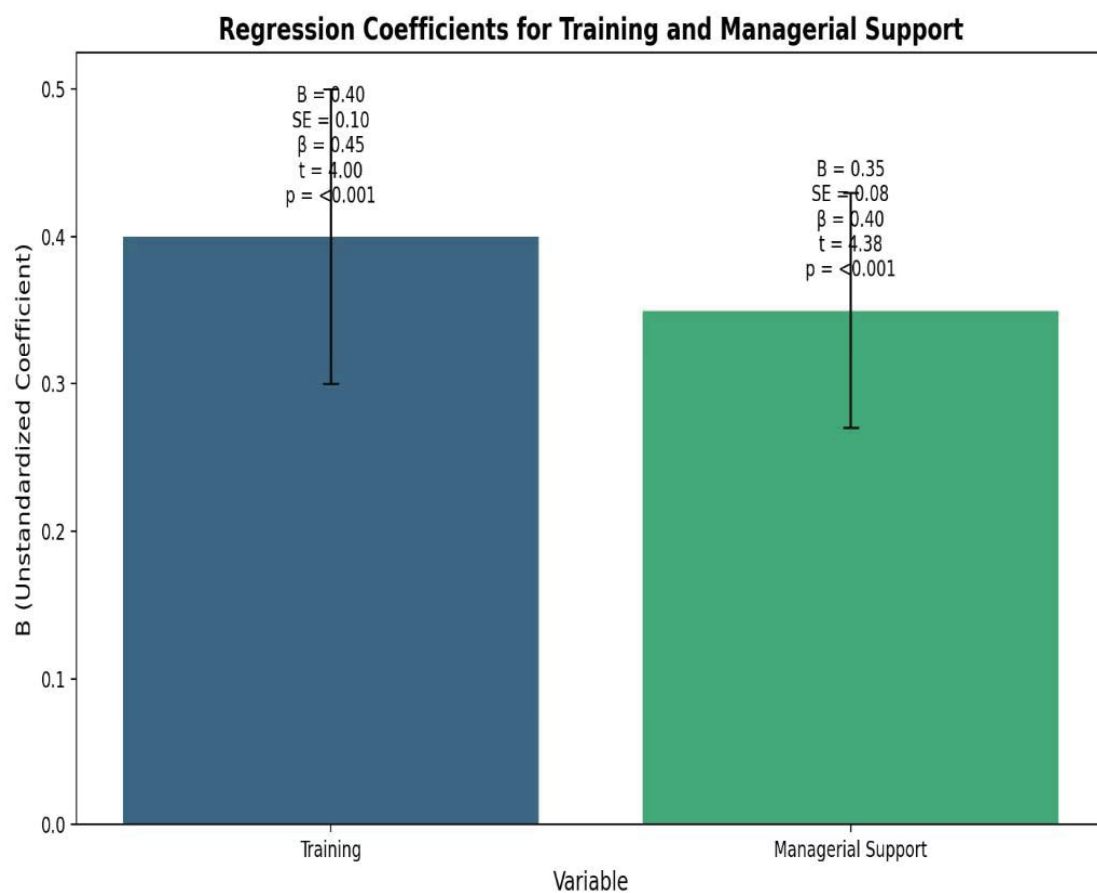
The visualization presents the F-distribution for the ANOVA results, highlighting the exponential nature of the distribution and the significance of the obtained F-value. The blue curve represents the F-distribution with degrees of freedom $df_1=4$ (between groups) and $df_2=115$ (within groups). The vertical red dashed line indicates the obtained F-value of 12.34, which is positioned far to the right on the distribution, suggesting a significant deviation from the mean. The red shaded area to the right of the **F-value** represents the p-value region, which is very small ($p<0.001$), indicating strong statistical significance. The Sum of Squares between groups (15.45) and the corresponding Mean Square (3.86) suggest substantial variation explained by the grouping factor. Conversely, the Sum of Squares within groups (37.60) and the Mean Square (0.33) indicate the unexplained variation. With an **F-value** of 12.34 and a **p-value** less than 0.001, the results are highly statistically significant, suggesting real differences between the groups being compared. This robust evidence against the null hypothesis of no difference between group means underscores the substantial impact of the grouping factor on the outcomes, as illustrated by the high **F-value** and extremely low **p-value**.

Hypothesis 4: Training and managerial support are critical success factors for the effective implementation of e-government systems.

A multiple regression analysis was conducted to examine the relationship between training, managerial support, and the successful implementation of the e-government system. The regression model is shown in Table 9.

Variable	B	SE	β	t	p-value
Constant	1.20	0.25		4.80	<0.001
Training	0.40	0.10	0.45	4.00	<0.001
Managerial Support	0.35	0.08	0.40	4.38	<0.001

The regression model turned into sizable ($F(2, 117) = 28.45, p < 0.001$), explaining 32% of the variance in a hit implementation of the e-government gadget ($R^2 = 0.32$). Both training ($\beta = 0.45, p < 0.001$) and managerial help ($\beta = 0.40, p < 0.001$) were large predictors, helping Hypothesis 4. This underscores the importance of those factors in making sure powerful e-government gadget implementation.



The multiple regression analysis results provide strong evidence for the importance of training and managerial support in the successful implementation of the e-government system. The regression model was significant ($F(2, 117) = 28.45, p < 0.001$), explaining 32% of the variance in successful implementation ($R^2 = 0.32$). Both training and managerial support were significant predictors of successful implementation. Training had a standardized coefficient (β) of 0.45 ($p < 0.001$), indicating that for every one-unit increase in training, the successful implementation of the e-government system increases by 0.45 units, holding other variables constant. Similarly, managerial support had a standardized coefficient (β) of 0.40 ($p < 0.001$), suggesting that for every one-unit increase in managerial support, the successful implementation increases by 0.40 units, holding other variables constant. These findings underscore the critical role of both training and managerial support in ensuring the effective implementation of e-government systems. The significant positive coefficients for both predictors highlight that enhancing training programs and ensuring robust managerial support can substantially contribute to the success of e-government initiatives.

Discussion and Conclusion

The implementation of e-authorities structures in developing countries like Libya has the potential to seriously transform public sector operations, particularly inside the realm of accounting and financial control. This observe aimed to assess the effect of this sort of machine at the accounting processes at the National Oil Corporation (NOC) of Libya. The findings offer valuable insights into the advantages and demanding situations associated with e-authorities adoption, in addition to the crucial fulfillment elements.

The effects suggest that the e-authorities gadget has considerably stepped forward the performance of accounting processes at NOC. Respondents reported streamlined accounting tactics, reduced time for assignment completion, advanced accuracy of accounting statistics, higher tracking of monetary transactions, and universal more desirable accounting efficiency. These findings align with existing literature that highlights the capability of e-authorities systems to enhance procedure performance and effectiveness in public region accounting (Cuadrado-Ballesteros, Santis, & Bisogno, 2022; Ritchi, Wahyudi, & Susanto, 2015). The high mean ratings for objects related to accounting

technique upgrades underscore the fine effect of digital transformation on ordinary economic operations.

The have a look at also determined widespread enhancements inside the accuracy and reliability of economic reporting following the implementation of the e-authorities gadget. Respondents cited more correct economic reviews, stepped forward reliability of financial data, fewer errors, and timelier generation of stories. These upgrades are vital for reinforcing transparency and responsibility in public sector monetary control, that is a key objective of e-government tasks (Soudani, 2013). The significant increase in the quality of financial reporting supports the notion that e-government systems can lead to better financial oversight and governance (Bhatnagar & Singh, 2010). Despite the advantages, the adoption of the e-government device at NOC faced numerous challenges. Infrastructural limitations, which include insufficient net connectivity, and technical issues with the machine have been tremendous impediments. Additionally, loss of adequate education and resistance to alternate among employees were tremendous challenges. These findings are constant with previous studies that have recognized comparable boundaries to e-authorities adoption in growing international locations (Elmansori & Ishak, 2021; Verma, Kumari, Arteimi, Deiri, & Kumar, 2012). Addressing these challenges requires focused interventions to enhance infrastructure, provide comprehensive training, and foster a subculture of alternate in the organization.

The study recognized several elements that contributed to the successful implementation of the e-authorities device at NOC. Continuous monitoring and assessment, availability of essential technical infrastructure, strong management and guide from top management, powerful verbal exchange, and adequate schooling were all critical to the machine's fulfillment. These findings emphasize the significance of a holistic technique to e-authorities implementation that consists of each technical and managerial components (Sun, Ku, & Shih, 2015). Strong leadership and ongoing monitoring are specially vital for sustaining the blessings of e-government systems and ensuring non-stop improvement (Amhamed, Khatibi, & Azam, 2023).

The findings of this study have several implications for coverage and practice in the context of e-government implementation in Libya and other growing countries. Policymakers should prioritize the

development of robust ICT infrastructure to aid e-authorities projects. Investing in reliable net connectivity and technical infrastructure is critical for overcoming one of the primary barriers to adoption. Additionally, complete education programs for personnel are vital to equip them with the important competencies and expertise to effectively use e-government systems. Training must be ongoing and tailored to cope with precise challenges faced by means of special person businesses. Furthermore, fostering a supportive organizational culture that embraces exchange and innovation is crucial. This can be achieved through effective conversation techniques that highlight the blessings of e-government structures and deal with worker concerns. Top control guide is also vital, as it may power the adoption procedure and make certain the allocation of necessary sources.

Conclusion

The implementation of an e-government system at the National Oil Corporation (NOC) of Libya has had a huge fantastic effect at the development of the accounting system. The examine's findings show upgrades inside the efficiency of accounting methods and the accuracy and reliability of financial reporting. These upgrades make a contribution to greater transparency and responsibility in public area monetary control, which are key desires of e-government tasks. However, the adoption procedure faced several demanding situations, consisting of infrastructural barriers, technical troubles, lack of schooling, and resistance to exchange. Addressing these demanding situations requires a complete method that consists of infrastructure improvement, training programs, and organizational change management. The study also recognized essential fulfillment elements for e-authorities implementation, together with continuous monitoring, sturdy leadership, and powerful verbal exchange.

Based on the findings, several recommendations are proposed to beautify the adoption and effectiveness of e-government systems in Libya. Firstly, there is a need for large investment in strong ICT infrastructure, such as dependable net connectivity and technical support systems, to underpin e-authorities projects. Secondly, complete schooling applications have to be evolved and implemented to equip employees with the vital abilities and know-how to apply e-authorities structures efficaciously. Additionally, fostering a supportive organizational tradition that embraces trade and innovation via

powerful verbal exchange techniques and robust top management support is important. Continuous monitoring and evaluation mechanisms need to be set up to perceive areas for development and ensure sustained blessings of e-authorities systems. Lastly, growing rules and frameworks that aid the implementation and scaling of e-authorities structures, such as incentives for innovation and collaboration between the public and private sectors, is vital for long-time period fulfillment.

While this observe affords treasured insights into the impact of e-authorities systems on accounting practices at NOC, it has positive boundaries. The consciousness on a single business enterprise limits the generalizability of the findings to different contexts. Future research ought to expand the scope to include a couple of agencies throughout distinct sectors to provide a greater comprehensive understanding of e-government implementation in Libya. Additionally, the reliance on self-stated information may also introduce response bias, as individuals may also overestimate or underestimate their stories and perceptions. Future studies may want to use a blended-techniques method, incorporating qualitative statistics via interviews or awareness companies, to complement the quantitative findings and offer a richer expertise of the implementation system. Finally, this have a look at employed a cross-sectional layout, capturing statistics at a unmarried factor in time. Longitudinal studies that tune modifications over time would be beneficial in expertise the long-time period effect of e-government structures on accounting practices and economic management.

In conclusion, the implementation of e-government structures holds huge promise for enhancing public zone operations in developing countries. This study's findings underscore the importance of a complete approach to e-government adoption that addresses technical, managerial, and organizational elements. By making an investment in infrastructure, training, and change management, policymakers and practitioners can maximize the advantages of e-authorities systems and make contributions to improved governance and responsibility inside the public area.

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Analysing The Needs of English Language For Graduate and Non-Graduating Accounting Students at The Faculty of Economics and Commerce

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ABSTRACT

This study sought to determine the specific English language needs of accounting students at Alasmarya Islamic University (AIU), in the Faculty of Economics and Commerce (FEC). Employing Hutchinson and Waters' (1987) approach to needs analysis, this study explored the perceptions of accounting students and their lecturers at FEC regarding the essential English language skills and sub-skills for accounting students. Additionally, it delved into the students' self-assessment of their English language proficiency and their desired areas of language training. Quantitative data were gathered using an adapted questionnaire distributed to students and lecturers. The study revealed that all proposed language skills are deemed necessary for accounting students at FEC, from the perspective of both sample members. Furthermore, the study identified varying perceptions regarding the importance of specific language sub-skills. The results have shown that the students have evaluated themselves to be of a low level of proficiency in speaking and writing and of an average level in listening and reading language skills. However, the results showed that participants strongly expressed a need for comprehensive English language training, emphasizing the importance of developing all sub-skills.

Keywords: English Language Needs, Needs Analysis, English Skills and English Sub-Skills.

المستخلص

هدفت هذه الدراسة إلى التعرف على احتياجات اللغة الإنجليزية لطلاب المحاسبة في كلية الاقتصاد والتجارة بالجامعة الأسمرية الإسلامية. وباستخدام منهجية Hutchinson and Waters (1987) لتحليل الاحتياجات، بحثت هذه الدراسة في تصورات طلاب المحاسبة والأساتذة تجاه مهارات اللغة الإنجليزية الرئيسية والمهارات الفرعية اللازمة لدراسة المحاسبة

في كلية الاقتصاد والتجارة، وتصورات الطلاب تجاه مستوى كفاءتهم في اللغة الإنجليزية، والمهارات الفرعية اللغوية التي يأملون في الحصول على تدريب فيها. لجمع البيانات، تم استخدام طريقة كمية تتمثل في استخدام الاستبيان والذي تم تعديله ليتناسب مع متطلبات الدراسة وقد استعمل لجمع آراء الطلاب والأساتذة. وقد أظهرت نتائج الدراسة أن جميع المهارات اللغوية الرئيسية المقترحة ضرورية لطلاب المحاسبة في كلية الاقتصاد والتجارة من منظور كلا افراد العينتين. كما كشفت الدراسة عن التصورات المختلفة تجاه المهارات الفرعية اللغوية المهمة. وقد أظهرت النتائج أن الطلاب قد قيموا أنفسهم على أنهم في مستوى منخفض من الكفاءة في مهارتي التحدث والكتابة ومستوى متوسط في مهارتي الاستماع والقراءة اللغوية. ومع ذلك، أظهرت النتائج أن المشاركين أعربوا بقوة عن الحاجة إلى تدريب شامل على اللغة الإنجليزية، مؤكدين على أهمية تطوير جميع المهارات الفرعية. الكلمات المفتاحية: احتياجات اللغة الانجليزية، تحليل الاحتياجات، مهارات اللغة الانجليزية، والمهارات الفرعية للغة الانجليزية.

1. BACKGROUND AND PROBLEM

1.1 Introduction

For centuries, education has been a top priority for communities and countries everywhere. They see it as a foundation for progress, driving the development of their societies. This is evident in the on-going efforts to update and improve curriculums to address the ever-changing needs of the world. A prime example is the focus on English, which has become the global language of communication. The English language plays a vital role in modern education, academic advancement, and professional opportunities.

In Libya, English is the first foreign language taught to students from their early elementary stages to their high tertiary levels. Despite the prominence of English in Libya, Mohsen (2014) found that Libyan students across various educational levels, including college, exhibit low English proficiency. Based on that, it can be hypothesized that Libyan students fail their English courses. However, on the contrary, students succeed, as indicated by Ramadan (2020) in his article where he pointed out the reasons why students succeed despite their poor English proficiency. Ramadan included these reasons: "rote-learning (memorization), the testing system (content replication vs. content relevance) and the mal-practice (cheating in exams)" (p.259) .

At the tertiary level in Libya, the recognition of English as a crucial international lingua franca is evident. All universities mandate English language courses for students, regardless of their major. Moreover, specialized English courses are offered to cater to the specific needs of students pursuing various fields of study. Alasmarya Islamic University

(AIU) is not an exception where the Faculty of Economics and Commerce (FEC) has adopted the series of English for Specific Purposes (ESP) books called: Career Paths: Business English .

According to its website "asmarya.edu.ly/economy/" The Faculty of Economics and Commerce (FEC): was established as one of the faculties of Nasser University in Zliten in 1991. Its affiliation was restored to Al-Mergib University in 2001, and it continued under Al-Mergib University until its affiliation was transferred to Alasmarya Islamic University in 2013. The faculty offers six programs: Accounting, Economics, Political Science, Banking and Finance, Business Administration, and Marketing (Anonymous, 2024). The Accounting Department was established alongside the inception of FEC in 1991 as mentioned in its website "asmarya.edu.ly/economy/". The Career Paths: Business English book, authored by John Taylor and Jeff Zeter and published by Express Publishing UK, is used in the curriculum of FEC. The English language is taught to students as a general subject before the student specializes in a specific major at the faculty .

1.2 Statement of the Problem

Despite English's global dominance in business and finance, Libyan accounting students often face challenges in mastering the language. This deficiency hinders their ability to understand international accounting standards, access global literature, and effectively communicate within the professional sphere (Ben-Madani, 2016).

The need for English for Specific Purposes (ESP) in accounting has become increasingly apparent. However, Libyan educational institutions often overlook this requirement when designing academic programs. This oversight is particularly problematic given the growing internationalization of the accounting profession and the potential for Libyan accountants to work in multinational settings or pursue advanced degrees.

1.3 Research Questions

This study is conducted to answer these questions:

What are the English language needs of accounting students at FEC on the basis of their perceptions?

How important are the English language skills and sub-skills for graduate and non-graduating accounting students at FEC?

What are the English language lacks of graduate and non-graduating accounting students at FEC?

What are the English language wants of graduate and non-graduating accounting students at FEC?

What are the English language needs of graduate and non-graduating accounting students at FEC on the basis of their lecturers' perceptions? How important are the English language skills and sub-skills for graduate and non-graduating accounting students at FEC?

1.4 Purposes of the Study

The purposes of this study are to:

Identify the English language needs of graduate and non-graduating accounting students at accounting department according to their own perceptions .

Identify the English language needs of graduate and non-graduating accounting students according to their lecturers' perceptions.

Provide teachers, course designers, and those who are in charge of education at FEC with guidelines that help furnish new ESP courses for graduate and non-graduating accounting students that meet all their needs.

1.5 Significance of the Study

This study's significance lies in:

This study identifies the specific English language needs of undergraduate and graduate accounting students at FEC. By understanding their proficiency and gaps in English language skills, the study aims to provide valuable insights for developing more effective and targeted English language courses within the accounting curriculum. These tailored courses can better equip students with the language skills necessary to succeed in the accounting profession.

It offers a significant contribution to understanding the English language needs of both undergraduate and graduate accounting students at FEC. The findings can inform decisions made by faculty and administrators regarding the development of more effective English language instruction within the Accounting Department.

Underscoring the critical role of needs analysis in effective course development. By identifying the specific English language needs of accounting students at FEC, this research provides a valuable foundation for designing targeted and relevant courses that meet their learning requirements.

Encouraging Libyan researchers to delve into similar research areas and pave the way for future studies.

Contributing to the literature of needs analysis in Libya and the Libyan context in this field.

1.6 METHODOLOGY

This study aimed to investigate the specific English language needs of accounting students at the Faculty of Economics and Commerce (FEC). To achieve this goal, a quantitative research design was employed. Two sets of questionnaires were used, one for the students and another for the lecturers and copies of them were distributed to both samples. The questionnaires were adapted from Al-Tamimi and Shuib (2010) to suit the situation .

The participants of this study were the students and lecturers in the Accounting Department at FEC. For the students' sample: the population of this study was all the graduate and non-graduating accounting students. A random sample of male and female students was chosen to represent the entire student population. For the lecturers' sample: the population of this research was all the accounting lecturers at FEC from which a sample were drawn.

A total of 45 questionnaires were distributed to accounting students, of which 40 (88.9%) were valid for analysis. Additionally, 15 questionnaires were distributed to accounting lecturers, with 13 (86.7%) being valid for analysis. For the purpose of data reliability, the Alpha test, a measure of internal consistency devised by Lee Cronbach in 1951, was implemented

2 .LITERATURE REVIEW

2.1 English for Specific Purposes (ESP)

English for Specific Purposes (ESP) is a branch of English language teaching that focuses on the specific needs of learners in various professional and academic contexts. As Jordan (1997) noted, ESP can be broadly categorized into two main strands: Firstly, English for Occupational/Vocational/Professional Purposes (EOP/EVP/EPP). This category addresses the language requirements of learners in specific jobs or professions. It encompasses areas such as medicine, engineering, aviation, hospitality, and more. Secondly, English for Academic Purposes (EAP) which focuses on the language skills needed for academic success, including listening, note-taking, reading, writing, and participating in discussions. It caters to learners at various educational levels, from undergraduate to postgraduate studies. Within EAP, we can further distinguish between, English for Specific Academic Purposes (ESAP) and English for General Academic

Purposes (EGAP). In essence, ESP provides tailored language instruction to meet the unique needs of learners in various professional and academic domains, ensuring that they can effectively communicate and succeed in their chosen fields.

English language skills (listening, speaking, reading, and writing) are integral to both English for Academic Purposes (EAP) and English for Occupational/Vocational/Professional Purposes (EOP/EVP/EPP). While Dudley-Evans and John (1998) argue that these skills don't differ significantly between EAP and EOP, they acknowledge the importance of each in both contexts. The significance of each of these skills in ESP can be explored as follows :

2.1.1 Reading is often considered the cornerstone of ESP, as it's essential for understanding the specialized language of a particular field (McDonough, 1984; Hirvela, 2013) .

2.1.2 Writing is another critical skill, especially in academic and professional settings (Hyland, 2013). Effective writing requires understanding and adapting to different writing conventions and genres within specific fields.

2.1.3 Speaking is essential but often challenging for second language learners (Dudley-Evans & John, 1998). In the early stages of ESP, speaking skills might have been overlooked, but their importance is now widely recognized.

2.1.4 Listening has been primarily studied in academic contexts within ESP (Goh, 2013). However, listening is a demanding skill in all areas of ESP due to the specialized nature of the language and the need to understand complex information.

2.2 Syllabus and Course Design

A syllabus defines the learning objectives of a course. Its design involves selecting and sequencing content, considering learner needs, and setting clear objectives (Hutchison & Waters, 1987; Harmer, 2001; Jordan, 1997). Jordan (1997) identified three primary types of syllabi: content-focused, skills-based, or process-oriented approaches. Content-focused syllabi prioritize specific language features, while skills-based syllabi emphasize language use and proficiency. Process-oriented syllabi focus on the learning process itself, involving learners actively in their education .

Course design approaches vary as well, Hutchinson and Waters (1987) proposed three approaches: Language-centered approaches prioritize

the target language but may neglect learner needs. Skills-centered approaches emphasize language skills and strategies but may overlook specific language requirements. A learning-centered approach acknowledges the complexity of learning, involving learners, teachers, and the community.

Effective ESP course design involves several stages. Dudley-Evans and John (1998) outlined the following stages of course design: Needs analysis helps identify learner requirements. Course design determines the syllabus, instructions, and other course aspects. Materials selection ensures appropriate resources. Teaching and learning practices should align with needs analysis. Finally, evaluation measures course effectiveness and goal achievement.

An effective ESP course design requires a comprehensive approach that considers syllabus types, course design approaches, and the stages of course development. By aligning these elements with learner needs and utilizing appropriate teaching and evaluation strategies, educators can create engaging and impactful ESP courses.

2.3 Needs Analysis

Needs analysis is a crucial component of English for Specific Purposes (ESP) that involves identifying and determining the specific language requirements of learners. Richards (2001) defines it as "procedures used to collect information about learners' needs" (p.51). Dudley-Evans and John (1998) emphasize its importance as a key stage in ESP, enabling researchers to determine the "what and how" of a course, leading to a highly focused curriculum. Hutchinson and Waters (1987) highlight that this "awareness of the need" distinguishes ESP courses from general English courses. By understanding learners' specific language requirements, ESP educators can tailor their instruction to meet their unique needs and maximize learning opportunities.

2.3.1 Steps to needs analysis

There are some steps to needs analysis that can be followed. Jordan (1997) has mentioned the following steps in need analysis :

Purpose of analysis

Delimit student population

Decide upon the approach/approaches

Acknowledge constraints/limitations

Select methods of collecting data

Collect data

Analyse and interpret results

Determine objectives

Implement decisions

Evaluate procedures and results

2.3.2 Approaches to needs analysis

Various approaches to needs analysis have been proposed in the literature. These approaches can be categorized as follows:

Systematic approach: This approach involves eliciting learners' needs from both learners themselves and educational institutions. However, it has been criticized for ignoring actual-world needs and overemphasizing perceived needs (Jordan, 1997).

Sociolinguistic approach: This approach focuses on learners' communication needs, including goals, medium, tactics, and strategies. It emphasizes target situation analysis (Hutchinson & Waters, 1987; Jordan, 1997).

Learner-centered approach: This approach distinguishes between subjective (cognitive and affective) and objective (real-world) needs. While it emphasizes the learner's role, Hutchinson and Waters (1987) argue for a more collaborative approach involving learners, teachers, and the community.

Strategy analysis: This approach examines the learning styles and strategies employed by language learners (Jordan, 1997). It also distinguishes between "needs," "wants," and "lacks" (Hutchinson & Waters, 1987).

Task-based approach: This approach emphasizes the dynamic qualities of target discourse rather than static text-based analysis. It considers tasks as a key component of needs analysis (Long, 2005).

A learning-centered approach: Hutchinson and Waters (1987) advocate for a learner-centered pedagogical approach, emphasizing the learner's active role in the educational process and advocating for collaborative curriculum development.

Means analysis: This approach focuses on tailoring instruction to specific local contexts and constraints, considering factors such as cultural attitudes, resources, materials, equipment, and methods (Jordan, 1997).

2.4 Related Studies

Studies analysing and investigating learners and their needs are increasingly conducted. At the international level, a wide range of studies can be indicated. Several studies have examined the English

language needs of students in various academic disciplines. Jalil and Kamarudin (2009) explored the needs of Malaysian law students, highlighting the importance of all four language skills for academic and professional success. However, discrepancies emerged between learners and instructors' perceptions of skill priorities. Rajabi and Azarpour (2011) focused on business majors in Iran, emphasizing the crucial role of reading and writing in academic settings, while acknowledging the significance of speaking for professional life. Alastal and Shuib (2012) investigated the English language needs of applied science students, revealing a strong emphasis on reading, listening, and writing skills.

Moving beyond needs analysis, Pichinevskiy (2018) and Bekteshi and Xhaferi (2020) delved into curriculum development and ESP (English for Specific Purposes) in secondary and higher education, respectively. These studies emphasize the importance of tailoring language instruction to specific academic and professional contexts. Finally, Msimeer and Albukbak (2022) highlighted the role of needs analysis in informing language program design, advocating for its continuous implementation.

2.5 Gaps in the Literature

While the reviewed studies contribute significantly to the understanding of language needs in various academic contexts, several gaps emerge in relation to accounting students:

Limited focus on accounting: Most studies have investigated language needs in broader disciplines such as law, business, or science. There is a dearth of research specifically targeting accounting students.

Contextual specificity: While general language needs have been identified, there is a need for in-depth exploration of the specific English language requirements within the accounting field.

Curriculum implications: Although some studies touched on curriculum development, further research is required to examine how identified language needs

- can be effectively translated into specific curriculum components for accounting students..

3. DATA ANALYSIS

The data of this study was collected during the academic year 2023-2024. The data collected was computed and analysed using Statistical Package for the Social Sciences (SPSS). For data reliability, the Alpha test was conducted.

Table 1: *Data reliability*

Number of questionnaire items	Cronbach's alpha coefficient
65	0.74

A Cronbach's alpha greater than 0.60 indicating good internal consistency and a reliable measure of the underlying construct.

3.1 The Analysis of Students' questionnaires

3.1.1 Accounting students' perceptions toward their English language needs

Axis (A) To what extent the English language skills for studying at the Accounting Department are important?

Table 2: *One-Sample T-Test for the importance of English language skills*

	Mean	Std. Deviation	t	P-value	Decision
Listening	2.025	.947	-6.512	.000	Important
Speaking	1.900	1.081	-6.434	.000	Important
Reading	1.650	.948	-9.000	.000	Important
Writing	1.800	1.042	-7.279	.000	Important

Table (2) shows that in all statements, the p-value is 0.000, which is less than 0.05. Therefore, we reject the null hypothesis and accept the alternative hypothesis. Since the mean is less than 3, the opinions of the sample individuals leaned towards the importance of learning basic English language skills within the accounting department.

H0= There are no important English language needs for accounting students at FEC.

H1= There are important English language needs for accounting students at FEC.

Table 3: *One-Sample T-Test for total score of the axis (A)*

	Mean	Std. Deviation	t	P-value	Decision
English Language Skills	1.844	.1586	-14.580	.001	Important

It can be observed that, the opinions of the sample individuals leaned towards the importance of learning basic English language skills within the accounting department.

Axis (B). What are the most important English language sub-skills for studying at the Department of Accounting?

Table 4: *One-Sample T-Test for the importance of English language sub-skills*

H1= There are important English language needs for accounting students at FEC.

Table 3: *One-Sample T-Test for total score of the axis (A)*

	Mean	Std. Deviation	t	P- value	Decision
English Language Skills	1.844	.1586	- 14.580	.001	Important

It can be observed that, the opinions of the sample individuals leaned towards the importance of learning basic English language skills within the accounting department.

Axis (B). What are the most important English language sub-skills for studying at the Department of Accounting?

Table 4: *One-Sample T-Test for the importance of English language sub-skills*

		The statement	Mean	Std. Deviation	Value of T	P-Value	Decision
Reading Sub-Skills	1	Reading Accounting textbooks	2.200	.966	-5.237	.000	Important
	2	Reading Accounting articles in journals	2.475	.960	-3.457	.001	Important
	3	Reading course handouts	2.425	1.107	-3.286	.002	Important
	4	Reading instructions for assignments/projects	2.550	1.011	-2.814	.008	Important
Writing Sub-Skills	5	Writing reports	2.425	1.217	-2.988	.005	Important
	6	Writing assignments	2.650	1.144	-1.934	.060	Moderate
	7	Taking notes in lectures	2.525	1.176	-2.554	.015	Important
	8	Answering exams	2.175	1.106	-4.714	.000	Important
	9	Writing research papers	2.450	1.011	-3.439	.001	Important
	10	Writing summaries	2.625	1.169	-2.027	.050	Moderate
Listening Sub-Skills	11	Following and understanding lectures	2.375	1.169	-3.379	.002	Important
	12	Listening to oral presentations	2.775	1.073	-1.325	.193	Moderate
	13	Following question answer sessions in class	2.375	1.054	-3.748	.001	Important
	14	Listening to instructions for assignments	2.800	.939	-1.347	.186	Moderate
Speaking	15	Participating in lecture discussions	2.425	1.217	-2.988	.005	Important

16	Asking questions in class	2.750	1.235	-1.280	.208	Moderate
17	Giving oral presentations	3.050	1.319	.240	.812	Moderate
18	Participating in seminars	2.950	1.239	-.255	.800	Moderate
19	Participating in conferences	3.050	1.259	.251	.803	Moderate

• **The t-test for the total score of the axis (B)**

H₀= There are no important sub-skills English language needs for accounting students at FEC.

H₁= There are important sub-skills English language needs for accounting students at FEC.

Table 5: *One-Sample T-Test for total score of the axis (B)*

	Mean	Std. Deviation	t	P-value	Decision
Sub-Skills	2.582	.258	-7.072	.000	Important

As Table (5) shows the p-value is 0.000, which is less than 0.05. Therefore, we reject the null hypothesis and accept the alternative hypothesis. Since the mean is less than 3, the opinions of the sample individuals leaned towards the importance of learning the sub-skills of English language within the accounting department.

Axis (C). How proficient are you in the following language skills?

Table 6: *One-Sample T-Test for the proficiency of the English language skills*

English Skills	Mean	Std. Deviation	t	P-value	Decision
Listening	2.625	1.0546	-2.249	.030	Good
Speaking	3.600	3.011	1.260	.215	Average
Reading	2.525	.960	-3.128	.003	Good

Writing	2.800	.966	- 1.309	.198	Average
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From Table (6) it can be observed that, the opinions of the sample individuals in the axis (C) the proficiency of English language skills within the accounting department, leaned towards the Average in speaking and writing and to the importance of reading and listening.

• **The t-test for the total score of the axis (C)**

H0= There are no English language lacks for accounting students at FEC.

H1= There are English language lacks for accounting students at FEC.

Table 7: *One-Sample T-Test for total score of the axis (C)*

	Mean	Std. Deviation	t	P- value	Decision
English Language Skills	2.888	.488	- .461	.676	Average

From Table (7) it can be noticed that, the opinions of the sample members tended towards neutrality in the axis (C) the proficiency in English language skills.

Axis (D). How proficient are you in the following language sub-skills?

Table 8: *One-Sample T-Test for the proficiency of English language sub-skills*

		The statement	Mean	Std. Deviation	Value of T	P-Value	Decision
Reading Sub-Skills	1	Reading Accounting textbooks	2.750	1.080	-1.464	.151	Average
	2	Reading Accounting articles in journals	3.000	0.961	.000	1.000	Average
	3	Reading course handouts	2.925	1.071	-.443	.660	Average
	4	Reading instructions for assignments/projects	3.050	0.959	.330	.743	Average
Writing Sub-Skills	5	Writing reports	3.150	1.145	.829	.412	Average
	6	Writing assignments	3.050	1.085	.291	.772	Average
	7	Taking notes in lectures	3.025	1.121	.141	.889	Average
	8	Answering exams	2.800	1.137	-1.113	.273	Average
	9	Writing research papers	3.125	1.244	.635	.529	Average
	10	Writing summaries	3.225	1.209	1.177	.246	Average
Listening Sub-Skills	1	Following and understanding lectures	2.675	1.309	-1.571	.124	Average
	1	Listening to oral presentations	3.000	0.987	.000	1.000	Average
	2	Following question answer sessions in class	2.925	1.269	-.374	.711	Average
	3	Listening to instructions for assignments	3.000	1.155	.000	1.000	Average
Speaking Sub-Skills	4	Participating in lecture discussions	3.100	1.355	.467	.643	Average
	5	Asking questions in class	3.150	1.189	.798	.430	Average
	6	Giving oral presentations	3.450	1.037	2.746	.009	Good
	7	Participating in seminars	3.675	0.944	4.521	.000	Good
	8	Participating in conferences	3.800	0.911	5.551	.000	Good
	9						

• **The t-test for the total score of the axis (D)**

H0= There are no English language lacks for accounting students at FEC.

H1= There are English language lacks for accounting students at FEC.

Table 9: One-Sample T-Test for total score of the axis (D)

	Mean	Std. Deviation	t	P- value	Decision
Sub-Skills	3.099	.285	1.511	.148	Average

From Table (9) we noticed that, the opinions of the sample members tended towards neutrality in the axis of the proficiency of English language sub-skills.

Axis (E). How much language training would you like to receive for the following to improve your English language sub-skills?

Table 10: One-Sample T-Test for language training to improve English language sub-skills

		The statement	Mean	Std. Deviation	Value of T	P- Value	Decision
Reading Sub-Skills	1	Reading Accounting textbooks	2.15	1.099	-4.892-	.000	A lot
	2	Reading Accounting articles in journals	2.65	1.145	-1.934-	.060	Moderate
	3	Reading course handouts	2.5	1.377	-2.296-	.027	A lot
	4	Reading instructions for assignments/projects	2.7	1.305	-1.454-	.154	Moderate
Writing Sub-Skills	5	Writing reports	2.55	1.319	-2.157-	.037	A lot
	6	Writing assignments	2.7	1.381	-1.374-	.177	Moderate
	7	Taking notes in lectures	2.525	1.176	-2.554-	.015	A lot
	8	Answering exams	2.6	1.215	-2.082-	.044	A lot
	9	Writing research papers	2.6	1.411	-1.793-	.081	Moderate
	10	Writing summaries	2.475	1.261	-2.634-	.012	A lot
Listening Sub-Skills	11	Following and understanding lectures	2.475	1.198	-2.772-	.009	A lot
	12	Listening to oral presentations	2.675	1.289	-1.595-	.119	Moderate
	13	Following question answer sessions in class	2.625	1.314	-1.804-	.079	Moderate
	14	Listening to instructions for assignments	2.575	1.318	-2.039-	.048	A lot
Speaking Sub-Skills	15	Participating in lecture discussions	2.7	1.137	-1.669-	.103	Moderate
	16	Asking questions in class	2.625	1.254	-1.891-	.066	Moderate
	17	Giving oral presentations	2.825	1.130	-.980-	.333	Moderate
	18	Participating in seminars	2.925	1.347	-.352-	.727	Moderate
	19	Participating in conferences	2.975	1.405	-.113-	.911	Moderate

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The t-test for the total score of the axis (E)

H0= There are no English language wants for accounting students at FEC.

H1= There are English language wants for accounting students at FEC.

Table 11: One-Sample T-Test for total score of the axis (E)

	Mean	Std. Deviation	t	P- value	Decision
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Sub-Skills	2.624	.179	- 9.153	.000	A lot
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It can be noticed that, the sample members see that they need much of language training to improve their English language sub-skills.

3.2 The Analysis of Lecturers' questionnaires

3.2.1 Accounting lecturers' perceptions toward accounting students' English language needs

Axis (A). To what extent the English language skills for studying at the Accounting Department are important?

Table 12: *One-Sample T-Test for the importance of English language skills*

	Mean	Std. Deviation	T	P- value	Decision
Listening	1.1538	.37553	-17.725	.000	Important
Speaking	1.5385	.51887	-10.156	.000	Important
Reading	1.2308	.43853	-14.546	.000	Important
Writing	1.5385	.51887	-10.156	.000	Important

Table (12) shows that, the opinions of the sample members tended towards the importance of learning English language skills at the Accounting Department.

- **The t-test for the total score of the axis (A)**

H₀= There are no important English language needs for accounting students at FEC.

H₁= There are important English language needs for accounting students at FEC.

Table 13: *One-Sample T-Test for total score of the axis (A)*

	Mean	Std. Deviation	t	P- value	Decision
English Language Skills	1.3654	.20234	- 16.157	.001	Important

It can be observed that, the opinions of the sample individuals leaned towards the importance of learning basic English language skills within the accounting department.

Axis (B). What are the most important English language sub-

skills for studying at the Department of Accounting?

Table 14: *One-Sample T-Test for the importance of English language sub-skills*

		The statement	Mean	Std. Deviation	Value of T	P- Value	Decision
Reading Sub-Skills	1	Reading Accounting textbooks	1.462	.519	-10.690	.000	Important
	2	Reading Accounting articles in journals	1.846	.555	-7.500	.000	Important
	3	Reading course handouts	1.761	.725	-6.121	.000	Important
	4	Reading instructions for assignments/projects	2.077	.494	-6.743	.000	Important
Writing Sub-Skills	5	Writing reports	2.000	.707	-5.099	.000	Important
	6	Writing assignments	2.000	.577	-6.245	.000	Important
	7	Taking notes in lectures	1.539	.519	-10.156	.000	Important
	8	Answering exams	2.000	.408	-8.832	.000	Important
	9	Writing research papers	2.154	.689	-4.430	.001	Important
	10	Writing summaries	2.308	.751	-3.323	.006	Important
Listening Sub-Skills	11	Following and understanding lectures	1.615	.768	-6.501	.000	Important
	12	Listening to oral presentations	2.077	.494	-6.743	.000	Important
	13	Following question answer sessions in class	1.692	.480	-9.815	.000	Important
	14	Listening to instructions for assignments	2.000	.408	-8.832	.000	Important
Speaking Sub-Skills	15	Participating in lecture discussions	1.769	.439	-10.119	.000	Important
	16	Asking questions in class	1.615	.650	-7.675	.000	Important
	17	Giving oral presentations	2.231	.439	-6.325	.000	Important
	18	Participating in seminars	1.923	.862	-4.503	.001	Important
	19	Participating in conferences	1.692	.8549	-5.516	.000	Important

- The t-test for the total score of the axis (B)

H0= There are no important sub-skills English language needs for accounting students at FEC.

H1= There are important sub-skills English language needs for accounting students at FEC.

Table 15: *One-Sample T-Test for total score of the axis (B)*

	Mean	Std. Deviation	t	P-value	Decision
Sub-Skills	1.883	.241	- 20.207	.000	Important

As Table (15) shows that, the opinions of the sample individuals leaned towards the importance of learning the sub-skills of English language within the accounting department.

3.3 Comparison Between the Mean responses of lecturers and students

1. Comparison in the axis of English language skills

The Hypothesis:

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 \neq \mu_2$$

Table 16: *Group Statistics of Means*

Group	N	Mean	Std. Deviation	Std. Error Mean
Students	40	7.375	3.614	.571
Lecturers	13	5.461	1.050	.291

The results showed a significant difference between the Mean evaluation of lecturers and students of the main English language skills, as the Mean evaluation of lecturers was 5.46, while the Mean evaluation of students was 7.37. This indicates a difference in the two parties' view of the importance of these skills.

Table 17: *Independent Samples Test*

	t	P-value
Equal variances assumed	1.872	.015
Equal variances not assumed	2.983	.004

From Table (17) we notice that p-value = 0.015 less than 0.05 this means that the variance is not equal in the two samples. Since the variance is not equal we take p-value = 0.004 less than 0.05 this means that the averages of the professors' and students' answers are not equal.

2. Comparison in the axis of English language sub-skills

The Hypothesis:

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 \neq \mu_2$$

Table 18: *Group Statistics of Means*

Group	N	Mean	Std. Deviation	Std. Error Mean
students	40	49.050	14.498	2.292
lecturers	13	35.769	4.549	1.262

From Table (18) we notice that the Mean of the lecturers' answers in the sub-skills is 35.76 and the Mean of the students' answers is 49.05.

Table 19: *Independent Samples Test*

	t	P-value
Equal variances assumed	3.233	.006
Equal variances not assumed	5.076	.000

From Table (19) it shows that p-value = 0.006 less than 0.05. This means that the variance is not equal in the two samples. Since the variance is not equal then p-value = 0.000 less than 0.05 can be taken. This means that the averages of the lecturers' and students' answers are not equal.

From the two comparisons demonstrates that the Mean of the lecturers' answers and the Mean of the students' answers are different and there is a difference between them due to the difference in educational level, age and job opportunities offered to the individuals of the two samples.

4. FINDINGS AND RECOMMENDATIONS

4.1 Findings

The study findings indicate that both accounting students and lecturers perceive all English language skills as essential. Furthermore, they also consider all language sub-skills to be important.

As for the language lacks, Based on their own assessment, accounting students believe they possess a high level of listening and reading skills, but consider their

speaking and writing skills to be average. As for the sub-skills, the students have assigned all the sub-skill that they lack all or that they are weak proficient in all sub-skill.

The accounting students expressed a substantial requirement for language training to enhance English language sub-skill competencies. The study has shown that students hope to get

training in all the suggested sub-skills.

4.2 Recommendations

Based on the findings of this study on the English language needs of accounting students, the following recommendations are presented to enhance English language proficiency and academic performance in the field of Accounting:

1. Based on the findings, it is evident that accounting students require proficiency in all four language skills to excel in their academic pursuits. To address their specific needs, any English for Specific Purposes (ESP) course designed for accounting students should prioritize speaking and writing, as these skills are deemed most crucial by both students and lecturers.
2. The findings of this study are significant for lecturers and course designers, as they provide valuable guidance for selecting, classifying, sequencing, or ordering materials in ESP course design.
3. Prior to course development, students' English proficiency levels must be accurately assessed. Furthermore, learners should be guided in understanding their current language abilities and the English language proficiency required for their field of study.
4. Students should complete additional English language courses prior to beginning their study of accounting to ensure they are adequately prepared for any expected ESP courses.
5. The currently offered course should be consolidated and supported by other courses that take into account different language aspects such as technical vocabulary- accounting terminology.
6. Cooperation between the Accounting Department and the English Department is recommended. Various events (workshops, training sessions, meetings with English speaking people, etc.) can be organized in order to help students and lecturers practice and use the language effectively in their discipline and promote their language proficiency.

4.3 Conclusion

It is anticipated that this study, to some extent, has identified the English language requirements of accounting students at the Faculty of Economics and Commerce (FEC). This foundation can serve as a robust

framework for course designers to develop targeted English for Accounting Purposes courses aligned with the needs of accounting majors. English language proficiency, particularly in reading and writing, is a critical gap in the preparation of the accounting students targeted in this study. Despite recognizing the importance of all language skills, students exhibit specific weaknesses in speaking and writing. By implementing the early mentioned recommendations, the study anticipates improved English language skills among accounting students, leading to enhanced academic performance and better preparation for professional life.

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A field study on the types of intestinal parasites in yard chickens in the western region of the city of Tripoli

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Abstract:

The poultry industry is a critical economic sector globally, providing essential protein sources through meat and eggs, and contributing to agricultural sustainability with organic fertilizers. Technological advancements have reduced production costs and increased consumer demand for poultry products. However, intensive poultry farming has also led to the proliferation of diseases, including parasitic infections, which pose significant challenges to both commercial and backyard poultry farming. This field study investigates the prevalence and types of intestinal parasites in yard chickens in the western region of Tripoli. Random fecal samples were collected from six areas: Al-Hashan, Janzour, Al-Aziziya, Sayad, Al-Zahraa and Al-Sahel Alakhdar. The samples were preserved in a 10% formalin solution and analyzed using the sedimentation method than microscopic examination was conducted at the National Center for Disease Control laboratories to prevent and control communicable and endemic diseases and Microscopic examination was performed at the Higher Institute of Agricultural Technology in Alghairan for the purpose of detecting the presence of worms or their eggs in chicken feces.

Statistical analysis, including mean, standard deviation, and Chi-square tests, was performed using SPSS version 27. The results indicated that Al-Zahraa had the highest prevalence of parasites, with *Hymenolepis carioca* being the most common, followed by *Ascaridia galli* and *Schistosoma japonicum*. Females were found to be more susceptible to parasitic infections, particularly in Al-Zahraa, Al-Hashan, the Al-Sahel Alakhdar, and Janzour. These findings underscore the importance of implementing effective biosecurity measures to control parasitic infections in poultry, thereby improving poultry health and

productivity. The predominance of *Hymenolepis car ioca* highlights the need for targeted interventions to manage this parasite.

Key words: Intestinal parasites - yard chickens .

1. Introduction

The poultry industry is one of the most important economic pillars of livestock in the world, as it provides, and sometimes is one of the most important sources of protein for human nutrition, and also supplies food markets with eggs and white meat, as well as organic fertilizer for agriculture (Food and Agriculture Organization (FAO), 2013). Its production cycle is also short, as it does not exceed two months in broilers and about a year and a half in laying hens (Nielsen et al., 2023). Technological progress in the poultry industry has reduced production costs and made poultry prices cheaper compared to red meat. It has also changed consumer patterns and increased consumer awareness, as well as the spread of specialized restaurants and shops selling grilled and fried poultry in innovative ways, which has increased demand for it (Srinivasa Rao, 2020).

Chickens are considered one of the most important types of poultry birds due to their large number and abundant production of meat and eggs, to the point that they have become an integrated industry in their own right, because of increasing consumer demand for their products as an important and useful source of protein (Gržinić et al., 2023).

Poultry birds regard a source of national income for many countries in order to benefit from their egg and meat products, which are considered an origin of animal protein (Khan et al., 2021). Obesity and heart diseases, have become one of the modern diseases that haunt people at the present time

Therefore, consumers turned to poultry meat as a source of high-quality animal protein due to its ease of digestion, palatability, and good taste, in addition to its use in preparing many other meals, as its reasonable price for the consumer, and also due to the low cholesterol and fat content of its meat, which cause obesity and heart disease. Which has become one of the modern diseases that haunt people at the present time (Pinto da Rosa et al., 2021).

Although intensive breeding of flocks of crossbred chickens for commercial breeds contributed to reaping enormous profits in financial terms, it also can contributed to increasing the spread of diseases, the emergence of epidemics, and huge losses due to intensive breeding

systems, which called for some breeders to work with a biosecurity system that contributed to controlling and reducing diseases. Even if only partially(Fulla, 2022)

Besides all this, there is a fact which is sometimes indispensable, parasites are one of the most important pathogens in poultry, and they also take their share wherever poultry is raised in large commercial flocks or in small backyard flocks, whether (local chickens)(Chaves Hernández, 2014).

The process of raising poultry birds is affected by many different variables, such as environmental conditions, mismanagement, feed quality, and infection with diseases, etc (Food and Agriculture Organization (FAO), 2013). Birds, like other animals, are exposed to parasitic infections, which lead to the appearance of disease signs in them and thus may lead to their death (Bush & Clayton, 2018).

Parasitic diseases are one of the most important dilemmas in commercial and non-commercial poultry farming. Among these diseases, internal parasites have presented a major challenge to poultry farming for several years(Pal & Rebuma, 2024).

The Poultry, like other animals, are exposed to many parasitic infections that cause many pathological effects, such as loss of weight, decreased egg production, immune deficiency and death in severe cases(Bitew & Ayele, 2019).

Birds are infected with parasites through food, by eating insects, earthworms, and grains, which may carry the infectious stages of internal parasites that include tapeworms (cestodes), nematodes, and trematodes, in addition to parasitic protozoa (Badparva et al., 2015).

Internal parasites in birds have been studied in various parts of the world, and researchers have concluded that domestic and non-domestic birds have a major role in spreading the infection within a wide geographical range as a result of the migration of birds and their contact with different conditions. They also transmit the infection to field animals, fish farms, domestic animals such as cats, dogs, and even humans(Leung & Koprivnikar, 2016).

Previous studies have shown that there is a major role for domestic and wild birds in spreading the area of infections within wide geographical areas as a result of the movement and migration of birds and their exposure to different conditions, which leads to a multiplicity of infections in quantity and quality(van der Kolk, 2019).

2. Materials and method

2.1. Materials:

- NaCl 0.9%.
- SAF-solution.
- Ether.
- Centrifugation tubes.
- Sieve.
- Funnel/gauze.
- Rubber stopper.
- Pasteur pipette with rubber bulbs.
- Wooden spatula.
- Beaker (50ml).
- Conical glass / plastic bottles.
- Wire mesh.
- Microscope slides, cover slips.
- Gloves.



2.2. Methods:

Random samples of chicken feces were collected from six areas in the Western Region, namely Al-Hashan, Janzour, Al-Aziziya, Sayad, Al-Zahraa and Al-Sahel Alakhdar, by placing them in special vials for collecting stool samples and submerging them in a 10% formalin solution until they were prepared for laboratory examination. Then the samples were transferred to the National Center for Disease Control laboratories to prevent and control communicable and endemic diseases for the purpose of detecting the presence of worms or their eggs in chicken feces using the sedimentation method. To do this, a piece of stool was taken and placed in a clean cup, then a salt solution was added to it, and the stool sample was stirred in the solution well (Ghodsian et al., 2019).

The sample was filtered using a single-layer gauze filter, then the sample was placed in a tube to be placed in the centrifuge. After that, 10 ml of physiological salt was added and the tube was closed with foil and mixed well. The tubes were then placed in the centrifuge for two minutes. At a speed of 2000 rpm, the supernatant was then discarded while the precipitate was kept. Then 4 ml of formalin and 3 ml of ethyl acetate were added and mixed well. The mixture was placed in the centrifuge for two minutes at 2000 rpm, and four layers were formed from top to bottom, as follows: the first layer was ethyl acetate, while

the second was the rest of the sample, while the third layer was formalin, and the fourth layer contained the sediment that was retained. It is used for microscopic examination (Cappuccino & Welsh, 2018).

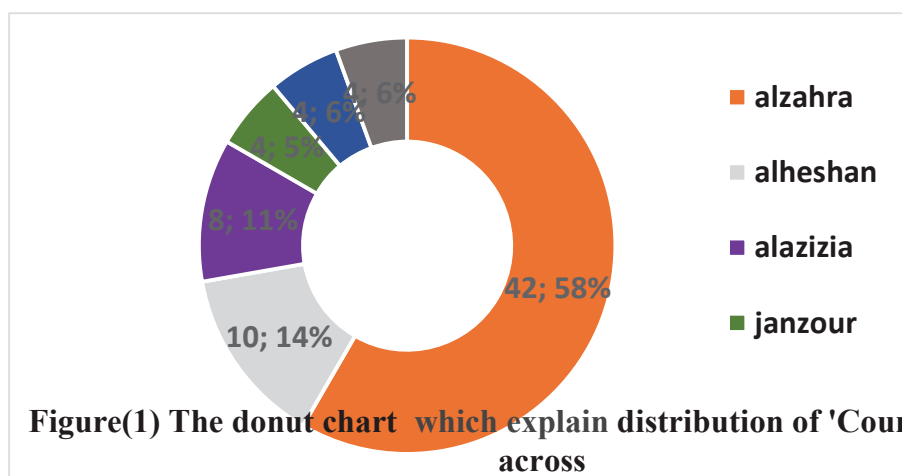
2.3. Microscopic examination:

This examination was performed at the Higher Institute of Agricultural Technology in Alghairan, where we took a one or two drops of the sediment put on a clean glass slide, then the cover slide placed on it to obtain a smear by gradually tilting the cover over the sample and placing it on the stage for examination. The microscopic examination by using objective lenses. The small ones, then the large lenses, and after seeing the parasite or its eggs, it was classified according to its external appearance (Gupta & Gupta, 2023).

Chi-square was used for statistical analysis based on the statistical program SPSS, version 27 (IBM & SPSS, 2017).

3. Resultes

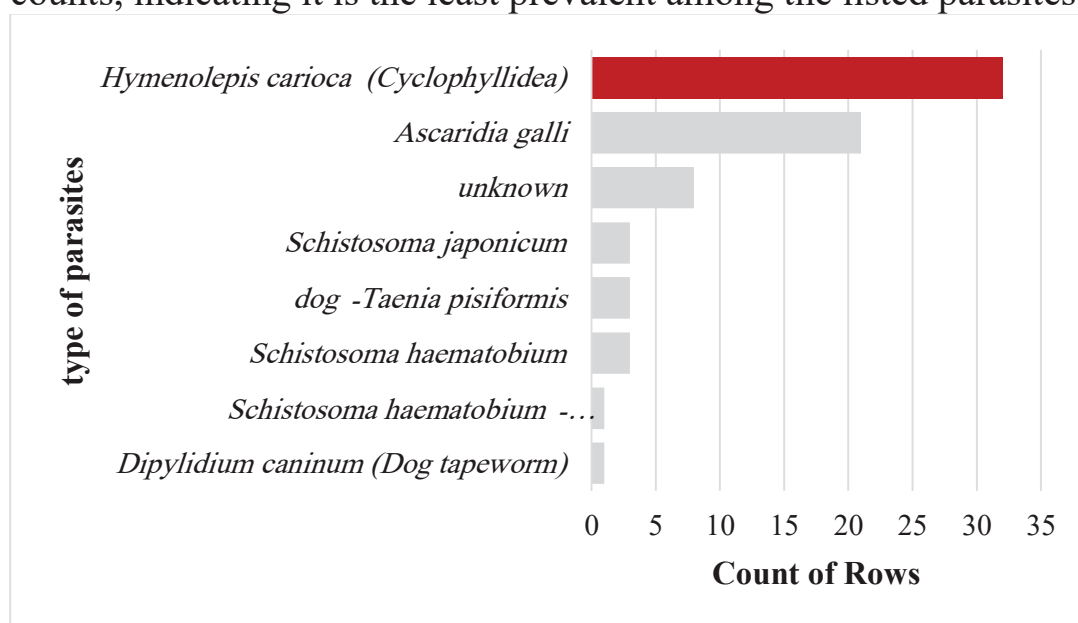
Through the statistical analysis of the results of the collected samples, the results were shown in the figure (1). It provides a donut chart which explain the distribution of 'Count of Rows' across six different areas, Which turns out to is: Alzahra is the largest segment, colored in orange, represents 42 counts, making up 58% of the total, Janziour is represented in green, with 10 counts, accounting for 14%, Aleshan is shown in gray, with 8 counts, making up 11%, Sayad in blue, with 6 counts, contributing 8%, Al Sahel Alakhdar in purple, with 4 counts, representing 5%, Alheshan in light blue, also with 4 counts, making up 5% and the chart highlights that 'Alzahra' has the majority share, indicating its significance or prominence in the context of the data.



Figure(1) The donut chart which explain distribution of 'Count of Rows' across Six different areas.

Through the data in the figure(2) The provided horizontal bar chart illustrates the distribution of 'Count of Rows' for various types of parasites, and this chart is useful for understanding the prevalence of different parasites within a dataset, where it shows that

Hymenolepis carioca (Cyclophyllidae), parasite has the highest count, close to 35, this means that it is the most prevalent in the dataset, *Ascaridia galli* (Ascarididae), With around 15 counts, this parasite is the second most common, *Schistosoma japonicum*: This parasite has just over 10 counts, making it the third most prevalent, *Schistosoma haematobium*: With close to 10 counts, this parasite is slightly less common than *Schistosoma japonicum*, *Dipylidium caninum* (Dog-tapeworm), this parasite has the lowest count, with approximately 5 counts, indicating it is the least prevalent among the listed parasites.



Figure(2) The chart lists the following types of parasites along the x-axis: *Hymenolepis carioca* (Cyclophyllidae), *Ascaridia galli* (Ascarididae), *Schistosoma japonicum*, *Schistosoma haematobium*, *Dipylidium caninum* (Dog-tapeworm), The x-axis represents the 'Count of Rows', ranging from 0 to 35.

The figure(3) helps visualize how different parasites affect males and females across various age groups, Horizontal Axis: Represents age in months, ranging from 0 to 14. Vertical Axis: Lists different types of parasites. *Dipylidium caninum* (Dog tapeworm): Shows the highest age range in both sexes. *Hymenolepis carioca* (Cyclophyllidae): Has a significant presence only in females. Other Parasites: Include dog - *Taenia pisiformis*, *Schistosoma haematobium* - *hymenolepis*, *Schistosoma haematobium*, *Ascaridia galli*, unknown, and *Schistosoma*

japonicum, It showed high rates of parasite infection in backyard birds aged 12 months and above and low exposure of birds aged 6 months or 14 month. It shows that the number of infections among females was higher than in males in backyard chickens in these areas.

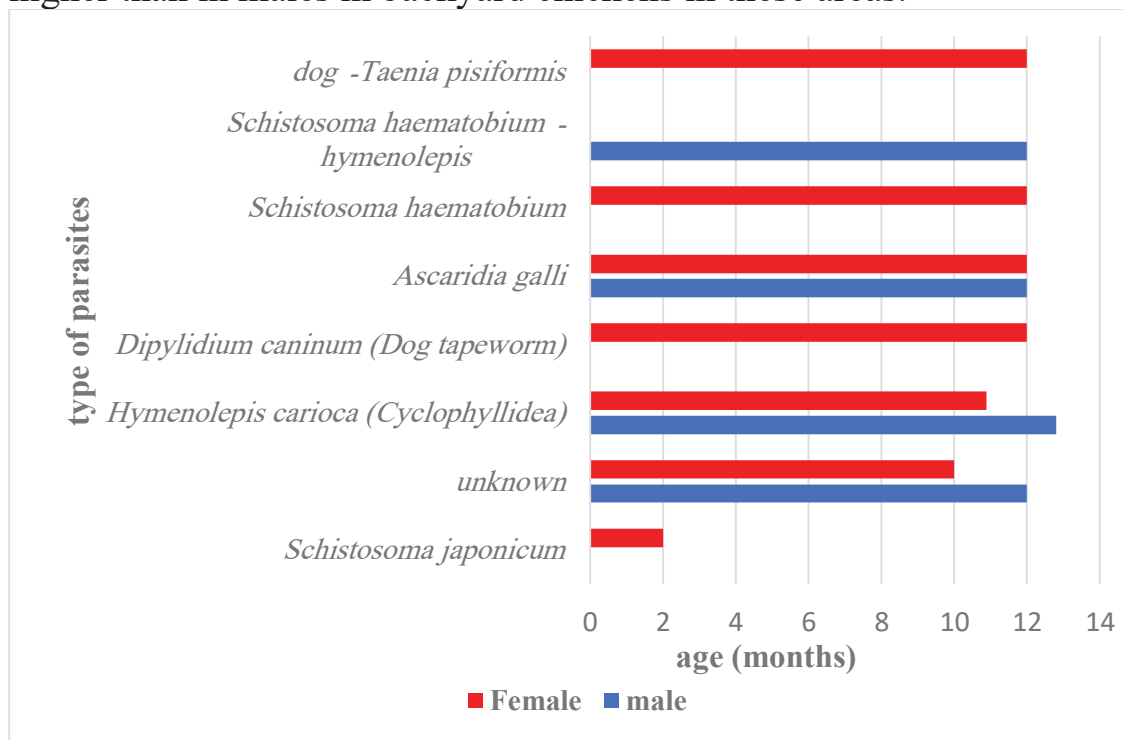


Figure (3) shows Age (months) by sex and type of parasites” shows the distribution of various parasites across different age groups and sexes.

4. Discussion

Through the statistical analysis of the results of the collected of samples, it was found that females were the most vulnerable birds to infection with parasites, especially in the area of Al-Zahra, Al-Hashan, the Al-Sahel Alakhdar and Janzour, there was no difference in the rate of infection in other regions as shown in Figure (1) and this is consistent with the results of (Rodrigues et al., 2020).

The chart(2) highlights a significant disparity in the prevalence of different parasites. *Hymenolepis carioca* (Cyclophyllidea) stands out with a markedly higher count compared to the others, suggesting it is a dominant parasite in the dataset. The other parasites, while present, have much lower counts, indicating they are less common, this is consistent with (Brar et al., 2021; Sulima-Celińska et al., 2022).

The results showed that the infection of females with parasites was higher than that of males this is consistent with (Ayabina et al., 2021), especially in aged 12 months and above and low exposure of birds

aged 6 months or 14 months in backyard birds (Eastwood et al., 2019).

The presence of *Taenia pisiformis* and *Dipylidium caninum* in the feces of chickens may be due to the presence of the chicken in the same place with dogs and cats (Rousseau et al., 2022).

5. Conclusion

This study highlights the significant prevalence of intestinal parasites in yard chickens in the western region of Tripoli, with a particular emphasis on the predominance of *Hymenolepis diminuta*. The findings indicate that female chickens are more susceptible to parasitic infections, especially in areas such as Al-Zahraa, Al-Hashan, Al-Sahel Alakhdar, and Janzour. There is different distribution in to parasites various, and emphasizing the predominance of *Hymenolepis carioca* (Cyclophyllidea), This information can be valuable for researchers and healthcare professionals in understanding the relative frequency of these parasites and potentially guiding further studies or interventions. The high prevalence of parasites underscores the need for effective biosecurity measures and targeted interventions to manage and control parasitic infections in poultry.

6. Recommendations

We recommend continuing rearing in the backyard and giving the necessary medications when there is a parasite infestation, By addressing these parasitic threats, poultry health and productivity can be significantly improved, contributing to the overall sustainability and economic viability of the poultry industry in the region.

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Impacts of Advanced Veterinary Technologies on Food Chain and Human Health in Developed Countries and Libya

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Abstract

This paper examines the transformative influence of cutting-edge veterinary technologies on food safety and human health, with a comparative analysis between developed countries and Libya. As veterinary science advances rapidly, innovations such as precision livestock farming, sophisticated diagnostics, and gene editing are playing pivotal roles in boosting animal health, optimizing food safety, and addressing public health concerns. The paper starts with an exploration of the importance of these technologies within the global food supply chain and their impact on public health, especially in managing zoonotic diseases and ensuring food security. It reviews the historical development of veterinary technologies, tracing the evolution from traditional methods to modern advancements. Recent progress in diagnostics, imaging, surgical methods, and treatments is discussed, highlighting their effects on veterinary care in developed nations. Additionally, the paper addresses the hurdles faced by developing countries, such as infrastructure challenges and the need for enhanced training and capacity building to effectively utilize these technologies. A case study of Libya provides an in-depth look at the current state of veterinary technology in the country, identifying key obstacles and opportunities for advancement. Regulatory and ethical considerations, including animal welfare standards and regulatory frameworks, are also examined. The paper concludes by highlighting emerging trends like precision livestock farming and gene editing, discussing their potential to transform veterinary medicine and tackle critical issues in animal health. The conclusion underscores the necessity for continued investment in research, infrastructure, and training to fully leverage these technologies and improve global food safety and public health.

Keywords: Advanced Veterinary Technologies, Food Safety, Public Health, Precision Livestock Farming, Gene Editing, Antimicrobial Resistance (AMR), Developing Countries

1. Introduction

Advanced veterinary technologies are significantly transforming animal health, with substantial implications for food safety, security, and public health. These technologies include innovations in diagnostics, imaging, and therapeutic interventions, crucial for monitoring and enhancing livestock health, which directly affects the quality and safety of animal-derived products (Luna et al., 2021). This paper explores the role of these technologies, tracing their development and examining their use in both developed and developing nations, with a particular focus on Libya, where veterinary technology faces unique challenges.

1.1 Technological Impact on Animal Health Management

The advancement of veterinary technologies has led to improved disease management and animal welfare. Diagnostic tools such as PCR and ELISA have enabled veterinarians to identify diseases with high accuracy and speed, which is critical for controlling disease outbreaks and ensuring timely treatment (Luna et al., 2021). Similarly, advanced imaging techniques like CT and MRI have enhanced the ability to diagnose internal conditions that were previously difficult to detect, leading to better treatment outcomes and reduced animal suffering (Avery, 2020). These technologies not only improve the health and productivity of livestock but also contribute to more efficient and humane management practices.

1.2 Challenges in Developing Countries

Despite the benefits, the adoption of advanced veterinary technologies in developing countries is often hindered by various challenges. Limited infrastructure, insufficient training, and financial constraints can impede the implementation and effective use of these technologies (Smith et al., 2022). In Libya, for example, ongoing political instability and conflict have exacerbated these challenges, creating barriers to accessing and utilizing modern veterinary tools and resources (Jones et al., 2023). Addressing these issues requires targeted efforts to strengthen veterinary infrastructure, provide training, and support technology adoption to improve animal health and food safety in such regions.

2. The Importance of Veterinary Technologies in Ensuring Food Safety and Security

2.1. Global Food Supply Chain

Veterinary technologies are essential for maintaining the global food supply chain by ensuring the health and safety of livestock, which is vital for producing high-quality animal products (Wooldridge, 2020). Advanced diagnostic tools, such as PCR and ELISA, are employed to detect pathogens and diseases in animals before they enter the food chain (Benskin et al., 2019). Electronic tracking systems enhance traceability, enabling prompt responses to food safety issues and mitigating the risk of widespread contamination (Zhao et al., 2022). Furthermore, sophisticated monitoring systems track environmental conditions and animal health indicators, optimizing production practices and preventing outbreaks (Van Der Meer et al., 2018). Overall, the integration of advanced veterinary technologies into the food supply chain is vital for ensuring that animal-derived products are safe, high-quality, and produced in a manner that *supports public health and food security*.

2.2. Public Health Implications

Integrating veterinary technologies with public health efforts is crucial for managing zoonotic diseases that can be transmitted from animals to humans (Morse, 2012). Technologies such as real-time disease surveillance and geographic information systems (GIS) assist in tracking and predicting zoonotic disease spread, allowing for timely interventions (Jones et al., 2013). Moreover, these technologies play a vital role in addressing antimicrobial resistance (AMR) by providing precise diagnostics that promote the judicious use of antibiotics, thereby reducing the risk of resistant pathogen strains and preserving the efficacy of antimicrobial treatments (Van Boeckel et al., 2019).

In addition to managing disease outbreaks, veterinary technologies contribute to strengthening the overall public health infrastructure by improving disease preparedness and response. For instance, real-time monitoring systems can quickly identify emerging zoonotic threats and facilitate coordinated responses between veterinary and human health agencies. This collaborative approach helps streamline efforts and resources, ensuring that both animal and human health concerns are addressed comprehensively (Morse, 2012). By enhancing the ability to predict and respond to health threats, these technologies support more resilient public health systems.

Furthermore, advancements in veterinary technologies are instrumental in enhancing food safety through improved surveillance and diagnostics. High-throughput screening methods and molecular diagnostic tools allow for the rapid detection of pathogens in food products, reducing the risk of foodborne illnesses. These technologies also contribute to tracking the sources of contamination, enabling more effective public health interventions and reducing the economic burden associated with foodborne outbreaks (Jones et al., 2013). As such, veterinary technologies play a critical role in ensuring that food safety standards are met and that public health is protected from potential risks associated with animal-derived products.

3. Evolution of Veterinary Technologies

3.1. Historical Overview

Veterinary medicine has evolved from basic observational practices to a highly sophisticated field supported by advanced technologies. Early veterinary care, which dates back to ancient civilizations such as Egypt and Mesopotamia, relied heavily on manual observation and rudimentary treatments. Techniques included the use of herbal remedies and simple surgical procedures, guided by the empirical knowledge of animal behavior and health (Baker, 2016). The practices were often more about trial and error, and understanding of disease mechanisms was limited.

The late 19th century marked a transformative period with the advent of vaccines, a breakthrough attributed to Louis Pasteur's work on rabies and anthrax vaccines. Pasteur's development of the first vaccines established the principle of immunization and set the stage for the systematic prevention of infectious diseases in animals (Smith, 2020). This era also saw the introduction of serological diagnostics, which further advanced the ability to detect and prevent diseases. The early 20th century brought the discovery and use of antibiotics, such as penicillin, which revolutionized veterinary medicine by providing effective treatments for bacterial infections. The widespread application of antibiotics significantly reduced mortality rates and improved the overall health of livestock and companion animals (Smith, 2020).

In the latter half of the 20th century, the field of veterinary medicine experienced rapid technological advancement. The development of radiography allowed for detailed internal imaging of animals, leading to more accurate diagnoses and improved treatment outcomes. Following this, the introduction of ultrasound technology provided

veterinarians with non-invasive imaging capabilities, enabling real-time visualization of internal organs and structures. These advancements facilitated early detection of conditions such as tumors, pregnancies, and internal injuries, which previously might have gone undiagnosed until symptoms became severe (Miller et al., 2018). The evolution of these diagnostic tools not only enhanced the precision of veterinary care but also led to the development of advanced surgical techniques and protocols that improved surgical outcomes and recovery times.

3.2. Recent Advancements

Recent advancements have significantly transformed veterinary medicine. Molecular diagnostics, including next-generation sequencing (NGS), enable detailed genetic analysis of pathogens, improving disease management (O'Connor et al., 2021). NGS technology provides comprehensive data on pathogen genomes, allowing for precise identification of genetic variations and mutations associated with diseases. This has led to more accurate diagnoses, better tracking of disease outbreaks, and the development of targeted treatments and vaccines. For example, NGS has been crucial in understanding the genetic makeup of viruses like SARS-CoV-2 in animals, facilitating the development of specific diagnostic tests and vaccines (O'Connor et al., 2021).

Imaging technologies, such as high-resolution MRI and CT scans, provide detailed images that enhance diagnostic precision (Wang et al., 2021). These advanced imaging modalities allow veterinarians to visualize internal structures with great clarity, aiding in the diagnosis of complex conditions. High-resolution MRI can reveal subtle changes in soft tissues, while CT scans provide detailed cross-sectional images of the body, which is essential for accurate diagnosis of conditions like tumors, spinal injuries, and joint abnormalities. The integration of these technologies into veterinary practice has significantly improved the ability to plan and execute precise treatments.

Innovations in treatment include minimally invasive surgical techniques and robotic-assisted surgeries, which reduce recovery times and improve outcomes (Reed et al., 2022). Minimally invasive procedures, such as laparoscopy and endoscopy, allow for internal examination and treatment through small incisions, reducing trauma and promoting faster recovery. Robotic-assisted surgeries enhance

precision by providing greater control and dexterity, which is particularly beneficial for delicate or complex procedures. These advancements not only improve the success rates of surgeries but also enhance patient comfort and reduce postoperative complications.

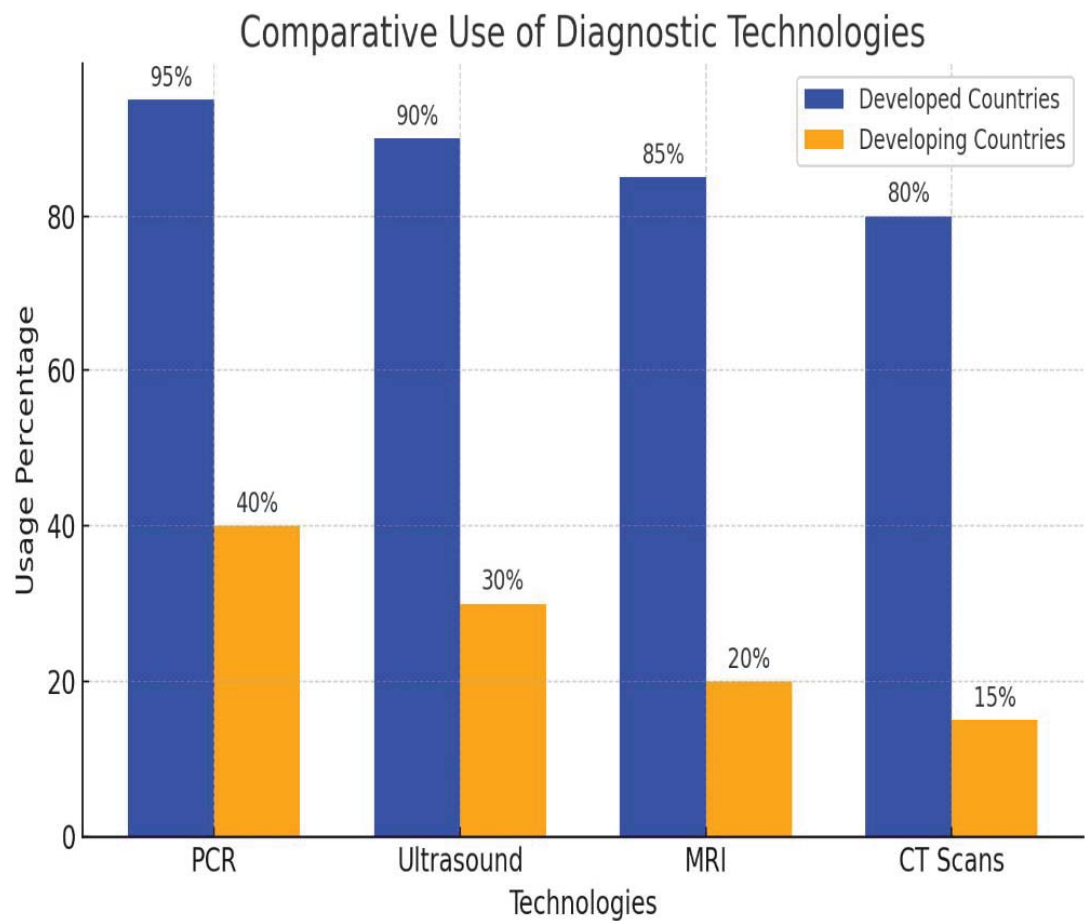
The development of targeted biologics and immunotherapies represents a major leap forward in precise disease treatment (Gonzalez et al., 2019). Targeted biologics, such as monoclonal antibodies, are designed to specifically bind to and neutralize disease-causing agents, offering highly specific treatment options. Immunotherapies, including vaccines and adoptive cell therapies, are tailored to stimulate the immune system to effectively combat specific diseases. These innovations have been particularly impactful in treating cancers and chronic conditions, providing new avenues for managing diseases that were previously difficult to treat.

Additionally, advancements in telemedicine and digital health technologies are transforming veterinary practice by enabling remote consultations and monitoring. Telemedicine platforms allow veterinarians to consult with specialists, conduct virtual examinations, and provide remote care, expanding access to veterinary services and improving patient management (Buchanan et al., 2021). Digital health tools, such as wearable devices and mobile apps, enable continuous monitoring of animal health parameters, facilitating early detection of issues and enabling proactive management of chronic conditions (Wilson et al., 2020).

4. Application of Advanced Veterinary Technologies in Developed Countries

4.1. Diagnostics and Imaging Technologies

In developed nations, advanced diagnostic and imaging technologies are widely utilized. High-throughput diagnostic platforms facilitate rapid and accurate disease detection, crucial for managing health in large herds and flocks (Harper et al., 2020). Digital PCR and immunohistochemistry offer detailed pathogen insights and disease progression analysis (Liu et al., 2019). Imaging technologies, including advanced ultrasound, MRI, and CT scans, enable precise non-invasive diagnosis of a variety of conditions, facilitating early detection and informed treatment decisions (Smith & Jones, 2020).



Comparative graph, chart (1) showing the usage of diagnostic technologies (PCR, Ultrasound, MRI, CT Scans) in developed vs. developing countries. The blue bars represent developed countries, while the orange bars represent developing countries (Harper, 2020).

In general, diagnostic technologies such as PCR, ultrasound, MRI, and CT scans are far more accessible and widely used in developed countries compared to developing countries. The most significant disparity is seen in MRI and CT scan usage. Developing countries tend to rely less on advanced diagnostic tools, likely due to resource limitations or access issues.

4.2. Surgical and Treatment Innovations

Surgical techniques in developed countries have advanced with the adoption of robotics and minimally invasive procedures, enhancing precision and reducing recovery times (Johnson et al., 2021). Innovations in surgical materials and techniques, such as laparoscopic surgeries and advanced suturing technologies, further improve surgical capabilities (Martin et al., 2022). Pharmaceutical advancements, including novel vaccines and therapeutics, offer targeted treatments for

various diseases (Choi et al., 2020). Biologics, such as monoclonal antibodies and gene therapies, provide new treatment options for previously untreatable conditions (Lee et al., 2023).

5. Challenges and Opportunities in Implementing Advanced Veterinary Technologies in Developing Countries

5.1. Infrastructure and Resource Limitations

Developing countries face substantial challenges in implementing advanced veterinary technologies due to limited infrastructure and resources (Bennett et al., 2021). Inadequate facilities, lack of modern equipment, and insufficient maintenance capabilities hinder the effective use of these technologies (Kumar et al., 2020). Moreover, the high costs of advanced technologies can be prohibitive for many veterinary practices in these regions (Ahmed et al., 2019).

5.2. Capacity Building and Training Needs

Addressing these challenges requires focused capacity building and training. Developing countries need targeted programs to train veterinarians and technicians in operating and maintaining advanced technologies (Smith et al., 2021). Collaborations with international organizations and universities can facilitate knowledge transfer and skill development. Investing in local training programs and infrastructure is critical for enhancing the adoption and effectiveness of veterinary technologies (Miller & Brown, 2022).

The chart (2) below compares the infrastructure and resource limitations in developed and developing countries across three elements: trained veterinarians, diagnostic tools availability, and cost of technology.

- **Trained Veterinarians:** Developed countries have a significantly higher percentage (90%) of trained veterinarians compared to developing countries (40%).
- **Diagnostic Tools Availability:** Developed countries again show a much greater availability (85%) of diagnostic tools compared to developing countries (30%).
- **Cost of Technology:** The cost of technology is lower in developed countries (70%) compared to developing countries (25%).

The chart visually highlights how developed countries have better infrastructure and more resources available in these key areas compared to developing countries. Developing countries face greater challenges, especially in terms of the availability of skilled personnel and diagnostic tools.

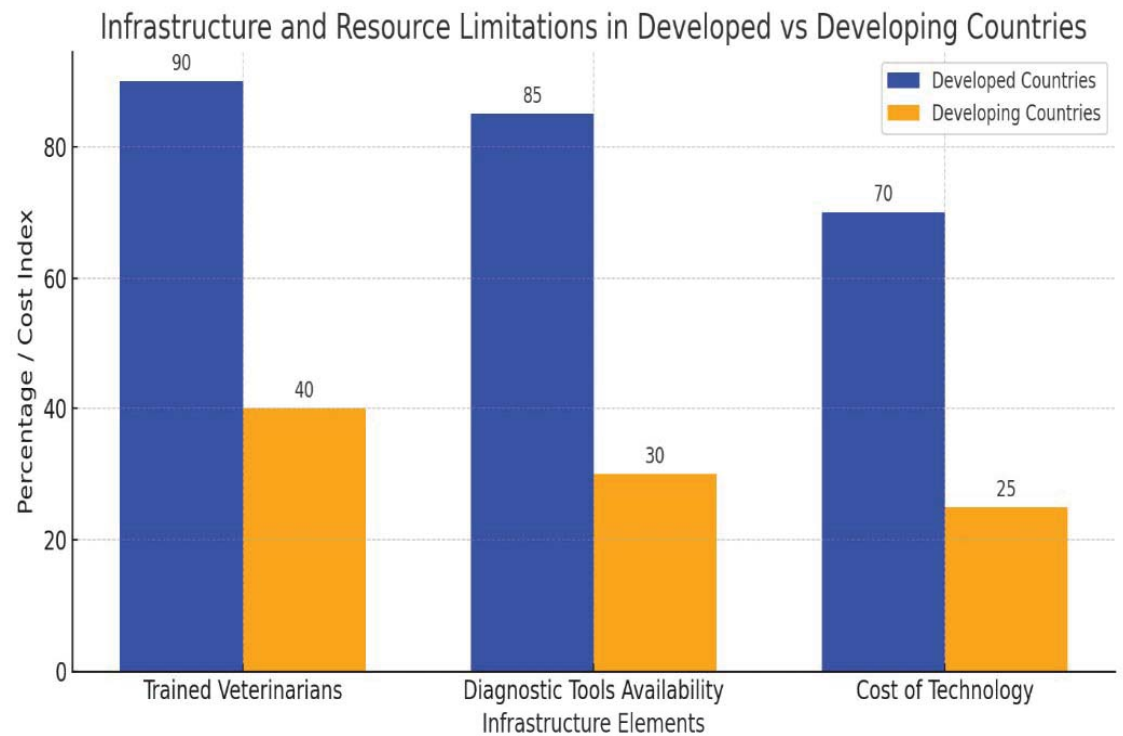


Chart (2) comparing infrastructure and resource limitations between developed and developing countries. The blue bars represent developed countries, while the orange bars represent developing countries. The categories compared include the number of trained veterinarians, availability of diagnostic tools, and cost of technology (Bennett, 2021).

6. Case Study: Veterinary Technology in Libya

6.1. Overview of Veterinary Sector in Libya

Libya's veterinary sector faces distinctive challenges, including political instability, resource constraints, and infrastructure deficiencies (Omar et al., 2021). The ongoing conflict and political fragmentation in Libya have significantly affected the delivery of veterinary services. The lack of a stable government has led to fragmented oversight and inconsistent application of veterinary regulations, which complicates efforts to manage animal health on a national scale. This instability has also disrupted supply chains, leading to shortages of essential veterinary medicines and equipments (Omar et al., 2021).

Resource constraints are a major issue, as funding for veterinary services is often limited, affecting the ability to invest in modern technology and training. Many veterinary facilities operate with outdated equipment, which limits their capacity to diagnose and treat diseases effectively. Additionally, there is a shortage of trained veterinary professionals, as the conflict has disrupted educational programs and led to the emigration of skilled practitioners (Ahmed et al., 2022). Despite these obstacles, there are ongoing efforts to enhance animal health and food safety. Government agencies, private practices, and non-governmental organizations (NGOs) are working to address these issues through various initiatives. For example, NGOs are involved in vaccination campaigns and disease surveillance programs aimed at controlling major animal diseases and improving overall animal health (Ahmed et al., 2022). Collaborative efforts with international partners are also providing critical support in terms of both financial resources and technical expertise.

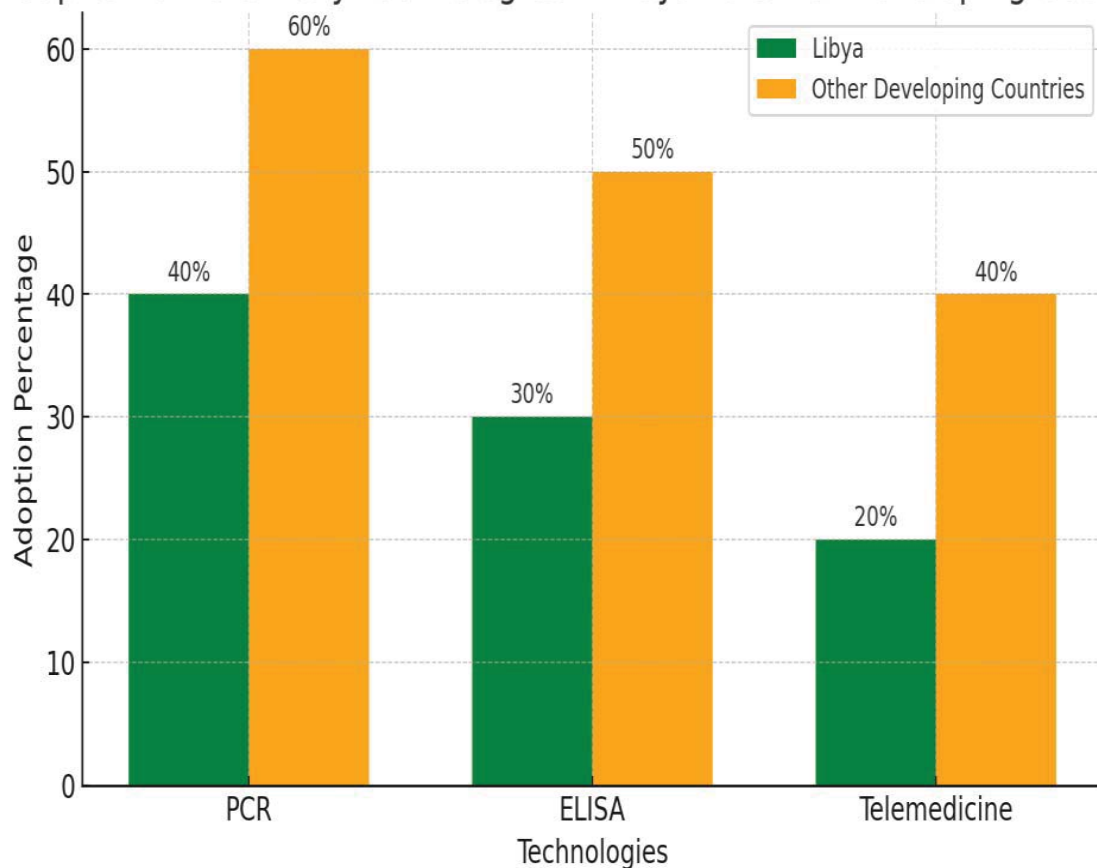
6.2. Current Technological Landscape

Libya's veterinary technology landscape is evolving, with the introduction of some advanced technologies, though their application is often limited by resource constraints (El-Sayed et al., 2022). The adoption of modern diagnostic tools such as PCR and ELISA has been a significant step forward in detecting and managing diseases. However, the high cost of these technologies and the need for specialized infrastructure and training pose substantial barriers. In many regions, access to these technologies is limited, and veterinary practices must rely on basic methods and traditional approaches (El-Sayed et al., 2022).

Efforts to integrate modern diagnostic tools and improve veterinary practices are underway, with successful pilot projects and international collaborations offering promising examples of technology integration in Libya. For instance, several pilot projects have demonstrated the effectiveness of mobile veterinary units equipped with diagnostic tools in rural and underserved areas. These mobile units help bridge the gap in veterinary care by providing essential services and training to local practitioners (Ali et al., 2023). Additionally, international collaborations have facilitated the transfer of knowledge and technology, leading to the establishment of training programs and workshops aimed at upskilling local veterinarians and technicians (Ali et al., 2023).

Furthermore, there is growing interest in adopting telemedicine solutions to overcome logistical challenges and improve access to veterinary care. Telemedicine platforms enable remote consultations and diagnosis, which is particularly valuable in a country with significant geographic and infrastructural barriers. While still in the early stages, these technologies have shown potential in enhancing veterinary services by connecting rural practitioners with specialists and providing continuous support for ongoing cases (Ali et al., 2023). The third chart (3) compares the adoption of veterinary technologies in Libya versus other developing countries. It focuses on three key technologies: PCR, ELISA, and Telemedicine.

Adoption of Veterinary Technologies in Libya vs Other Developing Count



Comparing the adoption of veterinary technologies (PCR, ELISA, and Telemedicine) in Libya versus other developing countries. The green bars represent Libya, while the orange bars represent other developing countries (El-Sayed, 2022).

- **PCR (Polymerase Chain Reaction):** Libya has an adoption rate of 40%, while other developing countries are at a higher rate of 60%.

- **ELISA (Enzyme-Linked Immunosorbent Assay):** Libya's adoption rate for this diagnostic tool is 30%, compared to 50% in other developing countries.
- **Telemedicine:** Libya has a lower adoption rate of 20%, whereas other developing countries show a higher rate at 40%.

The chart highlights that Libya lags behind other developing countries in adopting these veterinary technologies across the board, particularly in Telemedicine and ELISA.

7. Future Directions and Emerging Trends in Veterinary Technologies

7.1. Precision Livestock Farming

Precision livestock farming (PLF) represents a significant advancement in the way livestock management is approached. This emerging trend leverages data from various sensors and monitoring systems to provide detailed, real-time insights into the health, behavior, and environmental conditions of animals (Meyer et al., 2022). For example, wearable sensors can continuously track parameters such as activity levels, body temperature, heart rate, and rumination patterns. Environmental sensors monitor factors like temperature, humidity, and air quality in the animal's habitat, offering a comprehensive view of the conditions affecting the animals (Meyer et al., 2022).

The integration of these data streams enables individualized care tailored to each animal's specific needs. This can lead to early detection of health issues, allowing for prompt intervention before conditions become severe. Real-time monitoring also facilitates more precise feeding regimens, which can enhance growth rates and reduce feed waste. For instance, by analyzing data on an animal's feeding behavior, adjustments can be made to optimize nutrition and minimize overfeeding (White et al., 2023).

Advanced data analytics and machine learning algorithms play a crucial role in processing the collected data, identifying patterns, and making predictive analyses. This can lead to improved management decisions, such as forecasting disease outbreaks, optimizing breeding schedules, and enhancing overall farm productivity. For example, machine learning models can predict the likelihood of lameness or other health issues based on historical data, allowing for preventative measures to be taken (White et al., 2023).

Moreover, PLF contributes to environmental sustainability by optimizing resource use and reducing waste. By closely monitoring environmental conditions and animal needs, farms can minimize water usage, feed waste, and greenhouse gas emissions, thereby supporting more sustainable agricultural practices. Innovations such as precision irrigation and automated feed systems

are examples of how PLF technologies can enhance environmental stewardship (Meyer et al., 2022).

7.2. Gene Editing and Biotechnology

Gene editing technologies, particularly CRISPR-Cas9, hold transformative potential for veterinary medicine by enabling precise and efficient genetic modifications in animals. CRISPR-Cas9 allows for targeted alterations to the DNA of animals, offering significant benefits such as enhanced disease resistance, improved productivity, and the correction of genetic disorders (Davis et al., 2021). For example, gene editing has been used to create livestock with resistance to diseases like African swine fever and bovine tuberculosis. These advancements can reduce reliance on antibiotics and improve animal health, leading to more sustainable livestock production (Davis et al., 2021).

In addition to disease resistance, gene editing technologies can improve productivity traits such as growth rates, feed efficiency, and reproductive performance. By targeting specific genes associated with these traits, breeders can develop animals that perform better and require fewer resources. This has the potential to increase farm efficiency and profitability while also reducing the environmental impact of livestock production (Davis et al., 2021).

However, the application of gene editing raises important ethical and regulatory considerations. The potential for unintended genetic consequences and the long-term impacts on animal welfare and ecosystems are concerns that need to be addressed. For example, while gene editing can correct genetic disorders, there is debate over the potential unintended effects of such modifications on the animal's health and genetic integrity (Jones et al., 2022). Regulatory frameworks are evolving to address these concerns, but there is a need for comprehensive guidelines to ensure responsible use. This includes establishing protocols for assessing the risks and benefits of gene editing, as well as engaging with stakeholders, including ethicists, scientists, and the public, to ensure that the technology is applied transparently and ethically (Jones et al., 2022). The development of international standards and regulations will be crucial in managing the use of gene editing technologies and addressing the broader ethical implications.

8. Conclusion and Call to Action

Advanced veterinary technologies are crucial for ensuring food safety, security, and public health. While developed countries have made significant strides, developing countries like Libya face challenges that need to be addressed to fully leverage these technologies. It is essential for policymakers, practitioners, and stakeholders to collaborate in supporting the development, implementation, and regulation of veterinary technologies. Ongoing investment in research, infrastructure, and training is vital for advancing

veterinary care, improving animal health, and safeguarding global public health.

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Impact of hammermill screen Size on starch damage level, particle size distribution and water absorption in hard wheat

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Abstract

The objective of this experiment was to determine the level of starch damage (SD) and water absorption capacity in hard wheat after grinding in a hammer mill using four different screen sizes: 1.2, 2.4, 3.6, and 4.8 mm diameter. The ground wheat was divided into fine, medium and coarse fractions by sieving to evaluate SD and water absorption. Starch damage increased linearly and quadratically with decreasing hammer mill screen size ($P < 0.0001$). The smallest screen size resulted in the highest level of SD, while the highest screen sizes (3.6 and 4.6 mm) producing the lowest levels of SD ($P = 0.009$). The fine particle fraction of the ground wheat had the highest level of SD in quadratic fashion ($P = 0.01$). Water absorption responded to the screen size in a quadratic manner; the lowest level was observed when ground through a 2.4 mm screen, but the highest levels were observed when the wheat was ground through 1.2 and 4.8 mm screen size diameter. Scanning Electron Microscope (SEM) images of starch granules indicated that the large particles of ground hard wheat consisted of starch granules still imbedded within protein/or fiber matrix, but grinding did appear to create cracks in the matrix. It is concluded that grinding hard wheat using a hammer mill in the feed mill causes SD; fine particles produced the highest level of SD, whereas the coarse grinding produced the lowest level of SD. The water absorption was affected by the hammer mill screen size in a quadratic manner where the coarsest and finest grinds had the greatest water absorption.

Keywords: hard wheat, grinding, starch damage, SEM.

Introduction

Starch damage is the physical alteration of starch granules that occur during mechanical processes such as grinding. These processes can potentially fracture a portion of the starch, exposing the interior of the granule to water, increasing water absorption and access by α -amylase enzymes (Hasjim et al., 2009; Dhital et al., 2010; Sen Ma et al., 2016). During particle size reduction, the crystallinity of starch structure can be altered, and cracks can be observed inside the starch granule (Tran et al., 2011). Starch damage is most associated with the milling of hard wheat during flour production. It increases water absorption and increases the amylase access to starch during the fermentation process (Boyaci et al., 2004; Barrera et al., 2007; Liu et al., 2014; Zhu, 2014). The processes of flour production are different than the grinding of wheat prior to incorporation into animal diets. In flour milling, wheat is ground using a series of roller mills and sifting operations to separate the bran from the endosperm. Following this, the course endosperm material, termed semolina, is finely ground using the smooth rolls in a roller mill in a process called reduction resulting in very fine particles (Shinezorigt, 2019). In contrast, hammer milling for the feed production is typically a single stage process, whereby the seed is impacted by a metal bar (hammer), which is moving at a high speed, resulting in fracturing of the seed into smaller particles. The particles that are smaller than the holes in the screen pass through, however, the particles which are too large to go through the screen hole, or hit the edge of the holes bounce back and are hit again by the hammer, resulting in further particle size reduction (Amerah et al., 2007). Even though the particles are larger than the particles which are formed during flour milling, it would seem reasonable that some of the starch granules may be damaged by hammer mill grinding during feed preparation. Moreover, the mechanical energy and heat friction transferred by the grinding can damage the structure of starch granules and, thereby affect its' functional properties (Asmeda et al., 2016). Therefore, starch damage may increase water absorption by the starch granules, and the rate of starch digestion in the digestive tract of broiler chickens.

To the best of our knowledge, there is no published information on the impact of hammer mill grinding during feed manufacturing on the extent of starch granule damage in wheat. Therefore, the current study focused on the incidence of starch damage and water absorption in hard wheat following hammer milling. The objective of the current study

was to evaluate the effect of grinding in feed mill on the SD content of hard wheat and if this, in turn, increases water absorption. It was hypothesized that the screen size of the hammer mill hard wheat would increase SD and increase water absorption.

Materials and methods

A sample of commercial feed grade wheat consisting of Canadian Western Red Spring (CWRS) wheat was milled using a hammer mill (Colorado Milling Equipment HMS.2X, Diameter 18"D × 6"W, 1750 rpm), at the University of Saskatchewan - Canadian Feed Research Centre in North Battleford, SK, Canada. The experimental treatments included 4 hammer mill screen sizes (1.2, 2.4, 3.6, and 4.8 mm). The ground material was further divided into 3 fractions, coarse, medium and fine, to determine if starch damage is greater in the finest fraction.

Starch damage was measured using a Megazyme assay (Megazyme International Ireland Ltd, Bray Business Park, Bray, Co. Wicklow, Ireland), following the AACC method 76-31.01. The principle of this assay is that SD is rapidly digested by α -amylase to maltosaccharides and α -limit dextrin so to measures this the sample is only incubated for 10 minutes at 40°C and is not subjected to gelatinization by boiling. The reaction is stopping by the addition of diluted sulfuric acid after 10 minutes exactly; therefore, only damaged starch, which is most rapidly susceptible to the enzyme attack, is measured. Water absorption was measured, according to the AACC International Method 56-11.02. The particle size distribution of ground wheat was measured following the method described by Baker and Herrman (2002) using 12 sieves and shaking for 10 minutes. Samples of ground wheat were taken twice at the beginning, middle and end of the grinding and each sample (beginning, middle and end) pooled by the grinding size. The analysis of each sample was completed in duplicate. The ground wheat products were segregated into fractions using two sieves (850 and 212 μ m), following the method described by Baker and Herrman (2002) to produce three fractions: > 850 μ m, 850 to 212 μ m and < 212 μ m, respectively. The fraction retained by 850 μ m sieve was considered as coarse, while the fraction retained by 212 μ m sieve was considered as medium; the material which was passed through the 212 μ m was considered as fine. Two samples of ground wheat and their fractions were measured for SD and water absorption in each sample and

analyzed in duplicate as described above. Data were analyzed in one-way ANOVA analysis using Proc Mixed procedure of SAS version 9.4. Significant differences were declared at ($P < 0.05$) and means separation was conducted using Tukey's test. The impact of grinding on the morphology of starch granules was evaluated using a scanning electron microscope (Hitachi FE-SEM SU8010) in the imaging center at the University of Saskatchewan, Saskatoon, SK, Canada. The ground wheat was sputtered to the surface of two-sided adhesive tape with gold coating and imaged under the conditions of 3.0, 5.0 kV and 1.0 μ A. Images of the samples were captured at $\times 100$, $\times 400$, $\times 1000$ and $\times 5000$ magnifications.

Results and discussions

The effects of hammer mill screen size on particle size, and water absorption and starch damage, are shown in Table 3.1. The average particle size of CWRS decreased with decreasing hammer mill screen size. Water absorption appeared to be quadratically affected by the hammer mill screen size, where the lowest value was observed when the wheat was ground through a 2.4 mm screen and the highest values through the 1.2, and 4.8 mm screens. The difference of water absorption between screen size holes, for example, in the finest grinding (1.2 mm) and the coarsest grinding (4.8 mm), could be due to the SD level and fiber matrix. Grinding through a 2.4 mm screen may cause more disruption or collapse of the fibrous matrix as compared to the course grind and therefore reduce water absorption. In contrast fine grinding through a 1.2 mm screen increased the SD and surface area, and likely increased water absorption (Barekatain et al., 2015). In addition, the endosperm is comprised of a protein/fibre matrix which encases the starch. This structure likely supports water absorption through capillary action, but this may be interrupted by processing resulting in reduced water absorption capacity. Therefore, the effect of the hammer mill screen size on the water absorption is probably attributed to the interaction between SD and protein/fiber matrix. Protein/fiber matrix at this view of grinding in feed mill could have a greater effect on water absorption than SD content and may have a potential improvement on starch digestion rate in broiler chickens. Also, in current study, only raw ground wheat was examined, but in complete diet other ingredient could change the effect on water absorption.

The SD increasing quadratically ($P < 0.0001$) with the decreasing screen size. Starch damage was greatest in the finest fraction. The

lowest SD in the fine and coarse fractions was observed when wheat was ground through 3.6- and 4.8-mm screen sizes, and the highest level of SD was observed for 1.2 mm screen size; the screen size 2.4 mm was intermediate. Starch damage quadratically decreased with the increasing hammer mill screen size diameter in the medium fraction ($P < 0.009$), where SD increased 2.3% from 2.4 to 1.2 mm screen size diameter and 0.23% from 4.8 to 3.6 mm screen size diameter. Physical damage of starch granules in the current study is not high compared to the starch damage values found for flour grinding. Jinglin et al. (2015) reported that the level of SD in hard wheat reached 15.7% upon flour milling by using the same assay, which is much higher than the current study. The level of SD in hard wheat is attributed to the grain hardness, screen size, and mechanical energy during the grinding process (Hasjim et al., 2009; Barrera et al., 2013). However, SD might be a significant factor affecting starch digestion rate and apparent metabolizable energy in broiler chickens despite the lower level of SD in feed application.

Table 1 Impact of hammer mill screen size during grinding of hard wheat on wheat particle size, water absorption and starch damage.

	Hammer mill screen size (mm)				SEM ¹	P value	
	1.2	2.4	3.6	4.8		linear	quadratic
Average particle size (μm)	321 ^d	545 ^c	809 ^b	989 ^a	2.3	<.0001	<.0001
Water absorption (%)	109.7 ^b	69.3 ^d	83.3 ^c	131.6 ^a	0.86	0.05	0.05
Starch damage (%)	2.2 ^a	1.4 ^b	1.0 ^c	0.8 ^c	0.04	<.0001	<.0001
<u>Starch damage in fractions (%)</u>							
Fine (< 212 μm)	4.89 ^a	2.65 ^b	2.32 ^b	2.15 ^c	0.004	0.005	0.01
Medium (212-850 μm)	3.85 ^a	1.55 ^b	0.97 ^c	0.74 ^d	0.002	0.002	0.009
Coarse (> 850 μm)	3.66 ^a	0.83 ^b	0.38 ^c	0.22 ^d	0.0001	0.006	0.018

^{a-d}Means within a row with different superscripts are significantly different ($P < 0.05$).

Each number represented the mean of duplicates. ¹SEM: standard error of the mean.

Grain hardness and starch granule morphology are important factors affecting flour quality. Grinding in the flour mill often produces SD, but the process of flour production is significantly more intensive than feed production, and it was not known if feed processing would cause SD and potentially affect starch digestion rate. Therefore, a comparison was made with the studies in food application to understand the effect of coarse grinding on starch granule morphology. For instance, studies from Barrera et al. (2012; 2013) and Jinglin et al. (2015) reported an elevated level of SD in hard wheat, which is desirable to increase water absorption which contributes to bread making properties.

Images from the scanning electron microscope showed a distinct difference in appearance as affected by fine grinding (1.2 mm screen) of hard wheat, where some cracks between starch granules appeared and were still attached to endosperm. Starch granules were not clearly visible after coarse grinding instead large particles (Fig 3.1) with irregular shapes are observed, and the surface edge where protein and fiber-matrix remain embedded in the particles. Some cracks and holes can be seen in the large particles, but the starch granules are encased in the other components. Grinding of hard wheat through the larger screens greater than 1.2 mm (i.e. 2.4, 3.6 and 4.8 mm diameter) resulted in large particles, which appeared to have the starch granules that remained embedded in the endosperm matrix. The SEM analysis also appeared to show signs of cracks or possibly holes in the starch granules which appear at the surface of the matrix (Fig 3.2, 3.3 and 3.4). It is worth to mention that interpretation of SEM images is only a visual assessment and subjective in nature.

In hard wheat with high protein content makes strong interaction with starch granules (Barlow et al., 1973), which requires hard mechanical energy to grind, resulting in physical damage to the starch. The current study showed the evidence of physical damage to the starch granules of hard wheat feed mill, even with coarse grinding, and it was in accordance to the studies completed by Barrera et al. (2013), Lie et al. (2014) and Jinglin et al. (2015). The images of SEM further confirmed SD in hard ground wheat due to the presence of compacted large particles of ground hard wheat with protein/or fiber matrix, which contains holes or cracks. Moreover, protein structure surround starch granules of grains, which could impair enzymatic hydrolysis, thereby

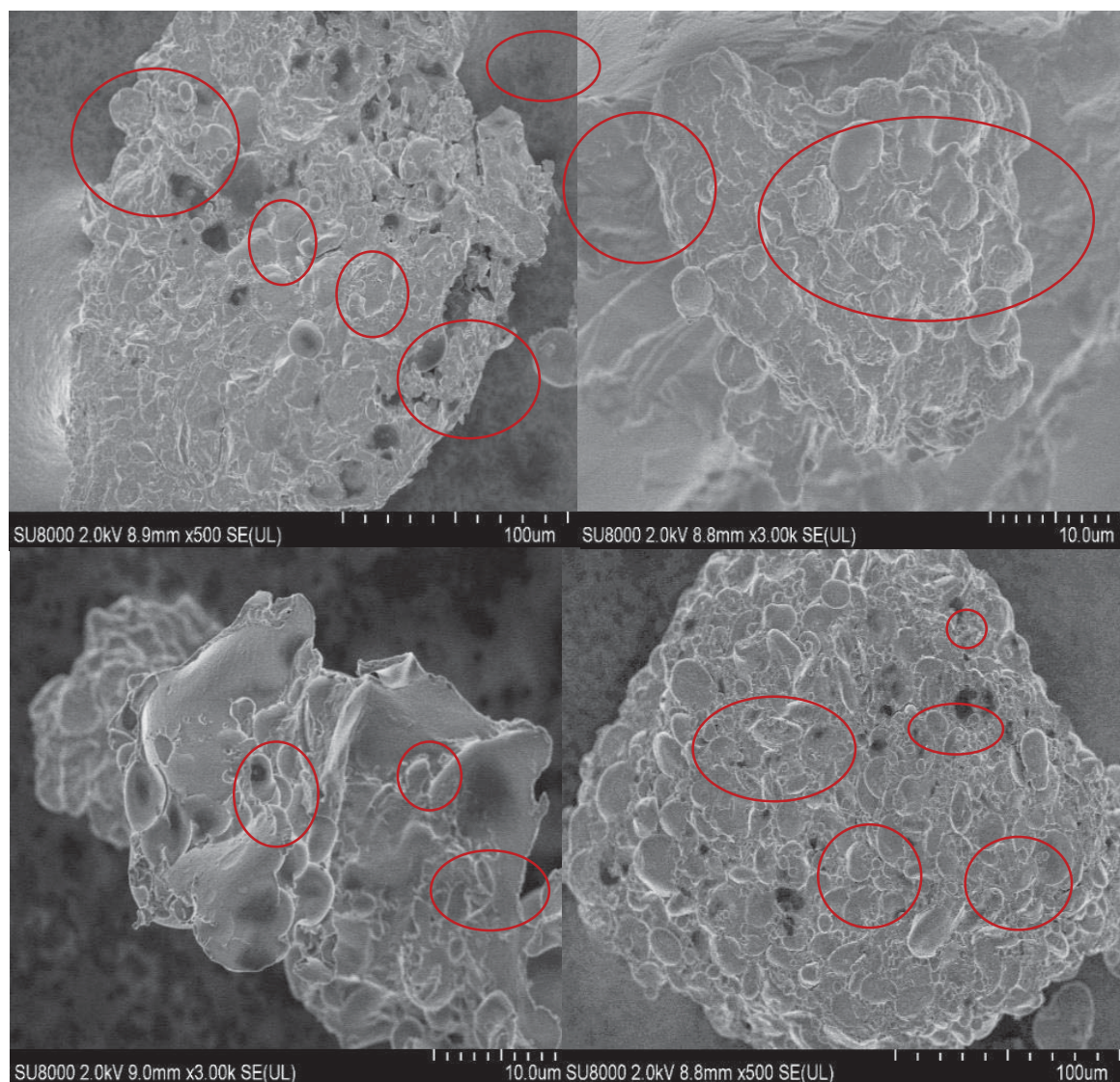


Figure 2. Scanning electron microscope photographs of hard wheat after hammer milling with screen size 2.4 mm (highlight areas that appear to have damaged starch granules and holes in endosperm)

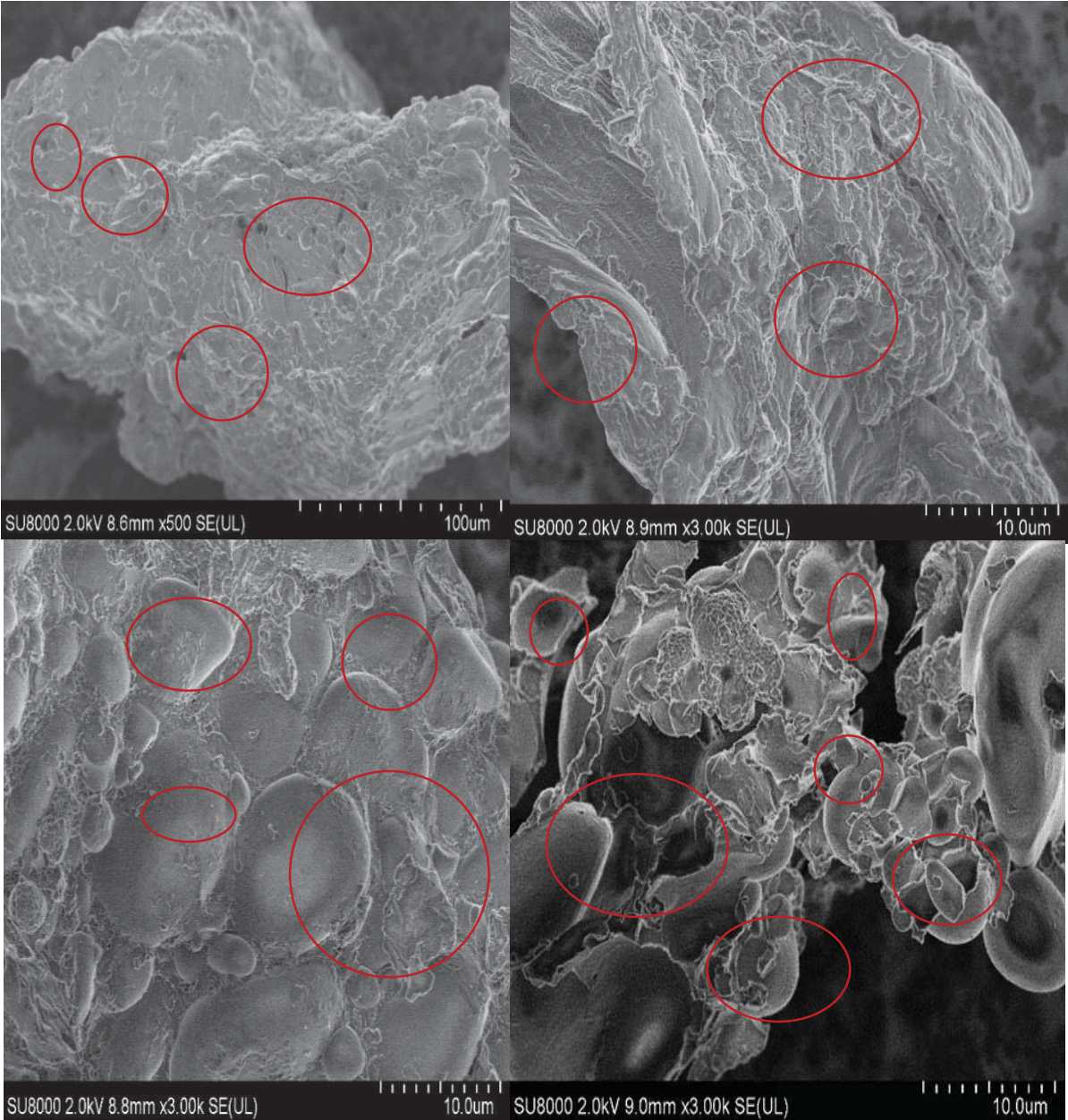


Figure 4. Scanning electron microscope photographs of hard wheat after hammer milling with screen size 3.6 mm (circles highlight areas that appear to have damaged starch granules)

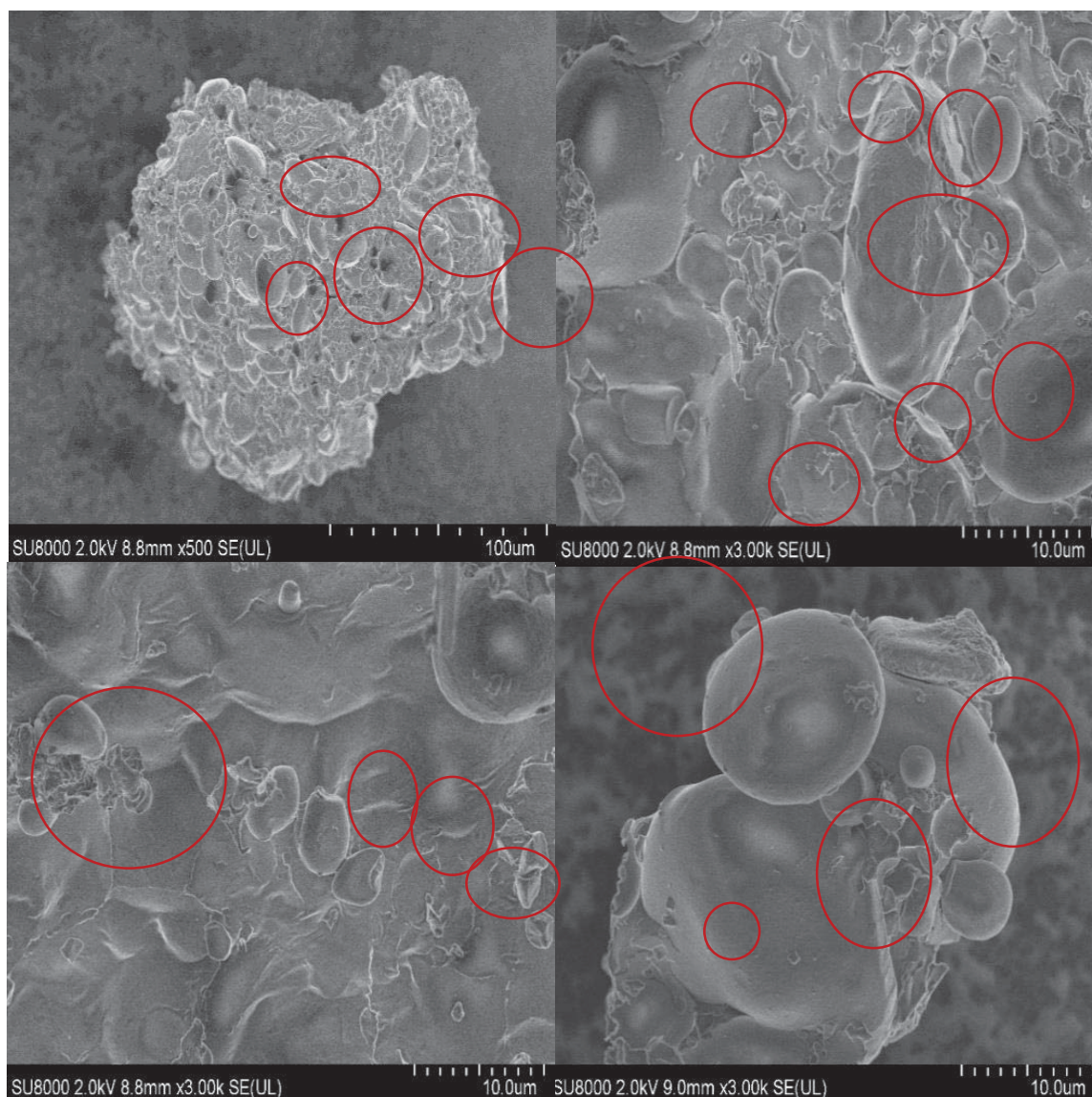


Figure □ Scanning electron microscope photographs of hard wheat after hammer milling with screen size 4.8 mm (highlight areas that appear to have damaged granules with holes and cracks in endosperm)

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Evaluation of cholesterol and triglyceride levels in diabetic patients in Al-Urban region, western Libya
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Abstract

Diabetes mellitus is a non-regenerative metabolic disorder with complex pathogenesis. It is characterized by high blood glucose levels resulting from a defect in secretion or action insulin or both. High blood glucose appears in different forms with a diverse presentation, leading to an imbalance in carbohydrate and protein metabolism. The study aimed to evaluate cholesterol and triglyceride levels in diabetic mellitus. The study was conducted on 53 diabetics attending Al-Urban Rural Hospital. 25 males and 28 females. The ages were 20 - 78 years, and 20 healthy individuals as control, 10 were males and 10 were females. Tests were performed on FBS, HbA1C, cholesterol, and triglycerides. The age group 61-70 was the highest percentage 26% compared to the other age groups, the age group 71-80 was the lowest 4%, Mean FBS, and HbA1C in males were higher than in females but no significant differences were observed, while cholesterol and Triglyceride were high in females compared to males with no significance, 67.9% cases, was HbA1C > 6.4%, increased FBS by increased Hb A1C, Of 53 cases we found 10 cases (18%) have high cholesterol levels >200 mg/dl) and 35% have high Triglyceride >150mg/dl. The mean FBS and HbA1c in patients (166 ± 81), (7.9 ± 17) were significantly higher compared to the control group (90 ± 17), (5.6 ± 0.7), $p < 0.05$. No significant differences were found in the mean cholesterol and triglycerides between patients and control, in this study, most cases suffer from increased levels of diabetes and glycated hemoglobin, and some patients have increased cholesterol and triglyceride.

Keywords: Diabetes mellitus, Al-Urban Rural Hospital, cholesterol and triglyceride

تقييم مستويات الكوليسترول والدهون الثلاثية لدى مرضى السكري في منطقة الغرب ليبيا
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الملخص

داء السكري هو اضطراب أيضي مزمن غير متجانس ذو مسببات مرضية معقدة. يتميز بارتفاع مستويات الجلوكوز في الدم، بسبب خلل في إفراز الأنسولين أو عمل الأنسولين أو كليهما. يتجلى ارتفاع سكر الدم في أشكال مختلفة مع عرض متنوع ويؤدي إلى اختلالات التمثيل الغذائي للكربوهيدرات والدهون والبروتين. هدفت الدراسة إلى تقييم مستويات الكوليسترول والدهون الثلاثية في مرضى السكري: أجريت الدراسة على 53 مريضًا بالسكري يرتادون مستشفى العريان القروي في شمال غرب ليبيا، تم جمع العينات من يونيو إلى يوليو 2024. تم جمع 53 عينة، 25 ذكور و 28 أنثى. تراوحت أعمارهم بين 20-78 عامًا، و 20 عينة. من أشخاص أصحاء استخدمت كضوابط، 10 ذكور و 10 إناث. تم قياس مستويات سكر الصيام والهيوجلوبين السكري والكوليسترول والدهون الثلاثية. كانت الفئة العمرية 61-70 هي الأعلى بنسبة 26%، بينما كانت الفئة العمرية 71-80 هي الأقل بنسبة 4%، وكان متوسط السكر في الدم والهيوجلوبين السكري و عند الذكور أعلى من الإناث ولكن لم يلاحظ وجود فروق معنوية بينهم ، بينما كان الكوليسترول والدهون الثلاثية مرتفعين عند الإناث مقارنة بالذكور بدون دلالة إحصائية ، و 67.9% من الحالات كان مستوى الهيوجلوبين السكري (6.4% >) ، ، ومن بين 53 حالة وجدنا 18% لديها مستويات كوليسترول أعلى من <200 مجم / ديسيلتر، و 35% لديها مستويات مرتفعة من الدهون الثلاثية (<150 مجم / ديسيلتر). وكان متوسط السكر والهيوجلوبين السكري عند المرضى (166 ± 81)، (7.9 ± 17) كانت أعلى بشكل ملحوظ مقارنة بمجموعة الضابطة (90 ± 17)، (5.6 ± 0.7)، عند $p < 0.05$ ، بينما لم يكن هناك فروق ذات دلالة إحصائية في متوسط الكوليسترول والدهون الثلاثية بين المرضى المجموعة الضابطة والتي كانت ضمن النطاق الطبيعي. من نتائج هذه الدراسة، وجدنا أن معظم الحالات كان لديها ارتفاع في مستويات سكر الصيام والهيوجلوبين السكري، وبعض المرضى لديهم ارتفاع في الكوليسترول والدهون الثلاثية. ولم نجد فروق معنوية ما بين الذكور والإناث.

Introduction:

Diabetes mellitus is a chronic and heterogeneous metabolic disease characterized by a complex pathogenesis. Diabetes is defined primarily by elevated blood glucose levels, or hyperglycemia, resulting from abnormal insulin secretion, abnormal insulin action, or both. Hyperglycemia can present in multiple forms, with varying clinical manifestations, and causes abnormal carbohydrate, fat, and protein metabolism. Prolonged hyperglycemia is a major cause of many microvascular and macrovascular complications associated with diabetes and has a significant impact on diabetes-related morbidity and mortality. Furthermore, hyperglycemia is recognized as a major biomarker for diabetes diagnosis. (1). The American

Diabetes Association (ADA) recommends a glycated hemoglobin (HbA1c) level of 6.5% or higher as the diagnostic threshold for diabetes mellitus. In contrast, individuals classified as pre-diabetic typically have HbA1c levels between 5.7% and 6.4%. The rationale for using HbA1c levels in both the diagnosis and monitoring of diabetes includes their minimal intra-individual variability, their ability to reflect average plasma glucose over the preceding two to three months, and the convenience of obtaining these measurements without requiring fasting. (2). Patients diagnosed with diabetes are at an increased risk of developing dyslipidemia, specifically atherogenic dyslipidemia. This condition is linked to the emergence of macrovascular diseases, including cardiovascular disorders and stroke, as well as microvascular complications such as neuropathy and nephropathy (3,4).. Atherogenic dyslipidemia is defined by elevated triglyceride (TG) levels, reduced high-density lipoprotein (HDL) levels, and increased low-density lipoprotein (LDL) levels in the serum (5). Type 2 diabetes mellitus (T2DM), along with its associated cardiovascular complications, poses significant public health challenges on a global scale. Individuals diagnosed with T2DM face a two- to four-fold increased risk of developing coronary artery disease (CAD), which remains the leading cause of mortality among this population. (6). Dyslipidemia and hypertension are significant modifiable risk factors for Type 2 Diabetes Mellitus (T2DM) and associated Coronary Artery Disease (CAD), contributing to over 87% of disability in low- and middle-income countries (7,8). Patients with diabetes commonly exhibit lipid abnormalities, often referred to as "diabetic dyslipidemia," characterized by elevated total cholesterol (T-Chol), increased triglycerides (Tg), reduced high-density lipoprotein cholesterol (HDL-C), and a rise in small dense LDL particles. Low-density lipoprotein cholesterol (LDL-C) levels may be moderately elevated or remain within normal limits. The prevalence of lipid abnormalities is notable among individuals with T2DM and prediabetes (9,10); however, the specific lipid profiles can vary based on ethnic backgrounds, socioeconomic status, and access to healthcare services. (11,12) A recent meta-analysis indicated that deviations from normal lipid levels are partially indicative of T2DM risk. (13). Furthermore, research involving individuals with T2DM has demonstrated a stronger association between CAD incidence when both high Tg and low HDL-C levels are present compared to the assessment of these two lipid parameters independently. (14,15). The study aimed to evaluate cholesterol and triglyceride levels in diabetic mellitus.

Materials and methods:**Study design and sampling techniques**

The study was conducted on 53 diabetics attending Al-Urban Rural Hospital in northwestern Libya, Samples were collected from June to July 2024. A total of 53 patients, were included 25 males and 28 females. Aged were between 20-78 years. 20 samples were collected from healthy individuals used as controls, 10 of whom were males and 10 females. Tests were performed on fasting sugar, glycated hemoglobin, cholesterol, and triglycerides. Samples were collected from venous blood using sterile injections of 5 ml, 1ml was placed in a tube containing Anticoagulant (fluoride oxalate) to measure glucose level, 1 ml was placed in a tube containing EDTA anticoagulant to measure the level of glycated hemoglobin and 3 ml of the blood sample was placed in a tube containing Clot activator tubes to obtain serum, to performance cholesterol and triglyceride, the samples were separated using a centrifuge at a speed of 4000 rpm for to obtain serum.

Study experiment

A photometer 4040 device was used to measure concentration of fasting blood sugar, (FBS), cholesterol, and triglycerides using reagents from the company Biomaghreb (Enzymatic colorimetric method)A device from I CHROMA II was used to measure the level of glycated hemoglobin.HbA1c, Diagnosis of diabetes was based on World Health Organization (WHO) criteria.

Statistical analysis

The data was analyzed statistically using the Excel 2016 program to Calculate frequencies, percentages, mean, and standard deviation. The statistical program Minitab was used to compare the results of patients and controls using the t-test to find significant differences at a significance level of $p (\leq 0.05)$

Results:

Of the 53 patient's diabetes, 25 (47%) were male, and 28 (53%) were female. The mean age of the participants was (51.2 ± 14) years range 20-78. As shown in Table 1, figure1

Table 1 Distribution of gender among cases study

Gender	Frequency	Percentage %
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Males	25	47 %
Females	28	53 %
Total	53	100 %

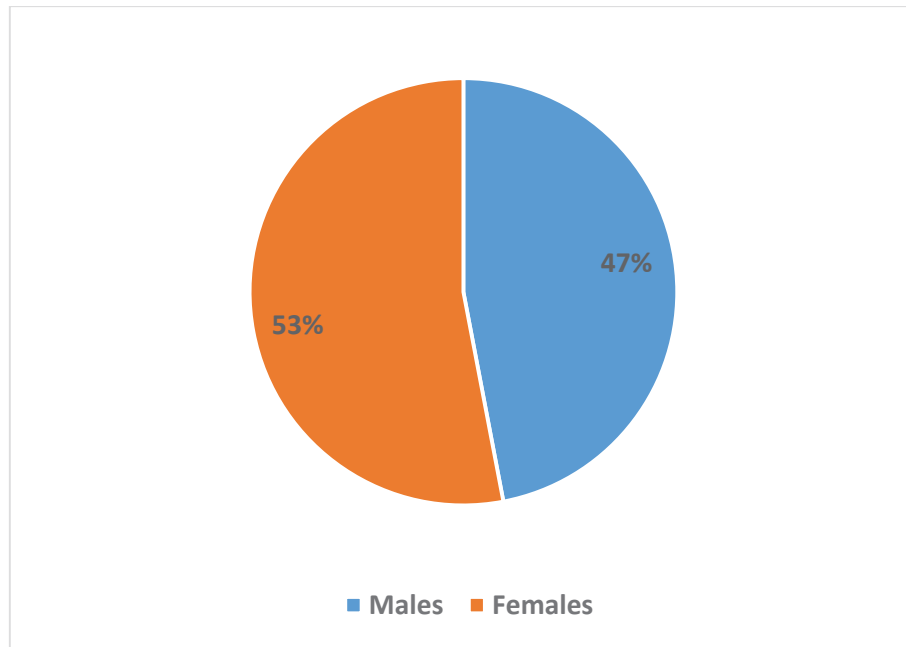


Figure 1 Distribution of gender among cases study

The patients were divided according to age into 6 age groups, the age group 61-70 had the highest percentage (26%) compared to the other age groups, while the age group 71-80 was the lowest among the cases (4%), as shown in the table 2, figure 2

Table 2 Distribution of age group among case study

Age group	Frequency	Percentage %
20 – 30	5	9 %
31 – 41	9	17 %
42 – 52	12	23 %
53 – 63	11	21 %
64 – 74	14	26 %
75 – 85	2	4 %
Total	53	100 %

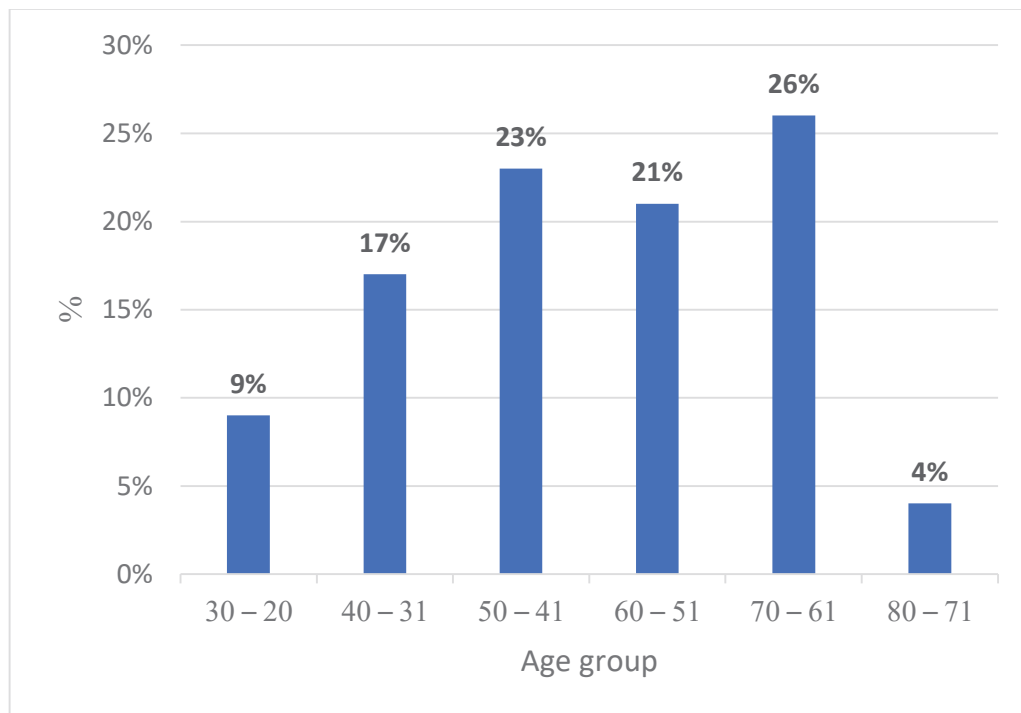


Figure 2 Distribution of age group among case study

Table No 3: Shows the comparison levels of FBS, HbA1C, cholesterol and Triglyceride between Males and females diabetes mellitus. Mean FBS, and HbA1C in males was higher than females but no significant differences were observed, while cholesterol and Triglyceride were high in females compared to males with no significance.

Table 3: Biochemical parameters in male and female patients

Biochemical parameter	Mean $\pm$ SD		P. value
	Males patients (n=25)	Females patients (n=28)	
FBS (mg/dl)	180 $\pm$ 90.3	155 $\pm$ 71	0.281
HbA _{1c} (%)	8.2 $\pm$ 2.28	7.67 $\pm$ 2.08	0.485
Cholesterol (mg/dl)	144 $\pm$ 71	154 $\pm$ 63	0.595
Triglyceride(mg/dl)	134 $\pm$ 90	150 $\pm$ 53.9	0.444

Table No 4: Shows the comparison levels of FBS, cholesterol, and Triglyceride according to level of HbA1C, we divided cases study into groups three based on the level of HbA1C: he first group (HbA1c < 6) were 7 cases (13.2%), the second group (6 –6.4 %) were 10 cases

(18.9%) and the third group (HbA1C (> 6.4%) were 36 cases (67.9%), increased FBS by increased Hb A1C, there were no significant differences between the three groups except in level Hb A1C. (p>0.05). Figures 3 and 4.

Table 4: Mean of FBS, HbA1C, Cholesterol, and Triglyceride According to HbA1C levels

HbA ₁ C level (%)	Mean ±SD			
	FBS mg/dl	HbA ₁ C %	Cholesterol mg/dl	Triglyceride mg/dl
<6 no=7 (13.2%)	110 ± 34.6	5.3 ± 0.5	115 ± 3	97 ± 24
6 – 6.4 no=10 (18.9%)	172 ± 69	6.2 ± 0.2	168 ± 1	179 ± 75
>6.4 no= 36 (67.9%)	176 ± 87	9.32 ± 2.2	149 ± 6	141 ±74
P. Value	0.14	0.000*	0.284	0.07

*Significant, SD; standard deviation

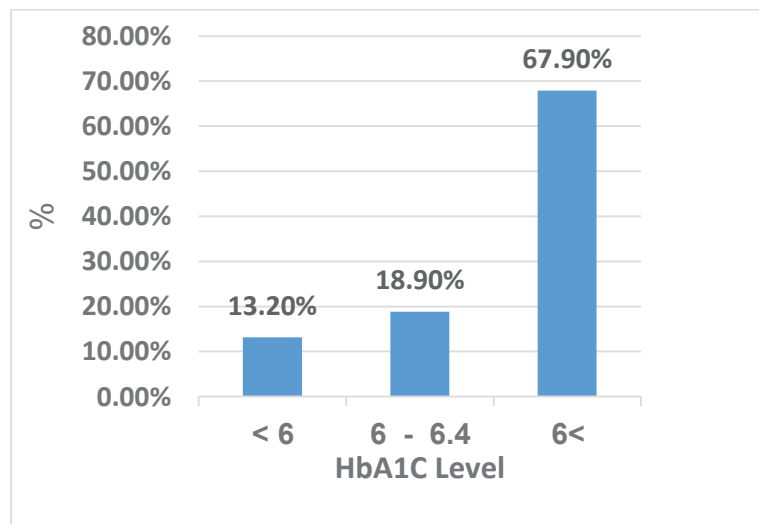


Figure 3 shows the percentage of cases according to HbA1C level. Table 5 shows the percentage of high Cholesterol, and Triglyceride in patients. Of 53 cases we found 10 cases (18%) have high cholesterol

levels (>200 mg/dl), and 19 cases (35%) have high Triglyceride (>150 mg/dl).

Table 5: Shows the percentage of high Cholesterol, and Triglyceride in patients

Parameter	frequently	Percentage %
Cholesterol >200 mg/dl	10	18%
Triglyceride >150 mg/dl	19	35%

The mean FBS and HbA1c in patients (166 ± 81), (7.9 ± 2.4) were significantly higher compared to the control group (90 ± 17), (5.6 ± 0.7), (p. value <0.05), as shown in table no 6 and Figures 4 and 5. No significant differences were found in the mean cholesterol and triglycerides between patients and controls and were within the normal range. as shown in Table no 6.

Table 6: Biochemical parameters in Diabetics and control groups.

Biochemical parameter	Mean $\pm$ SD		P. value
	Diabetics group (n= 53)	Control group (n=20)	
FBS (mg/dl)	166 ± 81	90 ± 17	0.000*
HbA _{1C} (%)	7.9 ± 2.4	5.6 ± 0.7	0.000*
Cholesterol (mg/dl)	148 ± 68	162 ± 24.8	0.207
Triglyceride(mg/dl)	142 ± 73	138 ± 13	0.685

*Significant, SD: standard deviation

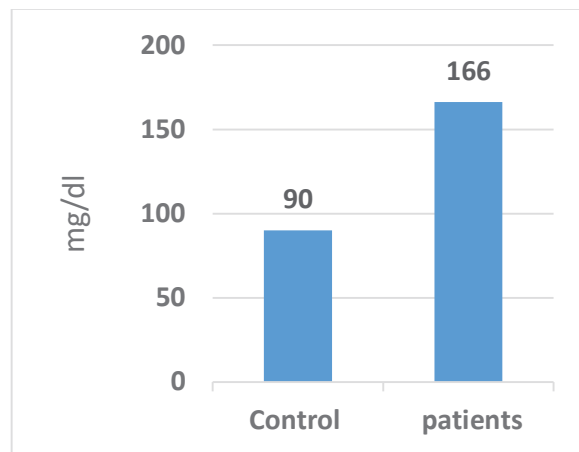


Figure 4 Comparison of mean FBS between patients and control

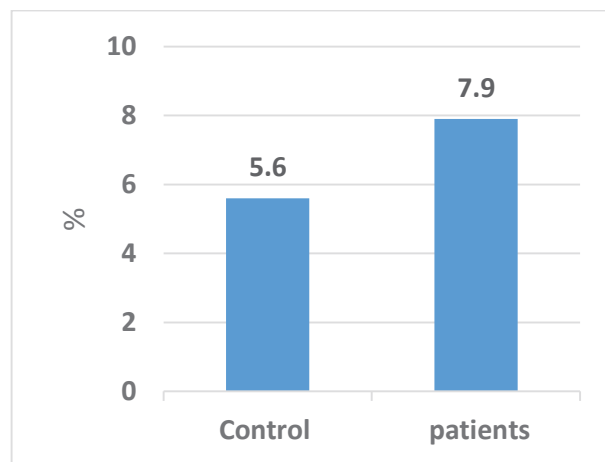


Figure 5 Comparisons mean HbA1C between patients and control

Discussion:

The data collected in this study shows that the percentage of females was higher compared with male patients, and this may be referred to the women were more careful about their health than males by making checkups or could be due to, lack of exercise, and high caloric diet. And these results agree with previous studies in Libya (16,17), Sundis, (18), also found that the age group (61 – 70) had the highest percentage compared to other age groups, while the age group (71 - 80) had the lowest rate. The current study showed that most cases had increased FBS, glycated hemoglobin, cholesterol, and Triglyceride. It indicates that patients do not maintain their FBS level within the normal range throughout the previous period of more than three months. The reason may be due to not maintaining the type of food or irregularity in treatment, or that the treatment that the patients take is not effective in regulating the glucose level, Therefore, the patient needs regular follow-up with a diabetes and endocrinology specialist. to regulate the

sugar level and advise on appropriate foods for diabetics, exercise, and other instructions, to avoid the risk of the disease developing into Atherosclerosis diseases, kidney failure, and other complications as a result of excessive glucose (hyperglycemia). These results are consistent with several previous studies, a study done by AL-shaheeb *et al*, the study was conducted on the control group and T2DM patients in Baghdad, they found significant differences between diabetic patients and control groups in HbA1c, TG, LDL, and FBS. (19), It also agrees with the results of a study conducted by Hussein *et al* (20) and researcher Merzah (21). And also another study conducted by Narjes *et al*. fifty patients with diabetes, their findings indicate that there was a significant increase in the level of FBS, HbA1c, TC, TG, LDL, VLDL, in patient groups compared to the control due hyperglycemia and it complication (22) The results of a study in India by Shankarprasad *et al* on 76 patients of diabetes mellitus, Triglycerides, cholesterol, and LDL were increased in patients compared to controls in both diabetic and control. (23).

Sundis *et al* did a study on 2765 patients with diabetes type II (76%) patients had cholesterol levels > 200 mg/ml, and 75% of patients had triglyceride levels > 165mg/ml for a couple of genders. (18) A quite prevalent issue among those with poorly managed diabetes mellitus is hyperlipidemia. Compared to non-diabetics, patients with diabetes generally have increased lipid levels, and this aberration is exacerbated in patients with inadequate diabetic control. This connection has multiple causes. According to the first theory, insulin regulates intermediate lipid metabolism and variations in the degree of diabetic control have varying impacts on plasma lipoprotein metabolism. Second, a lot of people with non-insulin-dependent diabetes are fat, and hyperlipidemia can arise from obesity. Finally, even though hyperlipidemia and diabetes are distinct hereditary illnesses, both conditions are prevalent in the population and may coincidentally occur in the same person. (24).

Conclusion:

In this study, most cases suffer from increased levels of FBS and HbA1c, some patients have increased cholesterol and Triglyceride. Controlling lipid levels is crucial for patients with diabetes to diminish the risk of cardiovascular events. A combination of lifestyle modifications and intensive pharmacological interventions plays a vital

role in effectively managing dyslipidemia-related risk factors within this population.

Recommendations:

Diabetes mellitus is associated with dyslipidemia in both Type I and Type II. It is necessary to treat dyslipidemia to prevent poor lipemic status and long term complications to ensure a healthy.

Regardless of the type of diabetes, various lifestyle modifications and interventions such as comprehensive diet control, exercise, changing sedentary daily routine and obesity control are important in diabetes prevention and management. Educational campaigns, which make the general public aware of the causes of this disease and the various controllable risk factors associated with it, are also important tool in the management and control of diabetes.

We recommend Conduct a studies that includes a larger number of patients about this topic to confirm the results more accurately.

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An Investigation into the Trends in Hospital Management and its Long Term Effects on Type 2 Diabetes Mellitus in Tripoli

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Abstract

Type 2- diabetes mellitus (T2DM) is a chronic disorder of carbohydrate metabolism caused by abnormal insulin function or insulin deficiency, which results in the high levels of blood sugars. T2DM is a significant and it continues to constitute a growing health problem worldwide. Moreover, there have been different opinions and views on the management of this disorder in the Tripoli region of Libya. Hence, it is necessary to present the current status of the hospital management of this disorder with emphasis on its epidemiology and its potential risk factors management. Therefore, the study sought to investigate the long term effects type 2- diabetic patients with emphasis on the trend of hospital management in Tripoli. Seventy five diabetic cases were randomly selected to participate in this study. Data collected by interviewing the patients and filling the questionnaire by the investigator depending on the patient information, attitude towards the use of hospital facilities and laboratory tests results. This study shows that some patients didn't see the necessity of visiting the hospitals while another group are well informed about the importance of visiting the hospital for proper medical attention. In all, about 72% of the study subjects have family history of diabetes while 28% were not of family history related. Therefore, this study has provided a clue to the improved health benefit offered by the hospital management in Tripoli and identifies ignorance and illiteracy among other risk factors such as family history of diabetes, hypertension, depression and sleeplessness as key factors responsible for the long term effects of Type 2- diabetes mellitus in Tripoli.

Keywords: Diabetes, Tripoli, Hospital Management, Metabolism, Insulin, Disorder.

Study Approval

- The study will be reviewed and approved by the relevant ethical to ensure compliance with ethical standards and patient safety. This includes obtaining informed consent from all participants.

Introduction

In recent years, studies on “Type 2 diabetes mellitus (T2DM)” and its adverse effects on human health have become a subject of considerable interest. (T2DM) is a chronic metabolic disorder that continues to present a major worldwide life threatening problem particularly in Libya. It is characterized by absolute or relative deficiencies in insulin secretion and/or insulin action associated with chronic hyperglycaemia and disturbances of carbohydrate, lipid, and protein metabolism. As a consequence of the metabolic derangements in diabetes, various complications develop including both macro and micro-vascular dysfunctions (Duckworth, 2001).

The rate of (T2DM) patients with major complications such as stroke, hypertension, amputation, nephropathy, neuropathy, retinopathy, cardiovascular, impotence, and skin lesion are on the increase in recent time (Chatuvedi, 2007). However, in Tripoli, the relevant hospital management system and facilities for self-care are in most cases insufficient. More so, there is lack of basic educational services and knowledge on diabetes as well as its prevention, management and treatment to people with diabetes and their families which has in turn led to increase long term effects of (T2DM) in the region. The causes of (T2DM) are multifactorial, which include genetic, physical inactivity, drug toxic agents, obesity, viral infection and location (Adeghate *et al.*, 20016).

It has been pointed out that there are several risk factors associated with (T2DM) among which are: obesity, diet and physical inactivity, increasing age, insulin resistance, and family history of diabetes, genetic factors, race and ethnicity (Jimoh, 2018). Moreover, as for genetic factors, previous reports have shown that certain gene variations raise the risk of developing diabetes and that its prevalence is very high among the age groups of 40 to 60 compared to those older than 60 years in developed countries (Shaw *et al.*, 2010). In most populations, (T2DM) incidence is low before age 30 years but increases rapidly with older ages. The prevalence of diabetes in Pima Indians aged 25-29 years (13%) is, however, as high as that of U.S. non-Hispanic whites age 60-64 years (King and Rewers, 1993).

More so, diet has been considered a possible cause of diabetes for centuries (Bennett *et al.*, 1992). Studies have shown that in a small sample of Pima Indian women, higher total and complex carbohydrate intake were associated with higher (T2DM) incidence (Bennett *et al.*, 1984). Ecological studies, suggest that (T2DM) prevalence is consistently lower in populations with higher levels of habitual physical activity (Wicking *et al.*, 1981). Other studies have shown that, as human aged, both weight gain and increased waist circumference occur; even in older persons who lose weight, waist circumference continues to increase. Such trends may partially account for the increased incidence of (T2DM) with aging (Stevens *et al.*, 1991).

Furthermore, studies have linked socioeconomic status such as: low income, poor education and social class with increased prevalence of (T2DM) (Hamman, 1983). The (T2DM), atherosclerosis, and hypertension share several critical risk factors, including dietary fat, physical inactivity, and upper body obesity. Increased triglycerides and decreased high density lipoprotein (HDL) levels have been consistently associated with (T2DM) and very low density lipoprotein (vLDL) concentration was an independent predictor of glucose intolerance in a 14 year follow-up of the Framingham Study in Massachusetts (Wilson *et al.*, 1981).

Moreover, part of the trends of the hospital management strategy in Tripoli is the availability of free services such as the government intervention of providing free human insulin, oral hypoglycemic drugs and syringes. There is no gainsaying in the fact that (T2DM) is the fourth leading cause of death in Tripoli in particular and Libya in general (WHO, 2012). Therefore, this study sought to investigate the trends in hospital management with emphasis on its ability to ameliorate the long term effects of type 2- diabetes mellitus in Tripoli.

Research question:

- How have trends in hospital management practices in Tripoli affected long-term outcomes of patients with type 2 diabetes mellitus (T2DM)?

Research objectives:

1. To identify and analyze the main trends in hospital management practices for patients with type 2 diabetes in Tripoli over the past decade.

2. To assess the impact of these trends on long-term health outcomes for patients with type 2 diabetes, including glycemic control, complications, and mortality rates.
3. To explore the factors contributing to differences in hospital management practices and outcomes across different healthcare facilities in Tripoli.

Study Type and Design:-

***Study Type:** * Cross Sectional Study*.

Research design:

A mixed methods research design was used to address the research question and objectives. This approach combines quantitative and qualitative methods to provide a comprehensive understanding of the topic.

Quantitative component:

- **Data collection:** Data were collected on patient demographics, clinical characteristics, hospital admission details, treatments received, and long-term outcomes (glycemic control, complications, and mortality).
- **Statistical analysis:** Statistical analysis was performed to determine trends in hospital management practices and their association with long-term outcomes.

Qualitative component:

Interviews: Patients with type 2 diabetes were interviewed to gather their perspectives on hospital management practices, their satisfaction with care, and the impact of these practices on their lives.

Participants

- ***Inclusion Criteria:**
 - The sample consists of 75 patients diagnosed with T2DM.
 - Age 18 – 65 years..
 - Receiving treatment at hospitals in Tripoli.
- ***Exclusion Criteria:**
 - Patients with other types of diabetes (Type 1, gestational diabetes).
 - Patients unwilling to provide informed consent.

Data Validation

- ***Data Sources:** * Patient questionnaires.

- ***Validation Process:** Cross-referencing medical records with patient reports, regular audits, and consistency checks to ensure data accuracy and reliability.

Data Collection

Data were collected from 19-10-2022 to 22-11-2022 from Al Baraa Medical Services in Tripoli. Seventy five patients aged from 18 - 65 years old were involved in this study. Data were collected by interviewing the patient and filling in of the provided questionnaire depending on the patient's information and laboratory tests.

Language and Type of Questionnaire

The *** language *** of questionnaire is Arabic language .

The *** type *** of questionnaire is:-

- ***Patient Questionnaire:**
 - Demographics Characteristics:- (age, gender, occupation).
 - Medical history and current treatment regimen.
 - Lifestyle factors (diet, physical activity, smoking status).
 - Self-reported adherence to medication.

A structured questionnaire was used. First part of the questionnaire included demographic characteristics of patient, as follow: Age, Sex, Education, Smoking habits, Diet Therapy and Body Mass Index (BMI). The second part of the questionnaire included information about the family history and no family history while third part of the questionnaire focused on the complications of diabetes such as: muscle fatigue, nausea, weakness, itching, depression, stress or sleeplessness in addition to the clinical analysis of the study subjects.

Data analysis:

- Quantitative data: Statistical analysis techniques, including descriptive statistics, were used to analyze the quantitative data.
- Qualitative data: Thematic analysis was used to identify key themes and patterns emerging from the qualitative data.
- Mixed methods analysis: Quantitative and qualitative results has been integrated to provide a more comprehensive understanding of the research question.

Statistical Methods:

Descriptive statistics to summarize baseline characteristics..

All data was presented as Mean $\pm$ SEM (n) or percentage (%) when needed. Graph Pad Prism version 6 was used for all statistical analysis of the results reported in this study.

Clinical Analysis

- *Parameters Monitored:*

- Blood glucose levels (HbA1c); Glycated haemoglobin, FBS; Fasting blood sugar, HDL; High density lipoprotein, LDL; Low density lipoprotein,
- Complication rates (cardiovascular issues, neuropathy, nephropathy, depression).
- Patient adherence to treatment protocols.
- Quality of life assessments.

Results

The features used for this study include: age, sex, education, smoking habits, diet therapy and BMI were recorded (Table 1). Subjects with age ranges 18 - 29Y, 30-39Y, 40-49Y, 50-59Y and 60-69Y represented 4%, 13%, 24%, 43% and 16% respectively for the total subjects under focus (Table 1). Females represented 32% of study sample; while males however represented 68% of study subjects. However, patients who are literate represented 35% while the illiterate patients represented 65%. Smokers represented 72% of the study sample while non-smokers represented 28% of whole study sample Subjects. More so, patients on diet therapy represented 33% while those of no diet therapy represented 67% and BMI (kg/m²) ranges < 17.8, 17.8-26.9, 27-29.9 and 30-49 represented 4%, 22%, 25% and 49% respectively of whole study subject (Table 1).

Features	Percentage (%)
Age	
18 – 29	4
30 – 39	13
40 – 49	24
50 – 59	43
60 – 69	16
Sex	
Male	68
Female	32
Education	
Literate	35
Illiterate	65
Smoking habits	
Non smokers	28
Smokers	72
Diet therapy	
Consumption of greens and fruits	23
Non consumption of greens and fruits	67
BMI (kg/m²)	
<17.8	4
17.8 – 26.9	22
27 – 29.9	25
30 – 49.9	49

Table 1: represents the features used in this current study

More so, this current study revealed that about 72% of the study subjects have family history of diabetes while 28% were not of family history related (Figure 1).

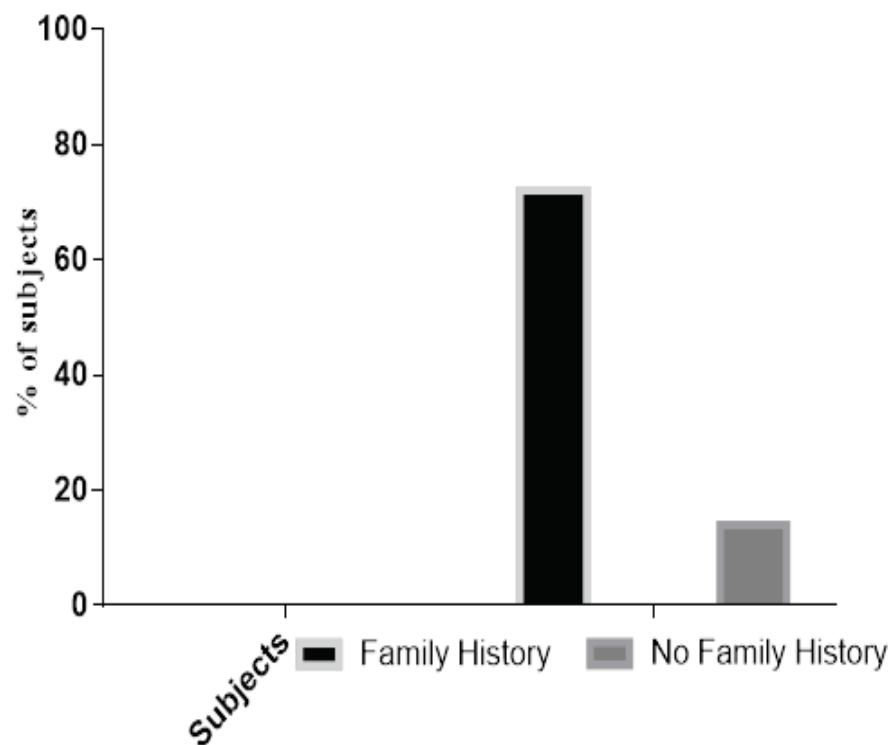


Figure 1: represents the percentage of diabetic patients with family history and those with no family history

The study further revealed that Ischemic heart diseases (IHD) revealed 7% of risk factors involved in the subjects. Hypertension and muscle fatigue both revealed 10% risk factors among the study subjects (Figure 2). Sleeplessness and Depression were responsible for 38% and 40% respectively of the common symptoms among study subjects (Figure 2).

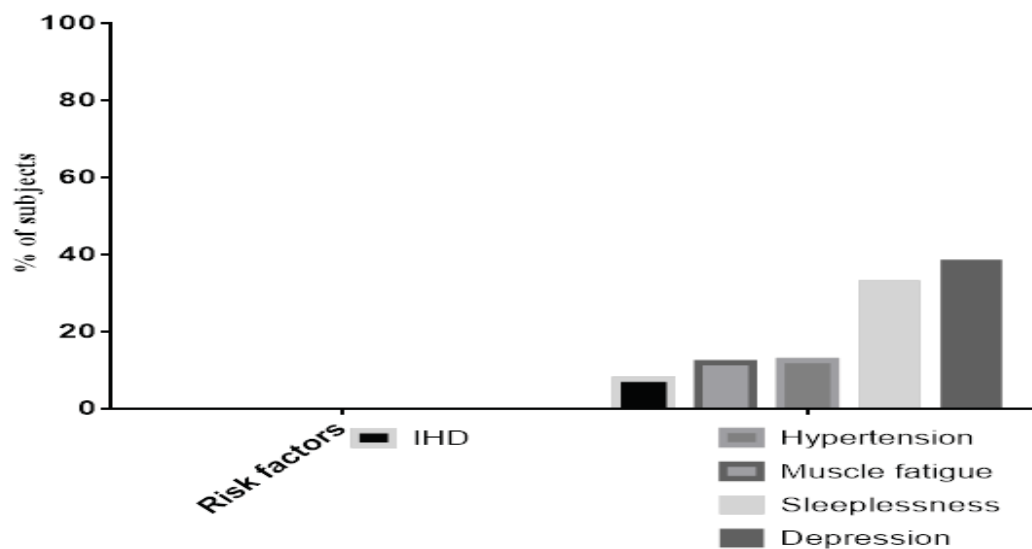


Figure 2: represents the percentage of relevant implicated risk factors to diabetes.

Discussion

The health promoting benefits offered by improved hospital management system in Tripoli cannot be over-emphasized. Despite the civil unrest in many parts of the city, the hospital management system has recorded an unprecedented achievement in healthcare particularly in the management of type 2- diabetes mellitus and its associated risk factors (Figure 2). This improved health management status in Tripoli appears to be promising when compared with reports from other research work such as; (Hawa Juma, 2018).

Type 2 – diabetes mellitus (T2DM) forms the major component of non-communicable disease burden in Libya. It is estimated to have about 90% prevalence among the total population in the country. (T2DM) causes serious complications, affecting the nervous system, the eye and the kidney. The overall risk of cardiovascular disease is more than doubled and life expectancy is reduced by an average of 7 years. The rising prevalence of the condition and the range of these serious complications, which can arise, emphasize the significance of up-to-date guidelines for management of diabetes. It is however noteworthy that there is an improvement on the management system compared to the previous health management status.

Although, illiteracy and lack adequate information appear to be a major contributor to the prevalence of T2DM in Tripoli but the current hospital management system has been instrumental to the progress reported in this study. Age, sex, education, smoking habits, diet therapy

and BMI were recorded under this study and the results revealed improved health status (Table 1). BMI gives important independent prediction of developing diabetes, a lot of studies used BMI independent predictor. The subjects whose ages ranged between 18 - 29Y, 30-39Y, 40-49Y, 50-59Y and 60-69Y represented 4%, 13%, 24%, 43% and 16% respectively were found to show appreciable improved health management status when one considered previous finding by (Sana Taher Ashur *et al.*, 2015).

The fact that females represented 32% of study sample; while males represented 68% of study subjects (Table 1) could be attributed to the claims of (Sweileh *et al.*, 2014); where females were reported to be less likely than males to have low adherence to their diabetes medications. More so, there appears to be a strict correlation between diets and diabetes as subjects who were on diet therapy were found to have low diabetes prevalence compared to the high prevalence recorded in those who are not on diet therapy (Table 1), and it could be related to the medicinal properties of those consumed vegetables and fruits (Jimoh, 2018). This current study revealed remarkable low percentage of 23% T2DM rate of the subjects that regularly consume greens and fruits while about 67% of whole study sample were those who are not consuming greens and fruits. This report is in agreement with the study of (Jaiswal *et al.*, 2009) where dietary antioxidant has been emphasized to offer health promoting potentials particularly for T2DM patients.

Essentially, subjects who were smokers were also found to have high prevalence of diabetes but the link between smoking and diabetes is wide and that was also confirmed in this study. Basically, in Tripoli, smoking as a risk factor could be regarded as a male related issue only because only a small number of females do smoke as religion inclination could be linked to why the female folks in this region are not interested in smoking. Suffice to agree that the female Libyans in Tripoli appears to be religiously stronger than their males and this could be a critical factor responsible for the low female prevalence to T2DM reported in this study.

Subjects who attributed many of the symptoms they had experienced to their diabetes were more likely to be those with family history and many other risk factors reported under this study (Figure 1 and 2). This study revealed that about 72% of diabetic patients have family history of diabetes while about 28% do not (Figure 1) this finding is agreement with the previous findings of (Meigs *et al.*, 2000)

where family history of diabetes was reported to have higher relation with the prevalence of T2DM. However, it is worthy of note that the government intervention in the hospital management system by providing free human insulin, oral hypoglycemic drugs and syringes to the sufferers of T2DM is directly related to the reduced prevalence of T2DM observed in the study subjects. This is so having considered the higher prevalence T2DM reported by (Sana Taher Ashur *et al.*, 2015) in their studies.

More so, there exist a strong relationship between depression and diabetes (Figure 2). In this regard, it is not a mere coincidence that depression has been associated with hyperglycemia and complications from diabetes (De Groot *et al.*, 2001). Additionally, depression in people with diabetes has been associated with sociodemographic lifestyle and clinical factors such as obesity and physical limitations (Egede and Zheng, 2003). The prevalence of depression is significantly higher in people with diabetes as compared to those without diabetes (Egede *et al.*, 2002). In a study conducted by (Olvera *et al.*, 2007) the prevalence of depression among a sample of 96 Latinas with diabetes was found to be approximately 32.3%. This current study revealed low prevalence of Ischemia heart diseases, Hypertension and muscle fatigue while sleeplessness and depression were both observed to be very high in the study subjects with T2DM.

In a different study conducted by (Mohamed *et al.*, 2012) 70.4% diabetic patients were reported to be linked with hypertension. This is however remarkably higher than the 10% prevalence recorded in this study and the critical factor responsible for this low prevalence could be linked to the improved hospital management system in Tripoli. Similarly, in a study conducted by (Shimaa, 2008), 12% of individuals with T2DM have increased risk of cardiovascular diseases and premature death. The reasons for this high prevalence of sleeplessness and depression could directly link with intermittent civil unrest that does occur in many parts of Tripoli regions.

Furthermore, there are several scientific articles that have reported the lack of adherence to treatment with one or more oral hyperglycemic agent. It has been demonstrated that there is an inverse relationship between taking a prescribed oral hyperglycemic agent and HbA1c level, with each 10% increase in oral hyperglycemic agent adherence associated with a decrease of 0.1% in HbA1c (Rozenfeld *et al.*, 2008). Hence, government intervention in the provision of oral

hyperglycaemic agents coupled with the hospital management technicalities in its handling could be linked with the reduced HbA1c level obtained in this study (Table 2). The clinical report of this study (HbA1C, FBS HDL, LDL and cholesterol) was observed to be feebly higher than the reference values. This report is in agreement with the study 2007 study where a significantly higher level of LDL, HDL, VLDL and triglycerides in plasma of the study subjects of type 2 diabetes patients were recorded (Gargum *et al.*, 2007).

Test	Mean	SEM	n	Reference value
HbA1c	8.7	0.19	100	5 – 6 %
FBS	195.49	7.58	100	70 – 115 mg/dl
HDL	156.78	11.35	100	40 – 55 mg/dl
LDL	99.56	6.28	100	<100 mg/dl
Cholesterol	202.10	4.65	100	50 – 200 mg/dl

HbA1c; Glycated haemoglobin, FBS; Fasting blood sugar, HDL; High density lipoprotein, LDL; Low density lipoprotein,

Table 2: represents the clinical analysis of the study subjects

Conclusion

Going by the data recorded in this study, it is clear that the government intervention in addition to the current improved hospital management strategy in Tripoli have contributed positively to the management of T2DM. Therefore, continued effort from the hospital management sector, government and all other stakeholders in Tripoli and the entire Libya is encouraged in other to record further healthcare management benefits in the country.

Conflict of interest

The author reports no conflict of interest on this study.

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Features	Percentage (%)
Age	
18 – 29	4
30 – 39	13
40 – 49	24
50 – 59	43
60 – 69	16
Sex	
Male	68
Female	32
Education	
Literate	35
Illiterate	65
Smoking habits	
Non smokers	28
Smokers	72
Diet therapy	

Consumption of greens and fruits	23
Non consumption of greens and fruits	67

BMI (kg/m²)

<17.8	4
17.8 – 26.9	22
27 – 29.9	25
30 – 49.9	49

Table 1: represents the features used in this current study

Test	Mean	SEM	n	Reference value
HbA1c	8.7	0.19	100	5 – 6 %
FBS 115 mg/dl	195.49	7.58	100	70 –
HDL mg/dl	156.78	11.35	100	40 – 55
LDL mg/dl	99.56	6.28	100	<100
Cholesterol 200 mg/dl	202.10	4.65	100	50 –

HbA1c; Glycated haemoglobin, FBS; Fasting blood sugar, HDL; High density lipoprotein, LDL; Low density lipoprotein,

Table 2: represents the clinical analysis of the study subjects

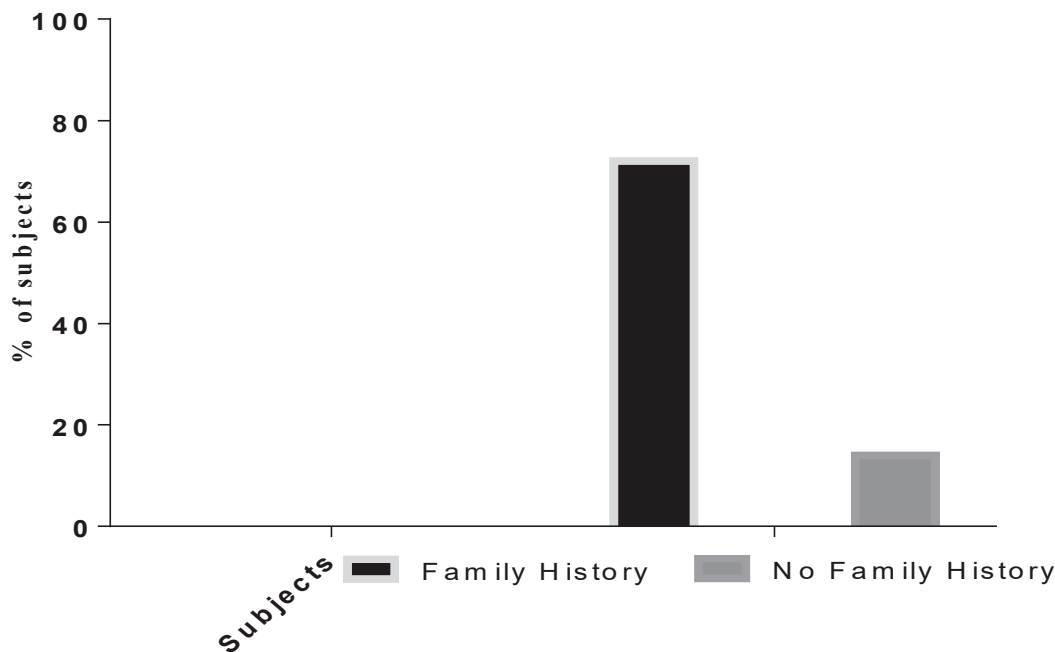


Figure 1: represents the percentage of diabetic patients with family history and those with no family history

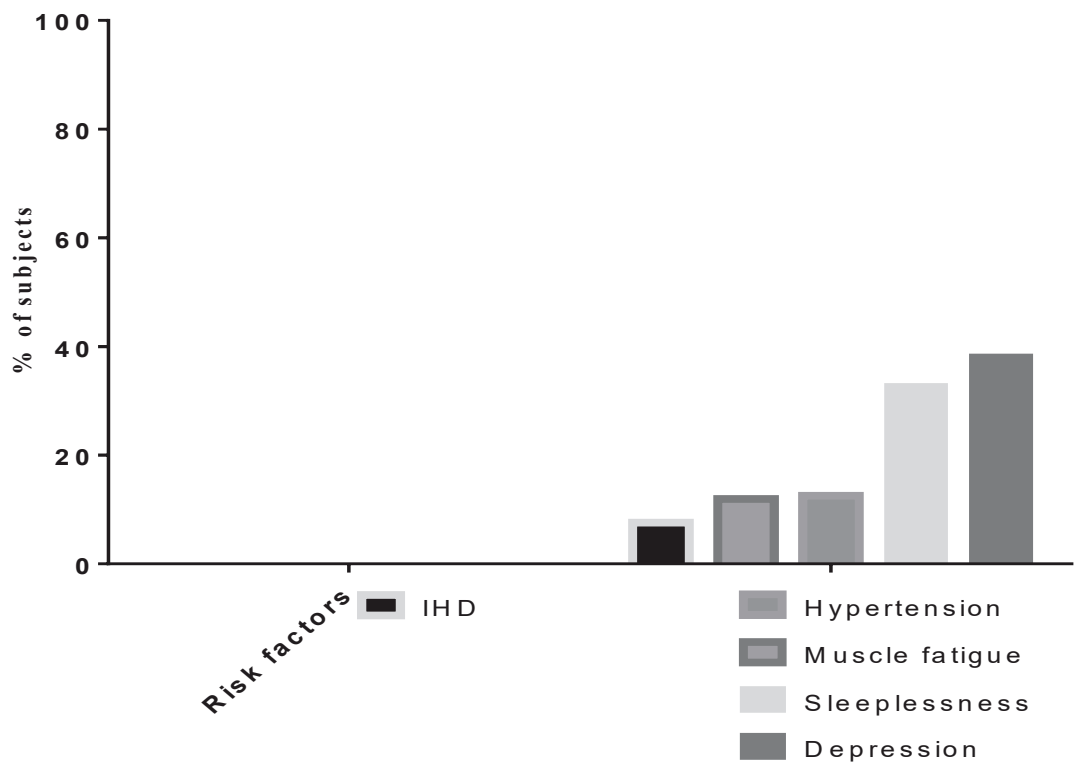


Figure 2: represents the percentage of relevant implicated risk factors to diabetes

Antimicrobial susceptibility for pathogens isolated from bacterial skin infections

Preparation by / Sara Saad Elgeroshi (ساره سعد الجروشي)

SUMMARY

Background . Skin infections are predominantly caused by Gram-positive bacteria, particularly *Staphylococcus aureus*, *Staphylococcus epidermidis* (formerly known as *Staphylococcus albus*), and *Streptococcus pyogenes*. Among these, oxacillin-resistant *Staphylococcus aureus* (ORSA or MRSA) has emerged as a significant pathogen, contributing to more complicated skin and skin structure infections. These infections can range from minor issues, like cellulitis, to more severe conditions requiring targeted antibiotic treatment.

Objectives . The present work aimed to identify the prevalence , etiology agents and clinical variants of bacterial skin infection in Jomhoria Hospital Benghazi and early detection of the presence of strains resistant to antibiotics

Patients & Materials. The cases included in this study were attending dermatology clinic in Benghazi city and the work was conducted on 185 patients with clinically suspected skin infection from March 2023 to August 2023 . Identification of bacteria isolates obtained was done by conventional microscopic examination, culture techniques and biochemical test .

Results. Our data proved that 185 patients confirmed to have bacteria skin infection, 96 were females and 89 were males. Out of 185 samples, 88% were culture positive, while 11.9% were culture negative. Among the positive cultures, *Staphylococcus aureus* was the most prevalent isolate at 73.6%, followed by *Staphylococcus albus* at 8.0% and *Streptococcus pyogenes* at 7.4%. This distribution highlights the dominance of *Staphylococcus aureus* in the samples analyzed., *Streptococcus viridinas* and *Streptococcus pneumonia* (1.8% each) , *Staphylococcus haemolytic* , *klebsiella pneumonia* and *Acentobacter baumanii* (1.1% each) , *Bacillus licheniformis* , *Sarcain loutic* , *Proteus mirabilis* , *Enterococcus* and *Gaffkya tetragen*a (0.5% each) . The antibiogram of the cultured cases should highest antibacterial effect was observed for colistin (100%). Amongst the *Staphylococcus aureus*, highest resistance was seen to oxacillin (36.8%) , ampicillin (27%) , penicillin (17.8%) , vancomycin (11.0%) , erythromycin (9.8%) , and sensitive was seen

in colistin and cefadrox (73% each) , ciprofloxacin (66.3%) .
Conclusion . Bacterial dermatitis is an inflammation of the skin and are common health problems, such as infected eczema .

الملخص بالعربي

يشكل عام اغلب الالتهابات الجلديه تحدث بسبب البكتيريا موجب جرام مثل المكورات العنقودية الذهبية . المكورات البيضاء والمكورات العنقودية المقيحة والعنقودية المقاومة للاوكساسيلين هي أيضا من العوامل المسببة للأمراض المهمه في التهابات الجلديه . ويهدف هذا البحث الى تحديد مدى انتشار العدوى الجلديه البكتيرييه في مدينه بنغازي والعوامل المسببه لها والمتغيرات السريرييه والكشف المبكر عن وجود سلالات مقاومه للمضادات الحيويه من المرضى وكانت الحالات المشموله في هذه الدراسه تتردد على عيادات الجلديه في مدينه بنغازي وتم اجراء الدراسه على 185 من المرضى الذين يعانون من عدوى جلديه من مارس 2022 الى أغسطس 2022 وتم التعرف على عزلات بكتيرييه عن طريق الفحص المجهرى التقليدي وتقنيات الاستتبات والاختبار الكيميائي الحيوي وكان من المرضى 89 ذكور 96 من الاناث من ال 185 عينه وكانت 88% ايجابيه 11.9% سلبيه من العينات السلبيه . من بين 88% من العينات الايجابيه كانت من المكورات العنقودية الذهبية هي العزله الأكثر شيوعا وشكلت نسبه 73% يليها المكورات البيضاء وشكلت نسبه 8% والمكورات المقيحة شكلت نسبه 7.4% . وكانت اعلى مقاومه (36.8%) oxacillin . فلهذا ان التهابات الجلديه البكتيرييه من المشاكل الصحيه الشائعه بسبب عدوى الجلد او الأشخاص المصابون بالاكزيما.

1. INTRODUCTION

Infections of the skin and soft tissues (SSTIs) are among the most prevalent bacterial infections in humans, accounting for approximately 10% of hospital admissions in the US and serving as a common reason for antibiotic treatment. While treatment often occurs outside of hospital settings, SSTIs exhibit a wide range of causes, clinical presentations, and severity. They can vary from cases that resolve spontaneously without antibiotics to severe instances that may lead to sepsis and fatal outcomes. Skin and soft tissue infections (SSTIs) account for 10% of severe sepsis and septic shock cases, ranking third after pneumonia (55.6%) and abdominal infections (25%). SSTIs involve microbial invasion of the epidermis, dermis, and subcutaneous tissue. The classical signs of inflammation calor (heat), rubor (redness), tumor (swelling), and dolor (pain) were first described by Celsus in the first century. The most common bacterial culprits in SSTIs include streptococci, *Staphylococcus aureus*, and methicillin-resistant *Staphylococcus aureus* (MRSA). Less frequently, Gram-negative organisms like *Haemophilus influenzae*, *Pasteurella multocida*, *Capnocytophaga* species, and *Vibrio* species can also be involved. ^(1,2)

2. REVIEWS OF LITERATURE

Infectious skin diseases present a wide spectrum of conditions, varying in severity from benign to life-threatening. Their clinical manifestations

depend on the involved pathogen, the affected skin layers, and the patient's underlying health. Commonly encountered by dermatologists, primary care physicians, and emergency departments, skin and soft tissue infections (SSTIs) can range from mild issues like pyoderma to severe conditions such as necrotizing fasciitis. Key diagnostic criteria for SSTIs include erythema, edema, warmth, and pain or tenderness. The functional impairment of the affected area, such as in the hands or legs, often correlates with the infection's severity. Comorbidities like diabetes or AIDS can escalate what might be a mild infection into a critical situation, underscoring the importance of timely and appropriate management.⁽³⁾

2.1 . MICROBIAL AETIOLOGY

The majority of skin and soft tissue infections (SSTIs) are primarily caused by *Staphylococcus aureus* and beta-hemolytic streptococci, particularly Lancefield groups A, C, and G, with group B being more common in diabetics and the elderly. Localized pus-producing lesions, such as boils and abscesses, are typically associated with *Staphylococcus*, while rapidly spreading infections like erysipelas and cellulitis are usually due to beta-hemolytic streptococci. ⁽⁴⁾ *S. aureus* is the predominant pathogen across geographic regions, along with *Pseudomonas aeruginosa*, *Escherichia coli*, and *Enterococcus* species. Treatment for staphylococcal infections relies on antibiotics and surgical drainage, but the rise of antibiotic resistance, especially methicillin-resistant *Staphylococcus aureus* (MRSA), poses significant challenges. MRSA was first identified in 1961 ⁽⁴⁾, and resistance rates vary globally, with North America⁽⁶⁾ showing the highest rates (35.9%). There is a notable increase in community-acquired MRSA (CA-MRSA) ⁽⁷⁾ infections, particularly in North America, which reflects a significant epidemiological shift. Factors such as recurrent infections, age, military service, athletics, and intravenous drug use increase the risk for CA-MRSA. ^(23,24) Conversely, healthcare-associated MRSA (HA-MRSA) ^(8,9) is linked to hospital visits, surgery, dialysis, diabetes, indwelling devices, and long-term care facility residence. In the Netherlands, contact with pigs correlates with higher MRSA carriage rates. ⁽¹⁰⁾ Although several criteria exist to predict CA-MRSA infections, distinguishing between MRSA and methicillin-sensitive *Staphylococcus aureus* (MSSA) at initial presentation remains challenging.⁽¹¹⁾

2.2 RISK FACTORS

Risk factors for the development of skin and soft tissue infections (SSTIs) include: Compromised Epidermis: Breakdown of the skin barrier due to: Ulceration Trauma Peripheral vascular disease Preexisting skin conditions (e.g., eczema, psoriasis) . Poor Personal Hygiene: Inadequate cleaning can lead to accumulation of pathogens. Crowding: Close living conditions can facilitate the spread of infections. Comorbidities: Conditions such as diabetes or immunosuppression increase susceptibility. Close Contact with Infected Individuals: Direct exposure to someone with an SSTI can lead to transmission. Certain skin conditions, such as eczema and psoriasis, create fissures that allow bacteria to penetrate, while fungal infections like tinea pedis and onychomycosis can alter the skin's integrity, predisposing individuals to secondary bacterial infections. ⁽¹²⁾ .

2.3 CLINICAL PRESENTATION

Cellulitis, impetigo, and folliculitis are the most common bacterial skin infections seen by the family physician. The percentage of office visits for cellulitis was 2.2 percent, and for impetigo, it was 0.3 percent, in a cohort of almost 320,000 health plan members

2.3.1 Impetigo

Impetigo is a highly contagious bacterial skin infection primarily affecting preschool children, particularly during the summer months in the Northern Hemisphere. It spreads through direct person-to-person contact and via fomites like towels and gym equipment. Impetigo typically presents in areas with broken skin, such as the face, extremities, and intertriginous areas, and can manifest in multiple locations. There are two main forms of impetigo: bullous and nonbullous. Clinical symptoms usually appear about 10 days post-colonization by the causative bacteria.

2.3.2 Cellulitis

Cellulitis is an infection of the dermis and subcutaneous tissue often caused by *Streptococcus pyogenes* or *Staphylococcus aureus*. It occurs when these bacteria enter the skin through breaks or fissures. Other strains, including Group B, C, or G beta-hemolytic streptococci, may also be implicated. Cellulitis commonly affects the arms, legs, and face, although it can appear on any part of the body. In cases of skin and soft tissue infections (SSTIs), *S. aureus* is frequently the most isolated organism. ⁽¹³⁾

2.3.3 Folliculitis

Folliculitis is indeed commonly caused by *Staphylococcus aureus*, including methicillin-resistant *Staphylococcus aureus* (MRSA). It often occurs when the skin is broken or irritated, which can happen through trauma or friction from close skin-to-skin contact during activities like wrestling, hockey, and football. Proper hygiene and care of the skin can help prevent outbreaks, especially in high-contact sports .

2.3.4 Staphylococcal Scalded Skin Syndrome

Staphylococcal scalded skin syndrome (SSSS) is primarily caused by *Staphylococcus aureus*, which produces two exfoliative toxins: ETA and ETB. These toxins lead to the separation of the epidermis, resulting in widespread blistering and skin peeling. SSSS is most commonly seen in newborns, infants, and immunocompromised adults, often following a localized staphylococcal infection. Prompt recognition and treatment are essential to prevent complications. ^(14,15) .

2.3.5 Erysipelas

Erysipelas is an acute skin infection primarily caused by beta-hemolytic *Streptococcus pyogenes*, with *Staphylococcus aureus* as a less common cause. It typically occurs after a breach in the skin, such as trauma, surgical incisions, insect bites, or stasis ulcers due to venous insufficiency. The infection manifests as a raised, well-defined red plaque, often seen on the legs or face. Symptoms include significant swelling, pain, and warmth in the affected area. Prompt medical treatment is important to manage the infection and prevent complications. ⁽¹⁶⁾ .

2.3.6 Necrotizing Infections

Necrotizing fasciitis is a severe soft tissue infection often caused by a single organism, such as *Streptococcus pyogenes* or *Staphylococcus aureus*. However, it is more frequently polymicrobial, involving both aerobic and anaerobic bacteria. Key risk factors include: Chronic liver disease Diabetes mellitus Recent varicella infection Injection drug use Penetrating injuries Burns Childbirth Recent surgery Muscle strain The condition most commonly affects the extremities, necessitating prompt medical intervention due to its rapid progression.. ⁽¹⁷⁾

2.4 BACTERIOLOGY

2.4.1 STAPHYLOCOCCUS AUREUS

Staphylococcus aureus is a Gram-positive, catalase-positive cocci from the *Staphylococcaceae* family, typically measuring 0.5 to 1.5 μm in diameter. These nonmotile, non-spore-forming, facultative anaerobes

often cluster in grape-like formations. Many strains produce various toxins, including staphylococcal enterotoxins, toxic shock syndrome toxin (TSST-1), and exfoliative toxins. *S. aureus* is part of the normal human flora, primarily residing in the nose and skin, and is commonly referred to as "golden staph." It can be distinguished from other similar genera, such as *Streptococcus*. When cultured on blood agar, *S. aureus* produces large, round, golden-yellow colonies, often exhibiting hemolysis. Reproduction occurs asexually through binary fission, resulting in daughter cells that remain attached, forming clusters. The catalase-positive nature of *S. aureus* allows it to break down hydrogen peroxide into water and oxygen, a feature that helps differentiate it from enterococci and streptococci. ^(18,19)

Historically, the coagulase test was used to distinguish *S. aureus* from other staphylococci, but it is now recognized that not all *S. aureus* strains are coagulase-positive, underscoring the need for accurate species identification for effective treatment and control. Additionally, *S. aureus* produces DNase, which degrades DNA, further aiding in its pathogenicity. ⁽¹⁹⁾

2.4.1.1 Methicillin resistant *Staphylococcus aureus* (MRSA) Methicillin-resistant *Staphylococcus aureus* (MRSA) is a significant global health threat. In the U.S. alone, the CDC reported that 2.3 million people were infected in 2007, resulting in approximately 19,000 deaths. The incidence of skin infections due to MRSA has been rising, with a notable increase in medical visits related to infectious skin diseases. MRSA infections typically present as red, swollen bumps and can escalate to severe conditions like necrotizing fasciitis, often referred to as "flesh-eating disease," which can rapidly destroy tissue and muscle. Addressing this growing concern requires heightened awareness and effective prevention strategies. ⁽²⁰⁾

2.4.1.1.1 Identification of CA- MRSA Susceptible Population

The studies conducted in Sacramento and Houston highlight the importance of identifying susceptible populations for effective MRSA prevention. In Sacramento, the focus was on adults over 18, revealing specific risk factors and patterns of community-associated MRSA (CA-MRSA) infections in this demographic over a seven-month period. In contrast, the Houston study concentrated on children under 18, analyzing a more extended timeframe of three years, which likely

provided insights into the evolving trends and incidence of CA-MRSA among pediatric patients. Both studies underscore the need for tailored prevention strategies that consider the unique characteristics of these populations, such as age-related health vulnerabilities and environmental factors, to effectively combat the spread of MRSA infections. Implementing targeted educational programs, hygiene practices, and screening protocols could significantly reduce infection rates in these high-risk groups. ⁽²¹⁾ .

2.4.1.1.2 Identification of HA-MRSA Susceptible Populations

The study from Sacramento highlights critical characteristics of patients susceptible to healthcare-associated MRSA (HA-MRSA) compared to community-associated MRSA (CA-MRSA). Notably, the average age of HA-MRSA patients was significantly higher (54 years) than that of CA-MRSA patients (22 years), with the majority of HA-MRSA infections occurring in those over 60.

Additionally, HA-MRSA patients had much longer hospital stays (mean of 21.4 days) than CA-MRSA patients. Despite similarities in gender, ethnicity, and insurance type where males, Caucasians, and those with public insurance were predominantly affected—there was a noteworthy difference in the socio-economic backgrounds of patients. For instance, a significant portion of CA-MRSA cases (49%) involved homeless injecting drug users, contrasting with only 19% in HA-MRSA cases. The pathogenic mechanisms also differ between CA-MRSA and HA-MRSA. Furthermore, *Staphylococcus aureus* secretes enterotoxins that act as superantigens, activating T cells and triggering a cytokine storm, further complicating the clinical picture. ⁽²³⁾

2.4.1.2 Vancomycin resistant *Staphylococcus aureus*

Vancomycin-resistant *Staphylococcus aureus* (VRSA) refers to strains of *Staphylococcus aureus* that have developed resistance to the antibiotic vancomycin. This resistance has become particularly concerning with the rise of methicillin-resistant *S. aureus* (MRSA), as vancomycin is often used to treat these infections. Three main categories of vancomycin resistance have emerged: Vancomycin-Intermediate *S. aureus* (VISA): First identified in Japan in 1996, VISA strains exhibit a thickened cell wall that limits vancomycin's effectiveness. Heterogeneous Vancomycin-Intermediate *S. aureus* (hVISA): These strains show variable resistance within a population,

making detection challenging. High-Level Vancomycin-Resistant *S. aureus* (VRSA): This type is rare and often results from the horizontal gene transfer of vancomycin resistance genes from *Enterococcus faecalis*, particularly the *vanA* gene, which was confirmed through PCR analysis.⁽²⁵⁾

2.4.2 *Staphylococcus epidermidis* Gram positive bacterium and one of the over 40 species belonging to the genus *Staphylococcus*. It is a catalase positive, coagulase negative, facultative anaerobe and is nonhemolytic on blood agar. Coagulase negative *Staphylococcus* (CNS) which is also termed as *Staphylococcus epidermidis* is a mainly important component of the normal skin flora. From the time of the early 1980s, *Staphylococcus epidermidis* has also emerged as an important pathogen.⁽²⁵⁾

2.4.3 *Staphylococcus haemolyticus* Gram positive coagulase-negative staphylococcus (CNS) and an opportunistic pathogen, second only to *S. epidermidis* in frequency of isolation. This bacterium is characterized as non-motile, non-sporulating, and facultatively anaerobic. Morphology: *S. haemolyticus* can be associated with various infections, particularly in immunocompromised patients or those with implanted medical devices. It is important to monitor for antibiotic resistance, as this strain can exhibit multidrug resistance.⁽²⁶⁾

2.4.4 *Streptococcus pyogenes* is a gram-positive bacterium responsible for Group A Streptococcal infections. It expresses the Group A antigen on its cell wall and typically produces large zones of beta-hemolysis on blood agar, indicating complete lysis of red blood cells. This characteristic, along with being catalase-negative, classifies it as Group A beta-hemolytic *Streptococcus* (GABHS). In ideal conditions, *S. pyogenes* thrives and can be cultured in a rich environment, such as blood agar, at temperatures around 35-37°C. It grows optimally in anaerobic or microaerophilic conditions and can cause various infections, including pharyngitis, impetigo, and more severe diseases like rheumatic fever and necrotizing fasciitis.⁽²⁷⁾

2.4.5 *Streptococcus pneumoniae* Gram-positive, alpha-hemolytic, aerotolerant anaerobe recognized as a significant human pathogen, particularly known for causing pneumonia. First identified as a major cause of pneumonia in the late 19th century, it is a focus of numerous studies on humoral immunity. *S. pneumoniae* commonly

resides asymptotically in the nasopharynx of healthy individuals, contributing to its role in respiratory infections. ⁽²⁸⁾

2.4.6 Streptococcus viridans are a group of alpha-hemolytic or nonhemolytic streptococcal bacteria that are commonly found as commensals in the human mouth and throat. Generally, their pathogenicity is low, but they can occasionally cause infections, particularly in individuals with compromised immune systems or underlying health conditions. To differentiate viridans streptococci from *Streptococcus pneumoniae*, the optochin sensitivity test is used: viridans streptococci are resistant to optochin, while *S. pneumoniae* is sensitive. Additionally, viridans streptococci lack the polysaccharide capsule that characterizes *S. pneumoniae*. ⁽²⁹⁾ .

2.4.7 Klebsiella is a genus of non-motile, Gram-negative, oxidase-negative, rod-shaped bacteria characterized by a prominent polysaccharide capsule. These organisms are significant human pathogens, commonly associated with pneumonia, urinary tract infections, and soft tissue infections. Additionally, *Klebsiella* species have been linked to the pathogenesis of ankylosing spondylitis and other spondyloarthritis conditions. Their ability to cause various infections highlights their importance in clinical microbiology and infectious disease. ⁽³⁰⁾

2.4.8 Proteus mirabilis *Proteus mirabilis* is a Gram-negative, rod-shaped bacterium commonly found in the human intestinal microflora. While it generally does not cause disease, it can become pathogenic when it enters the urinary tract and encounters urea, leading to urinary tract infections. These infections can potentially spread to other body parts, causing complications. ⁽³¹⁾

3.MATERIAL AND METHODS

3.1 Patients :

This study was conducted over a period of 10 months starting from March 2023 to August 2023 on 185 patients attending dermatology clinic in Benghzi the specimens were collected from infected skin from different sites including: scalp , face , axilla. upper limb ,lower limb ,and abdomen . the specimens were taken by sterile gloves and sterile swab i .e they were performed under sterile condition to oblige the incidence of contamination , there after cultured for bacterial growth and for antibiotic sensitivity

3.2 Sample collection

pus swabs collected from affected skin areas under aseptic condition were cultured & tested for antibiotic sensitivity .

3.3 Culture the specimen

Many types of bacterial growth media are used to culture bacteria in the laboratory . Bacteria grown in a laboratory environment , like captive animals in a zoo , need to have everything provided for them food , water , a suitable environment in order to survive and thrive . Several basic types of media are discussed below .

Types of Culture Media Used for Growing Bacteria

3.3.1 Blood agar (BAP) (Enriched medium) is widely used in medical bacteriology . The medium is prepared by adding sterile blood nutrient agar that has been melted and cooled 50 °C .

3.3.2 Chocolate agar (CHOC) or **chocolate blood agar (CBA)** (Enriched medium). It is a variant of the blood agar plate, containing red blood cells that have been lysed by slowly heating to 80 °C.

3.3.3 MacConkey agar : This is a medium for the cultivation of enterobacteria .

3.3.4 Mannitol Salt Agar : This medium is important in medical laboratories by distinguishing pathogenic microbes in a short period of time .

3.3.5 Müller Hinton agar is a microbiological growth medium that is commonly used for antibiotic susceptibility testing .

3.4 Examine the specimen microscopically

3.4.1 Gram stain

The Gram staining reaction is a crucial laboratory technique used to classify bacteria into two main groups: Gram-positive and Gram-negative.

3.5 Biochemical tests

3.5.1 Catalase test

Bacteria produce the enzyme catalase, it will break down hydrogen peroxide into water and oxygen, resulting in the formation of bubbles. This reaction helps differentiate catalase-positive bacteria, like staphylococci, from catalase-negative bacteria, such as streptococci.

3.5.2 Coagulase test

This test differentiates *Staphylococcus aureus* from other coagulase-negative staphylococci. In this test, plasma is mixed with a culture of the bacteria; if the bacteria produce coagulase, it will cause the plasma to clot, indicating a positive result for *Staphylococcus aureus*

3.5.3 DNAase test

This test is used to help in the identification of *S. aureus* which produces deoxyribonuclease (DNA-ase) enzymes

3.5.4 Citrate utilization test

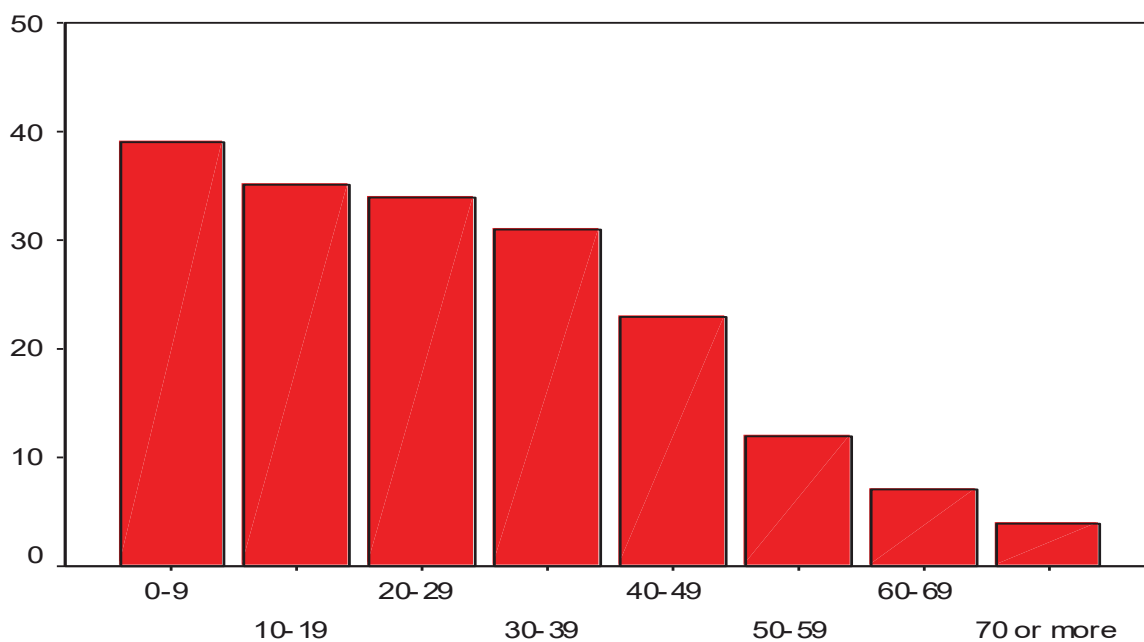
This test is one of several techniques used occasionally to assist in the identification of enterobacteria. The test is based on the ability of an organism to use citrate as its only source of carbon.

3.6 Susceptibility testing techniques :

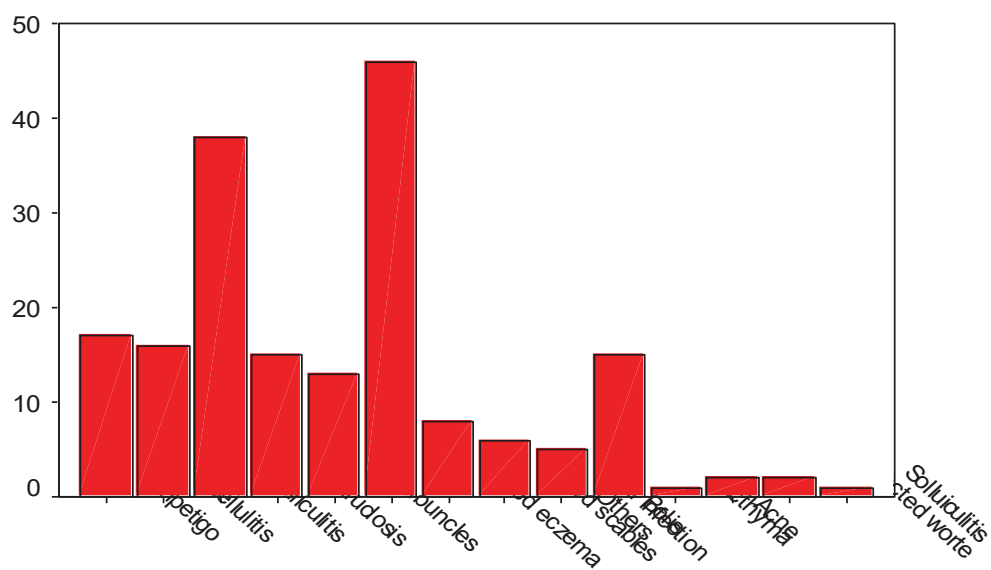
Disc diffusion susceptibility tests are a widely used method in laboratories to evaluate the antimicrobial susceptibility of bacteria. In this technique, a paper disc is saturated with a specific volume and concentration of an antimicrobial agent. This disc is then placed on an agar plate that has been evenly inoculated with the organism being tested. As the antimicrobial agent diffuses into the agar, it creates a concentration gradient. If the organism is susceptible, a clear zone of inhibition will appear around the disc, indicating that bacterial growth has been inhibited.

4. Results

Among 185 cases included in this study 96 patients (51.9%) were females and 89 patients (48.1%) were males. The greatest number of cases (39 patients) was seen. The age group from 0-9 years, followed by age group 10-19 years (35 patients), age group 20-29 years (34 patients) and age group 30-39 years (31 patients) (fig.1). The common clinical diagnosis seen in our study was infected eczema (24.9%), followed by impetigo contagiosa (9.2%). And one case ecthyma was caused by *Staphylococcus albus*, one case carbuncles. (Fig. 2,3,4,5,6) Amongst the total studied cases no culture growth was observed 22 cases (11.9%). The most common isolates bacteria from the culture growth was *Staphylococcus aureus* in 120 cases (64.9%) followed by *Staphylococcus albus* and *Streptococcus pyogenes* respectively. A rare isolates were observed including *Bacilli*, *Proteus mirabilis*, *Klebsiella pneumoniae*. And one isolate was *Staphylococcus haemolytic*.



(Figure .1)Age group distribution



(Figure. 2) Frequency clinical diagnosis of bacteria infection



(Figure .3) Infected eczema of the hands



(Figure .4) Impetigo of the face

(Figure .5) Ecthyma in the leg





(Figure .6) Carbuncle in the leg



Figure 7 *S. aureus*

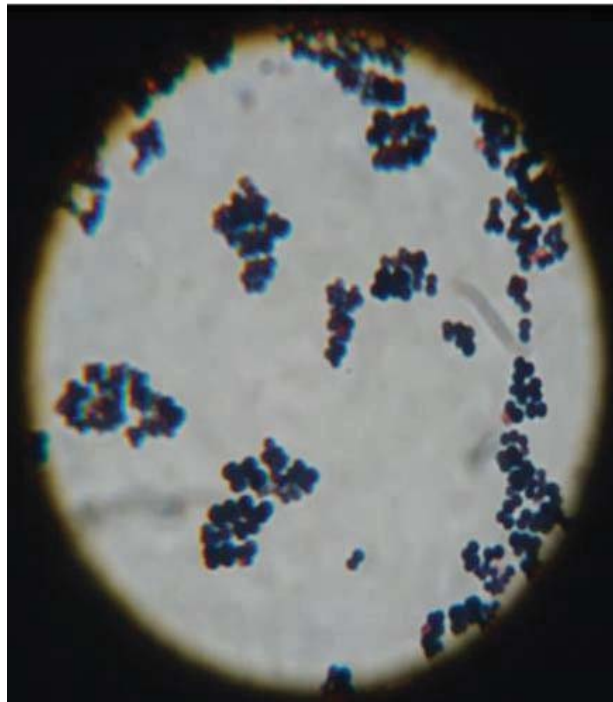


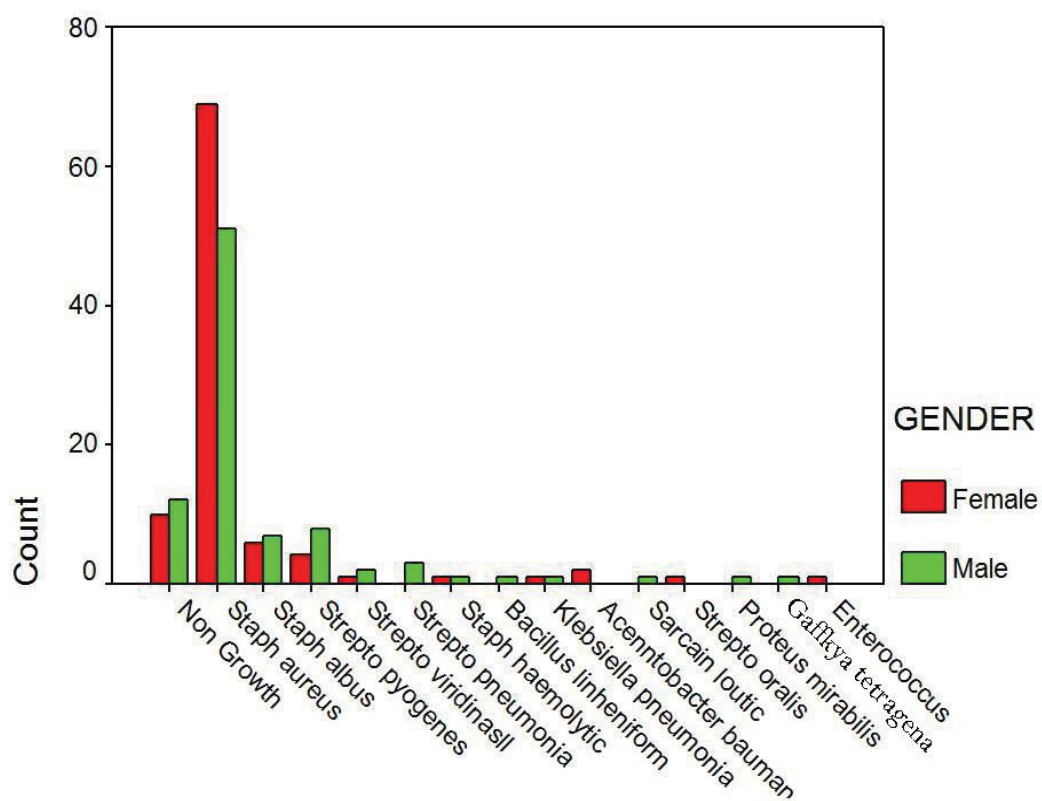
Figure 8 Gram-positive cocci.

(Figure. 9)Staph
albus on blood agar

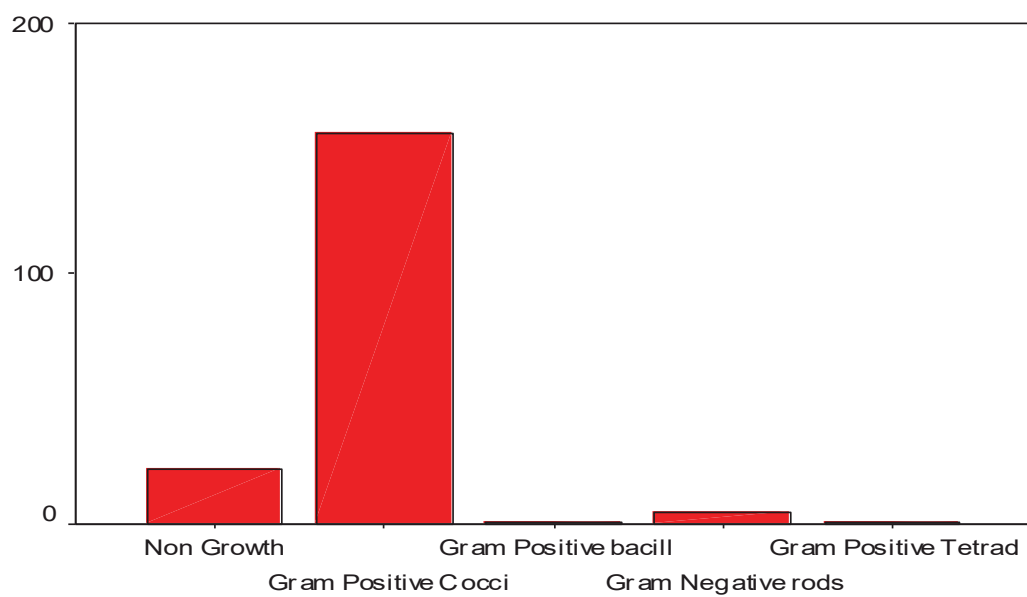




(Figure .10) streptococcus pyogenic



(Figure . 11)The distribution of bacteria species according gender



(Figure . 12) Identification of bacteria by Gram stain

(Figure . 13) Biochemical test

(Figure .13A)Catalase test





(Figure . 13) Coagulase test (b)



(Figure . 14) Disk shows antimicrobial susceptibility of staph aureus to different antibiotics , staph aureus was resistant to oxacillin , vancomycin , ampicillin , penicillin and augmentine and sensitive to ciprofloxacin , gentamycin and erythromycin .



(Figure 15) Culture of staph albus in this plates was sensitive to ciprofloxacin and chlorphenicol and surprisingly staph albus was resistant to oxacillin , vancomycin , ampicillin , penicillin ,erythromycin , clindamycin and augmentine

5. Discussion

Bacterial skin and soft tissue infections (SSTIs) are the most prevalent type of infectious skin disease, affecting various skin layers and structures. Complicated SSTIs lead to prolonged hospitalizations, increased healthcare costs, and contribute to antimicrobial resistance. (2) The majority of bacterial SSTIs are caused by gram-positive organisms. Gram-negative organisms, while less common, can also be responsible for these infections. ⁽⁵⁾ Cellulitis, impetigo, and folliculitis are indeed common bacterial skin infections encountered in primary care. Impetigo visits: 0.3% of 320,000 = about 960 visits. Folliculitis would also contribute to the overall statistics, although specific percentages weren't provided in your statement. These figures highlight the relevance of these conditions in family medicine, reflecting both the frequency of presentations and the need for appropriate diagnosis and management. ⁽³⁰⁾ The frequency of *Staphylococcus aureus* causing skin infection is more than *Staphylococcus epidermidis* ⁽³⁰⁾. Statistical analysis of the data showed that 72% of total isolated organisms from

skin infections were found to be *Staphylococcus aureus* while the remaining thirty three percent (33%) were *Staphylococcus epidermidis* ⁽³¹⁾. The previous study concluded similarity to our results *Staphylococcus aureus* was the commonest organism causing to skin infection and seen in 64.9% whereas *Staphylococcus albus* 7.0% of case . *Staphylococcus aureus* strains, 23.08% were found to be methicillin resistant *S.aureua* (MRSA) .This rate is almost similar to the study by Anandi et al (20.83%) ⁽³¹⁾ . However , all the isolates were sensitive to vancomycin and linezolid. The resistance shown to various antibiotics by MRSA was 67.3% to cotrimoxazole, 31.7% to gentamicin, 25.5% to ciprofloxacin, 23.2% to erythromycin, 22.4% to amoxicillin, and 19.5% cephalixin. Comparatively lower rate of resistance was seen in methicillin sensitive *S.aureua* (MRSA) .They showed 63.74% resistance to cotrimoxazole, 27.75% to gentamicin, 19.96% to ciprofloxacin, 19.88% to erythromycin, 15.7% to amoxicillin, and 14.78% to cephalixin, . Among *Staph aureus* strains in our study 60 (36.8%) were found to oxacillin resistant *staph aureus* .However same of isolates were vancomycin sensitive intermediate and resistant ⁽³²⁾ . The resistant to various antibiotic by (ORSA) was 53(32.5%) , Gentamycin 106(65.0%) . Comparatively the highest rate of sensitive was seen in (OSSA) . The showed Gentamycin (65.0%) , ciprofloxacin(66.3%) , erythromycin (62.0%).

6.CONCLUSIONS

- 1) Bacterial skin infections constitute a major health problem presented equally in both genders. The mean age was (years), majority of cases were seen at the between 10 years and 39 years and the common clinical diagnosis was infected eczema followed impetigo contagiosa.
- 2) There was no culture growth in 11.9% of cases. *Staphylococcus aureus* was the common isolated bacteria followed by *Staphylococcus albus* and *streptococcus pyogens*. A rare cultured isolates include *proteus mirabilis*, *klebsiella pneumonia* and *staphylococcus hemolytics*.
- 3) Lower extremities and hands were the common sites infected by *Staphylococcus* and the most common bacteria found in infected eczema and folliculitis. Recurrence the infection was recorded in 44.5%. and positive family history was recorded in

27% of cases. Infection with *S. Aureus* did not show significant difference between males and females.

- 4) Gram stain was positive in 84% of cases. Recurrence occurred in 40% of patients infected with Gram positive cocci. catalase, coagulase and DNase tests were positive in 120 cases. Gram positive tetrad, Gram positive and negative rods were reported.
- 5) High sensitivity of isolated bacteria to antibiotics was recorded to colistin, cefadrox followed by cephalotin, amikacin, ciprofloxacin, chloramphenicol, clindamycin, gentamycin and augmentin respectively (100% to 87.7%).
- 6) High resistance of the isolated bacteria to antibiotics was recorded against oxacillin (42.9%) and ampicillin (33.7 %), followed by erythromycin and vancomycin (16.6% each). Almost all cases of resistance was due to *staphylococcus aureus*.

7. RECOMMENDATIONS

- 1) Since resistance of *staphylococcus* against oxacillin and ampicillin is high among patients with superficial bacterial skin infection in hospital as well as out patient clinics, regular screening and full clinical and bacteriological examinations for the staff including doctors and nurses and workers.
- 2) Improving the health services through providing fully equipped laboratories with advanced techniques of culturing and identifying all types of bacteria in all hospitals and outpatient clinics.
- 3) Regular arrangement of education programmes to the community, patients, hospital staff and health workers regarding personal hygiene regular disinfection and use the protective and preventive measures in-order to keep the places, workers, patients and equipments clean and sterilized.
- 4) More advanced and in a large scale studies to be carried-out for detection of community- acquired MRSA and hospital-acquired MRSA infections in out- patient clinics and hospital .

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"Correlation of gestational hypertensive in Pregnant Women and ABO Blood Groups Types and Rh Factor"

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Abstract

gestational hypertensive is a widespread and important public health problem worldwide affecting a large portion of the population. While various risk factors have been implicated in the development of hypertension, including genetics, lifestyle, and hormonal changes, the role of ABO/Rh blood types in hypertension remains unexplored, especially at different stages of a woman's life. This research study aims to examine the possible relationship between ABO/Rh blood types and high blood pressure in pregnant women. This study was conducted over a period of three months on a diverse group of women between the ages of 19 to 50 years. The group included 282 women divided into groups (n-141) women suffering from high gestational hypertensive and (n-141) women who do not suffer from high blood pressure. Data were collected from the clinics and hospitals of Al-Khums, Al-Qarahbulli, Souk Al-Khamis and Masalta through clinical examinations and blood sample analyses. gestational hypertensive (GH) measurements and blood type typing were performed. Using standard medical procedures. Our results showed that there is a great difference in the average values of BP indicators between ABO/Rh blood types ($P>0.002$).

The ABO/Rh blood group system does not significantly affect blood pressure, and based on the conclusion of our study, there is no relationship between blood types and gestational hypertensive in pregnant women

Introduction:

1.1 Background of the Study:

Rodrigue et al,2017). stated that the system of ABO blood group is known as the identification of human body according to red blood cells inherited properties (erythrocytes) as seen by the existing or absence of

the antigens A and B which are carried on the surface of red blood cells. People might have type A, B, O or type AB blood (Rodrigue et al,2017).

The antigens of human ABO blood type show alternative phenotypes and genetically derived structures of glycoconjugate which found on the surface of red cells and have a dramatically role in cell physiology and pathology (Abdulganiyu, 2016).

Blood is classified into various blood groups depend on the existing or un existing antigens, or agglutinogens. The ABO blood group is distinguished by two glycolipid antigens, known A and B; based on whether the RBCs have none, only one, or both antigens, blood groups are characterized as type O, type A, type B, or type AB.. (Zakariya A, 2022)

gestational hypertensive (GH) is the pressure exercised by revolving blood contra the walls of blood vessels. The majority of this pressure comes from the heart pumping blood via the circulatory system. Once used without competence. Moreover, "blood pressure" could be defined as the pressure in the brachial artery, which is the most usually measured site. gestational hypertensive (GH) is typically described as the ratio of systolic pressure (the highest pressure through one heartbeat) to diastolic pressure (the minimum pressure between two heartbeats) in the cardiac cycle. It is stated in mercury millimeters (mmHg) over the surrounding the pressure of atmospheric, or in kilopascals (kPa). The difference among systolic and diastolic pressures is referred to as pulse pressure. (Homan TD, et. al. 2022) .

Hypertensive disorders in pregnancy are associated with increased risk of maternal, fetal, and neonatal morbidity and mortality. It is important to distinguish between pre-existing (chronic) hypertension and gestational hypertension, developing after 20 weeks of gestation and usually resolving within 6 weeks postpartum. There is a consensus that systolic gestational hypertensive ≥ 170 or diastolic gestational hypertensive ≥ 110 mmHg is an emergency and hospitalization is indicated. The selection of the antihypertensive drug and its route of administration depend on the expected time of delivery (Renata cifkova. 2023) .

1.2 Aim of the Study:

The relationship between ABO blood group and gestational hypertensive in pregnant women.

1.3 Materials and Methods:

In this study, the researchers took 141 sample pregnant women with gestational hypertension as cases, and 141 sample women with normal pregnancies without any complications were selected as controls. Only positive primary cases were included in the study. Subjects who had any other medical and surgical complications were excluded. Participants' age and hypertension status were obtained using structured questionnaires including questions regarding medical history, age, weight, height, blood group type, Rh factors, and gestational hypertensive measurement.

3.1 Center of Sample Collection:

The current study was conducted at Bin Nasser Al-Qarawi Hospital, Souq Al-Khamis General Hospital, Al-Mutawakkil Specialized Hospital in Al-Khoms, and Nour Al-Islam Clinic in Al-Qarabulli. From May 2024 to July. This study is a cross-sectional study and will focus on the relationship of blood types to high gestational hypertensive during pregnancy

3.2 Sample Collection:

The researchers collected blood samples and placed them in an EDTA anticoagulant tube. The blood type was determined by adding a drop of Anti A, Anti B and Anti D separately on a clean glass slide and to each of them a drop of blood was added. Using a separate tool, the serum was mixed well and the result was confirmed for ABO blood group and after two minutes for Rh blood group. Determination of BP measurements were taken using a standardized protocol. Subjects were asked to rest while seated for at least 5 minutes before measurements were recorded. Subsequently, the correctly sized cuff was placed on the right upper arm, and the BP was measured while the individual remained in a seated position. Systolic (SBP) and diastolic blood gestational hypertensive (GH) readings were measured using a digital BP monitor and a calibrated sphygmomanometer.

3.4 Data Analysis:

The data has been entered into the computer after coding; To perform the statistical operations required to analyze the data using the statistical program, the statistical packages for social sciences (SPSS) were used to answer the study questions at a significant level (0.05), which is an acceptable level in the social and human fields. Science in general, where sometimes we need to calculate some reliable indicators of the phenomenon in terms of the value at which the values are averaged or deducted, in terms of the degree of homogeneity of the values that the variable takes, so we need to provide some statistical measures through which we can determine the differences between

Study variables. Frequency distributions: to determine the number of frequencies, and the percentage of repetition of all study variables. Chi² test to determine differences between response ratios in non-ordinal measure

1.4 Results and Discussion:

4.1 The Pregnant Women Characteristics:

The main method used for the data collecting was the questionnaire which includes the information that related to the relationship between blood types and gestational hypertensive in pregnant women. The questionnaire contains common information and demographic characteristics of the patients targeted for this study, such as age, height and weight. In order to identify some characteristics of the study samples, particular characteristics for example height, weight and age were analyzed, and the following is a detailed presentation of these properties:

4.2- Distribution of Sample Individuals According to the Age:

Table (4.1): The repetitive distributions and percentage of the sample individuals on the basis of Age :

Age	Frequency	Percent
Less than 20 years	5	1.8
20 to less than 30 year	119	42.2
30 to less than 40 year	128	45.4
40 to less than 50 year	30	10.6
Total	282	100

The data set out in the above table relating the distribution of the sample individuals depending on age indicated that (1.8%) of the sample there age were less than 20 years, and (42.2%) of the sample were aged 20 to less than 30 years, and (45.4%) of the sample were aged 30 to less than 40 years and (10.6%) of the sample ranged in age from 40 to less than 50 years.

4.3- Distribution of Sample Individuals Based on Weight:

Table (4.2) : Repetitive distribution and percentage of the sample individuals on the basis of weight:

weight	No.	Percentage
--------	-----	------------

40 to less than 60 kg	42	14.9
60 to less than 80 kg	160	56.7
80 to less than 100 kg	74	41.5
100 kg and more	6	0.7
Total	282	100.0

The data set out in the above table , regarding the distribution of the samples individuals on the basis of weight, It was found that (14.9%), weighed from 40 to less than 60 kg , and (56.7%) of the patients weighed from 60 to less than 80 kg, While (41.5%) of the patients weighed from 80 to less than 100 kg, and (0.7%) who weighed 100 kg and more.

4.4- Distribution of Sample Individuals Based on Height:

Table (4.3) : Repetitive distribution and percentage of the sample individuals on the basis of height:

Height	No.	Percentage
140 to less than 150 cm	5	1.8
150 to less than 160 cm	117	41.5
160 to less than 170 cm	117	41.5
170 to less than 180 cm	41	14.5
180 cm and more	2	0.7
Total	282	100.0

From the data shown in the table above, with regard to the distribution of sample individuals based on height, it was found that (1.8%) their heights ranged from 140 to less than 150 cm, and (41.5%) their heights ranged from 150 to less than 160 cm, also (41.5%) their height ranged from 160 to less than 170 cm, while (14.5%) their height ranged from 170 to less than 180 cm and (0.7%) their height was more than 180 cm.

4.5- Distribution of Sample Individuals Based on Blood Types:

Table (4.4) : Repetitive distribution and percentage of the sample individuals on the basis of blood type:

Blood type	No.	Percentage
A+	64	22.7
A-	8	2.8
B+	45	16
B-	10	3.5
O+	106	37.6

O-	22	7.8
AB+	20	7.1
AB-	7	2.5
Total	282	100.0

From Table No. (4), it was shown that (22.7%) there blood type was A+, while (2.8%) there blood type was A-, while (16%) had blood type B+, (3.5%) had blood type B-, and (37.6%) The blood type was O+, (7.8%) was the blood type O-, (7.1%) was the blood type AB+, and (2.5%) was the blood type AB-.

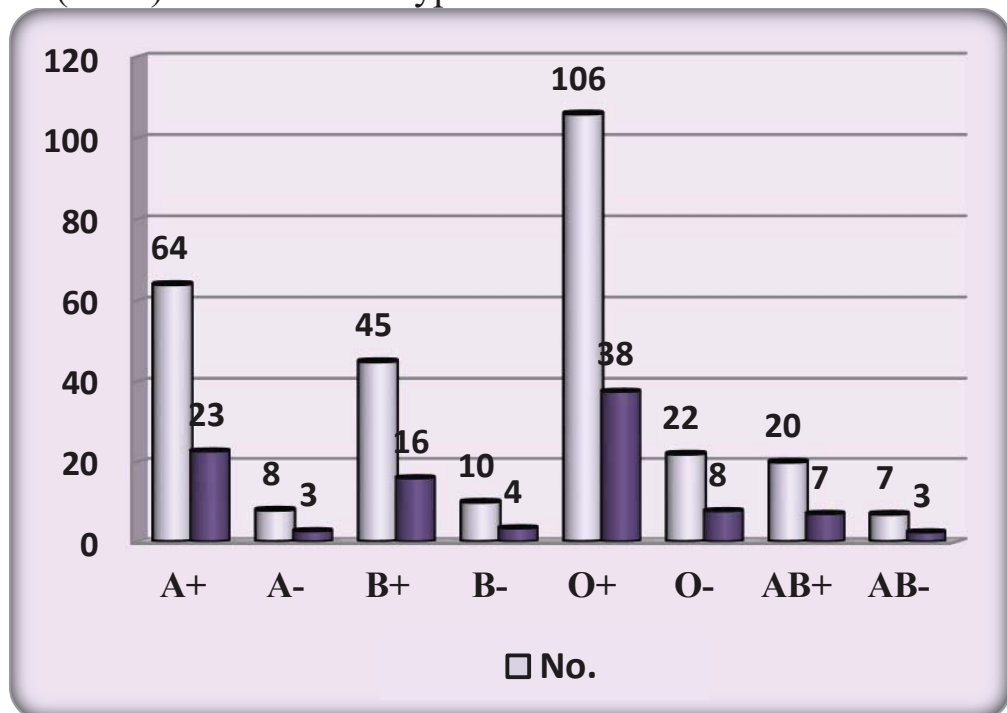


Figure (4.1) Repetitive Distribution and percentage of sample individuals based on blood type

4.6- Distribution of Sample Individuals Based on gestational hypertensive (GH):

Table (4.5) : Repetitive distribution and percentage of the sample individuals on the basis of gestational hypertensive (GH):

gestational hypertensive (GH)	No.	Percentage
Normal	141	50
Abnormal	141	50
Total	282	100.0

From Figure No. (5) it was found that (50%) of pregnant women do not suffer from gestational hypertensive (GH), and the same percentage (50%) of pregnant women suffer from blood pressure.

4.7-The Relationship Between Blood Type and gestational hypertensive (GH) in Pregnant Women:

From Table No. (4.6), it was shown that the calculated chi-square value was (9.456), which was less than its tabulated value (14.07). This indicates that there wasn't relationship between blood type and gestational hypertensive (GH) in pregnant women, and this is reinforced by the statistical significance value (p-value), which was (0.222), which was greater than 0.05 and confirms that there wasn't relationship between blood type and gestational hypertensive (GH) in pregnant women.

Table (4.6) shows the chi-square test to determine the relationship between blood type and blood pressure

			blood pressure		Total	P-value
			Normal	abnormal		
blood type	A+	No.	35	29	64	0.222
		Percentage (%)	54.7%	45.3%	100.0%	
	A-	No.	5	3	8	
		Percentage (%)	62.5%	37.5%	100.0%	
	B+	No.	20	25	45	
		Percentage (%)	44.4%	55.6%	100.0%	
	B-	No.	5	5	10	
		Percentage (%)	50.0%	50.0%	100.0%	
	O+	No.	56	50	106	
		Percentage (%)	52.8%	47.2%	100.0%	
	O-	No.	13	9	22	
		Percentage (%)	59.1%	40.9%	100.0%	
	AB+	No.	6	14	20	

		Percentage (%)	30.0%	70.0%	100.0 %	
	AB-	No.	1	6	7	
		Percentage (%)	14.3%	85.7%	100.0 %	
Total		No.	141	141	282	
		Percentage (%)	50.0%	50.0%	100.0 %	

Calculated value = 9.456 Degrees of freedom = 7 Tabular value = 14.07

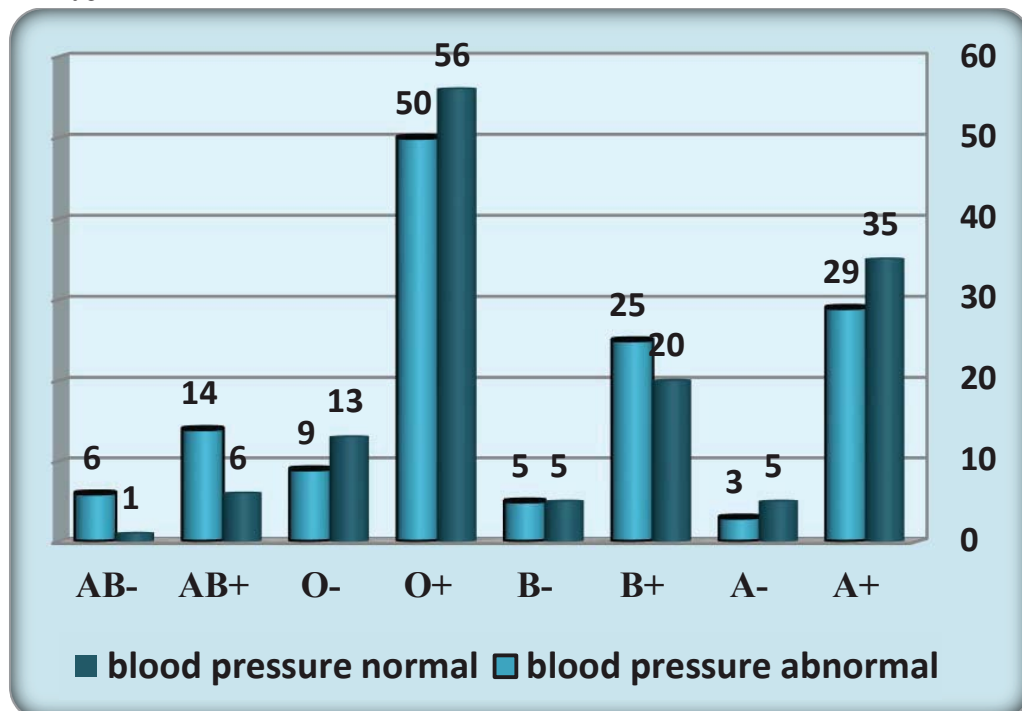


Figure (4.2) The relationship between blood type and blood pressure

There wasn't relationship between blood type and gestational hypertensive (GH) in pregnant women, and this was confirmed by the statistical significance (0.222), which was greater than 0.05. As illustrated In the table (4.6) The consequences demonstrated that the majority of pregnant women (37.6%) with blood type O⁺, (22.7%) had blood type A⁺, and (16%) had blood type B⁺. Also, The results showed that the majority of pregnant women with gestational hypertensive (GH) were of the blood type (AB-) which reached (85.7%), and the

blood type (AB+), which reached (70%). Finally, The results showed that the lowest percentage of pregnant women with gestational hypertensive (GH) were blood type (A-), which reached (37.5%), and blood type (O-), which reached (40.9%)

2 Discussions:

study evaluated the correlation between ABO blood types and gestational hypertension among 284 women from 20 weeks to 40 weeks where half of them were hypertensive and the others half were normotensive. The results of the study were that the index between blood types and gestational hypertensive was 0.222, which points that there is no correlation between gestational hypertensive and ABO blood type. The ages of the women participating in this research ranged, with the largest number of participants being between 30 and less than 40 years of age (45.4%), followed by those between 20 and less than 30 years of age (42.2%). Among those aged 40 to less than 50 years (10.6%), the smallest number of participants was under 20 years of age (1.8%)

ABO phenotypes frequency in women with the disease is comparable to that in pregnant women with typical gestational hypertensive. Blood type AB had the greatest risk of developing high gestational hypertensive among study participants (85.7%) for cases and controls, respectively), while blood type A had the lowest risk of developing high gestational hypertensive(37.5%)

In India, there results wear agreement with our study, which are showed that blood type O is less susceptible to gestational hypertension, while types A, B, and AB are more susceptible to PIH, while no relationship was found between ABO blood types and blood pressure. Blood during pregnancy. (Vasatha N, et al.2016).

Another study conducted by (Huda J, 2015), she found that blood group O was more main blood group with hypertensive patients & no significant difference was founded among sex difference in hypertensive patients which wear disagreement with our study.

In Australia, the study showed that it is linked to many factors such as genetic issues, competition and the existing living environment. The micro type blood group high risk of hypertensive disorders might be useful clinically. Furthermore, It could play a critical role in defending and restorative the role of maternal and neonatal in addition to the management of pregnancy.. Preeclampsia, a condition that

accompanies human pregnancy and a major cause of maternal and fetal morbidity and mortality, is also linked to the mother's blood type. Pregnant women with type AB blood have raised risk of severe and early intrauterine growth restriction (IUGR) associated with preeclampsia (Mark A, et al. 2018)

A study conducted in Nigeria was inconsistent with our study, which revealed that patients with blood type AB are at a higher risk of developing gestational hypertension, while those with blood type A have a lower risk of developing gestational hypertension. However, an association between ABO blood groups and gestational hypertensive (GH) in pregnant women was found but not statistically significant. (Ahmed Q, et al. 2023), in China, women diagnosed with group AB face an increased risk of developing gestational hypertension (CHEN Q, et al. 2022).

In Ireland, the study, which does not agree with our study, revealed that its results are related to age and was able to find evidence that the ABO blood group is more susceptible to developing high gestational hypertensive (Lisa C, et al. 2021).

In another study, it was found that blood type A is significantly associated with high gestational hypertensive disorders during pregnancy. However, the Incidence of gestational hypertension reaches a maximum with blood type O, while the incidence of preeclampsia and eclampsia is higher in individuals with blood type A. The role of Blood types in hypertensive disorders during pregnancy are statistically significant (Prasanna P, 2015).

Also, another study in India, the results of a study showed that blood type B has the highest tendency to obesity, while blood type AB has the lowest chance of developing high gestational hypertensive and obesity (Pawan, et al. 2021).

The results of a study in the city of Damietta showed that there is a positive relationship between the ABO type and high gestational hypertensive induced during pregnancy, and a negative relationship between the Rh factor and high gestational hypertensive, especially with group B. It showed that the highest percentage of A and the lowest percentage of O are for PIH, while the association with preeclampsia is higher in O and B positive blood types (Aziza M, et al. 2023).

Conclusion:

Knowledge of the ABO system is also important in blood transfusion medicine and tissue transplantation and plays an important role in medical-legal cases. Many diseases have been reported to be associated with different types of ABO system. The results of this study indicate that there is no relationship between blood types and gestational hypertensive in pregnant women, and this was confirmed by statistical significance (0.222) greater than (0.05). It was also found that the highest percentage of pregnant women with gestational hypertensive were blood types AB-, AB+, and the lowest percentage were blood types -A-, O. Further research is needed to clarify the relationship between blood types and the risk of developing hypertension.

Recommendations:

Holding cultural conferences in order to raise the level of health awareness for all segments of society regarding pregnancy-related complications to ensure reducing the risks of pregnancy. Rely on sports and keep the body active, and consult a doctor about permissible physical activity.

It is necessary to adhere to a healthy diet, and consult a nutritionist when additional assistance is needed. Eat fresh foods instead of processed foods to control high Blood pressure (GH).

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Cesarean section prevalence in Al Gemil hospital: A twelve years review

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Keywords: Cesarean section, Al Gemil , indication, Libya, pregnancy, prevalence

Abstract

Background: Cesarean section is a surgical operation used to protect mother and child, when a vaginal delivery is not possible. The global incidence of cesarean sections is increasing; yet, this may lead to a large rise in morbidity and mortality rates for mothers and newborns. The purpose of this study was to ascertain the prevalence and trends of cesarean sections in Al-Gemil Hospital, Al-Gemil, Libya over the previous twelve years.

Methods, The Department of Obstetrics and Gynecology at Al-Gemil Hospital, the only referral facility in Libya's far west, carried out a retrospective review of its medical notes and records, the medical files of every female who delivered a child at Al-Gemil Hospital were taken from first of January , 2012, until December 31, 2023. Trained data collectors gathered information with a standardized paper form before inputting it into an electronic database. Data analysis was performed using SPSS software version 24.

Results: The overall rate of C-section in Al-Gemil city from 2012 to 2023 was as high as 36.8%. The rates of C-sections varied significantly over the years, with a substantial rise from 30% in 2012 to 55% in 2023. The age of mothers who deliver by C-section ranged from 15 to 48 years with mean $\pm$ SD age of 32.4 ± 5.16 years. The most common documented indications were elective repeated C-section (22%), followed by patient's request (18%) and fetal distress with other causes (16%).

Conclusion: The rate of cesarean section deliveries at Al-Gemil Hospital is experiencing a notable upward trend. Currently, the overall

cesarean section rate at Al-Gemil Hospital stands at 36.8%, which exceeds the standards set by the World Health Organization

Introduction

Cesarean section is a surgical operation advised in circumstances where normal vaginal delivery may endanger the mother, the infant, or both^{1,2}. The ideal C-section rate for a nation should fall between 5% and 15%, according to recommendations from the Pan American Health Organization and the World Health Organization (WHO).² On the other hand, both wealthy and developing nations are seeing an increase in the frequency of cesarean sections³. Such circumstances include fetal distress, prolonged or obstructed labor, hypertension or diabetes, multiple gestations, or atypical fetal presentation/position, among others.^{1,3} This surgical technique has been performed for many years, either on a scheduled or emergency basis, due to its demonstrated advantages. When applied according to the right guidelines, CS greatly lowers maternal and newborn morbidity and death; nevertheless, If not applied properly, it can pose risks to both the mother and the child.^{4,5} Currently, not all cesarean sections (CS) are performed for medical reasons, as there is a notable increase in non-medically indicated cesarean deliveries, including those conducted at the request of the mother.^{3,6-8} Several non-medical factors have been identified as contributing to this significant rise in CS rates. These factors include increased requests from mothers due to anxiety or fear of pain associated with a typical vaginal delivery (NVD), as well as the desire to have the birth scheduled for a specific date⁹, the preferences and convenience of physicians, along with financial incentives for both physicians and hospitals, contribute to the elevated rates of cesarean sections (CS) compared to normal vaginal deliveries (NVD)¹⁰⁻¹⁴ This phenomenon is particularly pronounced in private hospitals as opposed to public ones. Various socio-cultural and religious factors have been identified that both promote and discourage cesarean deliveries upon maternal request in certain communities¹⁵⁻¹⁷. Additionally, the apprehension regarding potential legal consequences and litigation arising from adverse outcomes associated with NVD is a significant factor influencing clinicians' decisions to perform for CS as a protective measure, thereby leading to an increase in cesarean deliveries^{15, 18-20}. Concerns over a potential rise in cesarean sections have been raised by the inadequate oversight and control of the health industry by the

government. Therefore, determining the frequency of cesarean sections and their indications can aid in developing methods that will lower the rate of cesarean sections. The objective of this article is to illuminate the general public and pertinent stakeholders regarding the prevalence of C-sections and their common indications at Al-Gemil Hospital in Al-Gemil, Libya, thereby enhancing awareness, particularly among the general populace and healthcare professionals.

Materials and methods

Within the Obstetrics & Gynecology Department at Al-Gemil Hospital, the sole referral hospital in the far west of Libya carried out a retrospective review of medical notes and records. At first, the medical files of every female who delivered a child at Al-Gemil Hospital were taken from January 1, 2012, until December 31, 2023. Trained data collectors gathered information with a standardized paper form before inputting the information was transferred into an electronic database. Routine consistency checks were conducted to ensure that any missing data were identified by the data collector and subsequently recorded in the electronic database. A spread sheet for collecting data was created in the Excel for the study, which included information on age, obstetric history, maternal outcome, and neonatal outcome. Neonatal results, including gestational age, baby's gender, birth weight, and perinatal mortality, were also recorded.

Statistical analysis

The data acquired in the Excel sheet were subsequently imported into SPSS software version 24 for analysis. For all variables, descriptive statistics such as percentages, means, ranges, and standard deviations (SDs) were calculated.

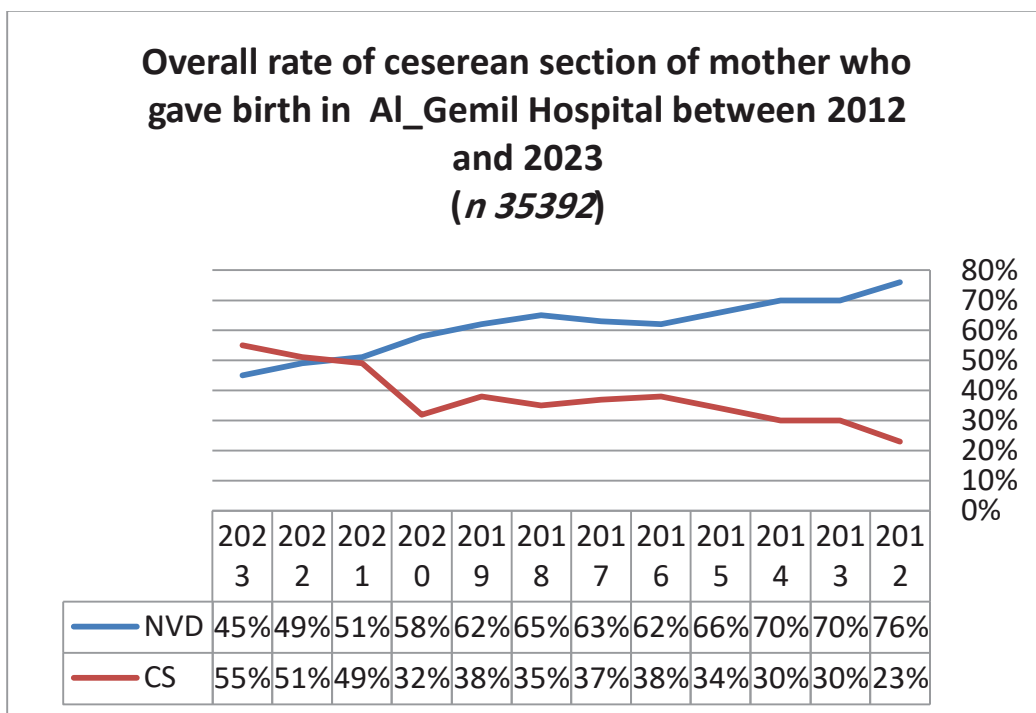
Result

As can be seen in table 1, from 2012 to 2023, 35392 mothers delivered in the Al-Gemil Hospital in Al-Gemil city; of these, 13037 had a C-section, meaning that the overall C-section rate in Al-Gemil from 2012 to 2023 was 36.8%. Furthermore, there was a significant variation in C-section rates over time, with a sharp rise from 30% in 2012 to 55% in 202 [figure 1].

Table 1 shows the number of CS and the total number of the deliveries (CS & NSD)

Year	No of CS	Total No of deliveries
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2012	769	3249
2013	1216	4080
2014	1077	3577
2015	1170	3458
2016	1348	3640
2017	1169	3167
2018	964	2770
2019	915	2427
2020	960	2296
2021	1020	2118
2022	1318	2569
2023	1111	2041
TOTAL	13037	35392



The age distribution of mothers who underwent C-section for child birth ranges from 15 to 48 years with mean $\pm$ SD age of 32.4 ± 5.16 years. The largest groups of mothers who give a child by this type of delivery were found within the 20–30 and 30–40 years' age group, accounting for 6143 mothers (46%) and 6183 mothers (46.3%)

respectively. Most mothers who deliver via C-section are multigravidas.

of which 5815 (44.6%) having between 1 and 3 pregnancies and 3833 (29.4%) were grandmultigravida [Table 2].

Table 2: Age and the obstetrics history of mothers who had cesarean section in Al-Gemil hospital (n=3560)

	Variables	n° (%)
Age (years)	< 20	326 (2.5%)
	20–30	6167 (47.3 %)
	30–40	5958 (45.7%)
	> 40	587 (4.5 %)
Gravidity	Primigravidae	3390 (26%)
	Multigravida	5815 (44.6%)
	Grandmultigravida	3833 (29.4%)

The outcome of birth was one of the variables examined in this study, with a significant proportion of the fetuses being delivered via C-section (96.4%) were single and 3.6% were twins fetus. As can be seen in the table 2 the mortality rate among newborn babies in this period of time was 1.5% [Table 3]

Table 3: Newborn among mothers having baby by cesarean in Al-Gemill hospital in Al-Gemill (n=13037)

	Variables	n (%)
Gender	Boy	6414 (49.2%)
	Girl	6623(49.8%)
Fetal outcome	Live	12842 (98.5%)
	Died	196 (1.5%)
Number of Babies	Single	12569 (96.4%)
	Twins	468(3.6%)

Unfortunately, the indications of the c. sections were not always written in the files (37%), The most common documented indications were elective repeated C-section (22%), followed by patients request (18%) and fetal distress with other causes (16%) [Table 4].

Table 4: Indications of cesarean section of mothers who gave a birth by cesarean in Al-Gemil hospital in Al-Gemil (*n*=13037)

Indication	Frequency %(<i>n</i>)
Previous CS	22% (2868)
Patient request	18% (2347)
Not registered	37% (4824)
Postdate	3% (291)
Oligohydraminase	1% (130)
Malpresentation and malposition	2% (260)
Cephalopelvic disproportion	1% (130)
Fetal distress	7% (913)
Hypertensive disorders	3% (391)
Infertility	2% (261)
Others	4% (521)

Discussion

This study has distinctly highlighted the elevated rates of cesarean section deliveries in Al-Gemil, and it is anticipated that these trends will continue. The cesarean section rates have risen markedly from approximately 23% in 2012 to 55% in 2023, exceeding the World Health Organization's recommended acceptable range of 10% to 15%⁶. This notable increase is similar with findings from various national and international studies. For instance, Ba'aqeel²³ reported that between 1997 and 2006, the cesarean section delivery rate in Saudi Arabia increased from 10.6% to 19.1%. Additionally, a publication from China documented a dramatic rise in cesarean section rates from 3.4% to 39.3% between 1988 and 2008²⁴. A similar trend has also been observed in developed countries such as USA²⁵ and Australia.²⁶ In this study, The largest groups of mothers who give a child by CS were found within the 20–30 and 30–40 years' age group, accounting for 6143 mothers (46%) and 6183 mothers (46.3%) respectively.

Nonetheless, there is insufficient data regarding the C-section rate across all Libyan cities due to the absence of national registration systems. In our study CS rate in 2012 was equal to CS estimation in

Derna 23%²⁷. In contrast, in 2023, the CS rate considerably increased to 55%, but it was still lower than the 70% rate recorded in Zawia Medical Center in 2022.²⁸ with this rise in the CS rate, mothers and children will undoubtedly suffer from the resulting consequences. However, the CS rates that are lower than necessary may also be linked to more unfavorable results for mothers and their infants. Numerous studies demonstrate the increased morbidity and mortality linked to vaginal birth in moms who are considered high-risk due to factors including atypical presentations.^{14–16, 29}. The key is to optimizing healthcare the distinction between mothers qualifying for CS from those who are low-risk. It is imperative that healthcare professionals adhere to guidelines precisely.

Libyan policies have mostly concentrated on physician training, with midwives' roles in maternal care being largely overlooked. Standardizing personnel distribution based on local needs and training level is critical for resource optimization, and we advocate making it a national priority. Furthermore, the media can have a significant impact on the general population's view and play a vital part in the dissemination of an acceptable culture and attitude toward pregnancy and reproductive health.

In conclusion, it is undeniable fact that there is a rise in CS delivery rates in our practice which is now becoming an epidemic. More thorough research is required to determine the precise scope of this trend and the underlying causes, and prompt, effective national solutions are required.

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Effect of wet cupping on liver function tests and renal function tests

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Abstract:

Cupping therapy is currently widely done in many nations across the world. The exact origin of cupping therapy is a subject of contention. Cupping is a simple application and safe; Each cupping session takes about 20 min. This prospective study carried in High Institute of Medical Science and Technologies / El Marj; it's initiated in 3/June/ 2024 and Ended in 29/ August/2024, performed on 7 cases; all volunteers are adult males healthy individuals. the principle of this research based on comparing biochemical tests (LFT and RFT) and some hematological CBC parameters with each volunteers participate in this study; where blood collected via vein puncture in EDTA for hematology assay and plain tube for biochemical assay; this process performed two times with each volunteer; first time one day before cupping and the second blood collection one day after cupping.

In this study; remarkable increase seen in total numbers of white blood cells (WBCs) in all subject with exception subject 6,7. The number of Lymphocytes in percentage were notable increase seen in all cases with exception with subject 1 were lymphocytes weighty decreased observed. Change of Granular cells in percentage after cupping were increased in 3 subjects significantly. the number of platelets elevated in five cases; while the another two cases the range of change were slightly increased. MPV similar in that of platelets count.

In biochemical tests; No significant change observed in Liver enzymes and renal function tests; results fluctuate some are equal in others slightly increased or decreased.

Introduction:

Cupping therapy (dry cupping therapy) is a simple process in which sucking cups apply negative pressure to the skin [1]. The literature describes several types of cupping therapy, including dry cupping

therapy, wet cupping therapy, medicinal cupping therapy, moving cupping therapy, and others [2]. Al-hijamah (a wet cupping therapy procedure used in prophetic medicine) appears to be the most important type.

Cupping therapy is legally done in hospitals in China [3] and is well known in certain European countries [4,5]. The current approaches for cupping therapy change depending on the type of cupping therapy, for example, the dry cupping method differs from the medicinal cupping method.

Today, cupping therapy is done in numerous nations all over the world, including Germany, Norway, Denmark, Saudi Arabia, Egypt, India, China, and others. [6]

The Arab civilization referred to cupping therapy as Al-hijamah therapy, meaning "to restore to the original size." The Assyrians were the first to use crude implements like animal horns and bamboo wood for cupping therapy.[7] Cupping therapy was said to have been practiced by ancient Egyptians before many other ancient civilizations, and it was one of the oldest known medical procedures in Egypt. [6]

Wet cupping therapy is an artificial surgical excretory method that removes blood and interstitial fluids from CPS. It opens the skin barrier, stimulates natural excretory activities of the skin, boosts immunity, and increases filtration.

A brief description of cupping technique:

Cupping is a simple application of quick, vigorous, rhythmical strokes to stimulate muscles and is particularly helpful in the treatment of aches and pains associated with various diseases. Thus, cupping carries the potential to enhance the quality of life.[8]

Each cupping session takes about 20 min and could be conducted in five steps. The first step includes primary suction. In this phase, the therapist allocates specific points or areas for cupping and disinfects the area. A cup with a suitable size is placed on the selected site and the therapist suck the air inside the cup by flame, electrical or manual suction. Then the cup is applied to the skin and left for a period of three to 5 min. The second step is about scarification or puncturing. Superficial incisions are made on the skin using Surgical Scalpel Blade or puncturing with a needle, auto-lancing device or a plum-blossom needle.[15] The third step is about suction and bloodletting. The cup is placed back on the skin using the similar procedure described above for

three to 5 min. The fourth step includes the removal of the cup, followed by the fifth step which includes dressing the area after cleaning and disinfecting with FDA approved skin disinfectant. Furthermore, suitable sizes of adhesive strips are then applied to the scarified area, which remain there for 48 h.[9] It is wise to know that the suction and scarification are the two main techniques of wet cupping therapy. Each technique of cupping might be responsible for certain changes at the level of body cells, tissues or organs. Specific interventions could enhance or suppress body hormones, or it might stimulate or modulate immunity, or it may get rid of harmful substances from the body, and eventually it might ease the pain.

Side Effects:

Cupping is fairly safe, as long as practiced by a well-trained health professional. But may these side effects in the area where the cups touch your skin:

- Mild discomfort
- Burns
- Bruises
- **Skin infection**

If the cups and equipment become contaminated with blood and are not sterilized correctly between patients, blood borne diseases such as hepatitis B and C can be spread.

Claimed uses:

Cupping practitioners use cupping therapy for a wide array of medical conditions including fevers, pain, poor appetite, indigestion, high blood pressure, acne, atopic dermatitis, psoriasis, anemia, stroke rehabilitation, nasal congestion, infertility, and dysmenorrhea.[1] There is low to moderate evidence that cupping can reduce pain associated with musculoskeletal pain and myofascial pain syndrome, although the benefits may be indistinguishable from those of a placebo.[10] In a recent Harvard medical school investigation on juvenile patients suffering from persistent severe pain, the authors found that cupping and acupuncture treatments were both enjoyable and effective for pain relief [11].

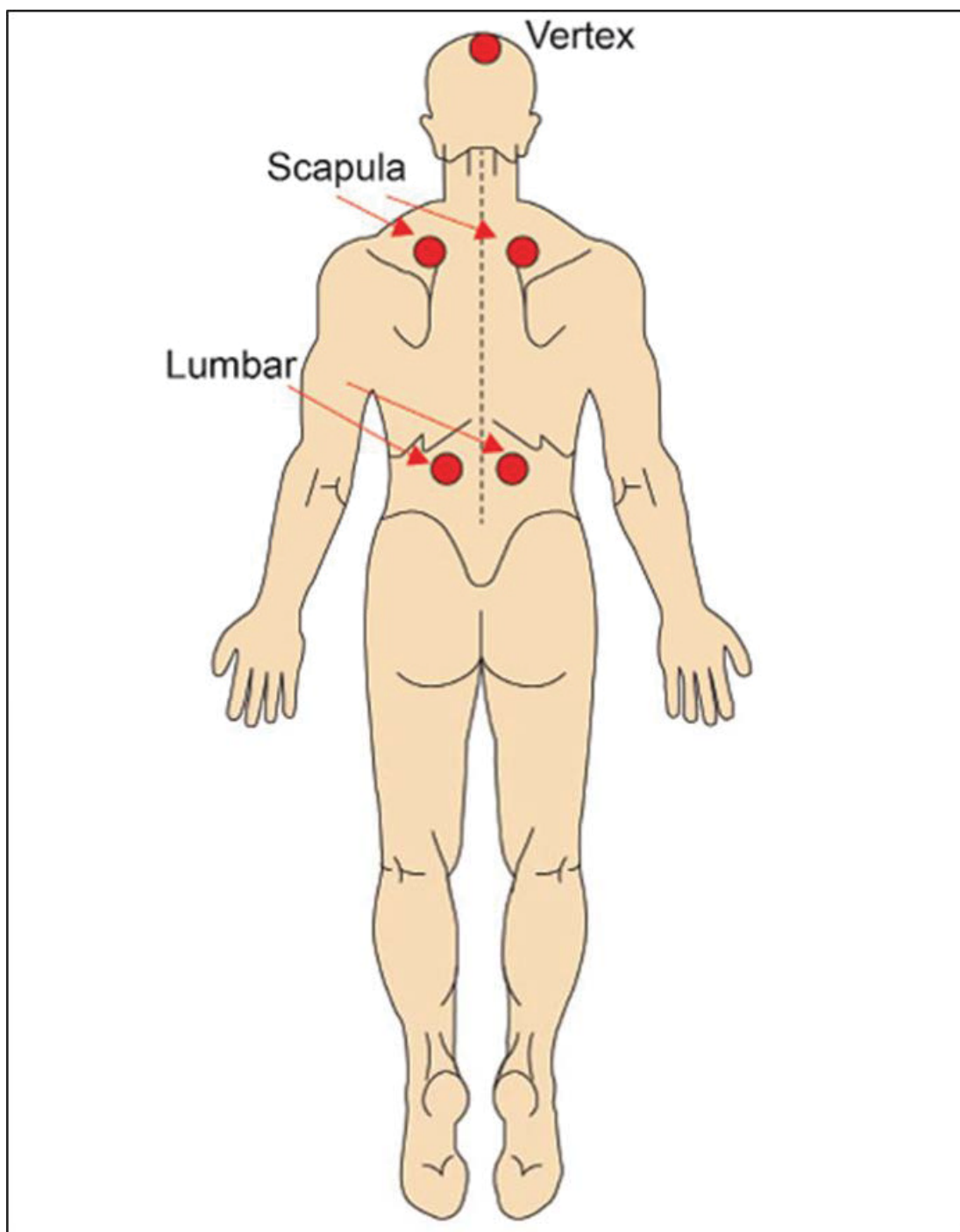


Figure 1: shows the five points of the posterior neck and bilateral perispinal areas of the neck and thoracic spine used for cupping.

Materials and Methods

This prospective study carried in High Institute of Medical Science and Technologies / El Marj; it's initiated in 3/June/ 2024 and Ended in 29/August/2024, performed on 7 cases; all volunteers are adult males healthy individuals. Consent form taken from all volunteers and research ethics applied as far as possible.

the principle of this research based on comparing biochemical tests (LFT and RFT) and some hematological CBC parameters with each volunteers participate in this study; where blood collected via vein puncture in EDTA for hematology assay and plain tube for biochemical assay; this process performed two times with each volunteer; first time one day before cupping and the second blood collection done one day after cupping.

All tests will done in private sector medical laboratories and the procedure of wet cupping performed by individuals practice fire cupping in their centers.

Results ranked in tables for each subject separately and observing the range of change in hematological and biochemical tests. The range of change will expressed according to the change using arrows that indicate to increase or decrease of the test.

Hematological tests that taken in concern in this study include complete blood count (CBC) which composed of WBC and RBCs count, Lymphocytes in %, Granular leukocytes in %, Hemoglobin (HB), hematocrit (HCT), platelets count and mean platelets volume (MPV). While; biochemical test include blood glucose level , Liver function tests (LFT) which are: Alkaline phosphatase (ALP), glutamic – oxaloacetic transaminase (GOT), glutamic- pyruvate transaminase (GPT); While Renal function test (RFT) includes urea, creatinine and serum electrolytes.

Results

These tables below summarizing the obtained result for each volunteers one day prior procedure of wet cupping and the test results after one day of cupping procedure. The fourth column in the tables gives the range of change that expressed by using arrows 1,2,3,or 4 according to the change in the results.

Table 1 :illustrate hematological finding in subject 1; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
WBCs count x 10 ⁹ /L	6.4	7.4	↑↑↑
Lymphocytes %	31.5	24.6	↓↓↓
Granular %	56.1	64.2	↑↑
RBCs count x 10 ¹² /L	4.82	4.84	↑
Hb	14.7	14.8	↓
HCT %	44.0	44.4	↑
MCV	91.4	91.9	↑
RDW _{-SD}	43.4	45.2	↑
Platelets count x 10 ³	182	189	↑
MPV	8.0	8.3	↑

Table 1: hematological flinging in subject 1.

Table 2: illustrate biochemical finding in subject 1; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
Blood sugar	73	96	↑
ALP	141	149	↑
GOT	21	21	=
GPT	17	19	↑
Urea	24	24	=
Creatinine	0.8	0.8	=
Na ⁺⁺	138.9	138.9	=
K ⁺⁺	4.21	4.14	↑
Cl ⁻	101.2	99.8	↑

Table 2 biochemical flinging in subject 1.

Table 3: illustrate hematological finding in subject 2; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
WBCs count x 10 ⁹ /L	9.5	9.0	↑
Lymphocytes %	27.9	38.0	↑↑↑
Granular %	66.0	53.0	↑↑↑
RBCs count x 10 ¹² /L	5.40	5.05	↑
Hb	13.6	12.6	↓
HCT %	42.8	40.2	↑
MCV /fL	79.3	79.7	↑
RDW _{-SD}	35.1	34.3	↓
Platelets count x 10 ³	355	329	↓↓
MPV / fL	7.8	8.0	↓

Table 3 hematological flinging in subject 2.

Table 4 illustrate biochemical finding in subject 2; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
Blood sugar	89	80	↓
ALP	121	111	↓
GOT	27	39	↑↑↑
GPT	17	19	↑
Urea	33	27	↓↓
Creatinine	0.8	0.8	=
Na ⁺⁺	146.1	145.4	↓
K ⁺⁺	4.88	4.06	↓
Cl ⁻	105.9	106.0	↑

Table 4 biochemical flinging in subject 2.

Table 5 illustrate hematological finding in subject 3; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
WBCs count x 10 ⁹ /L	6.7	8.0	
Lymphocytes %	36.4	25.4	
Granular %	55.3	66.2	
RBCs count x 10 ¹² /L	5.55	5.47	
Hb	13.8	13.9	
HCT %	44.6	43.9	
MCV	80.7	80.4	
RDW _{-SD}	37.1	36.0	
Platelets count x 10 ³	266	241	
MPV	8.6	8.5	

Table 5 hematological flinging in subject 3.

Table 6 illustrate biochemical finding in subject 3; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
Blood sugar	106	92	↓
ALP	106	88	↓↓
GOT	27	22	↓
GPT	28	19	↓↓
Urea	30	39	↑↑
Creatinine	0.8	0.9	↑
Na ⁺⁺	142.5	140.7	↓
K ⁺⁺	4.16	4.34	↑
Cl ⁻	105.6	107.6	↓

Table 6 biochemical flinging in subject 3.

Table7 : illustrate hematological finding in subject 4; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
WBCs count x 10 ⁹ /L	8.2	9.9	↑↑↑
Lymphocytes %	17.7	20.1	↑↑
Granular %	77.5	72.9	↓↓
RBCs count x 10 ¹² /L	5.60	5.70	↑
Hb	14.4	14.5	↑
HCT %	44.5	45.3	↑
MCV	79.5	79.4	↓
RDW _{-SD}	34.3	33.7	↓
Platelets count x 10 ³	364	349	↓↓
MPV	7.9	8.0	↑

Table 7 hematological flinging in subject 4.

Table 8 illustrate biochemical finding in subject 4; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
Blood sugar	93	82	↓
ALP	99	136	↑↑
GOT	26	34	↑↑
GPT	24	42	↑↑
Urea	39	32	↓↓
Creatinine	0.9	0.8	↓
Na ⁺⁺	142.6	139.9	↓
K ⁺⁺	5.03	4.38	↓↓
Cl ⁻	106.9	107.6	↑

Table 8 biochemical flinging in subject 4.

Table 9 illustrate hematological finding in subject 5; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
WBCs count x 10 ⁹ /L	5.6	5.9	↑
Lymphocytes %	37.0	39.1	↑
Granular %	57.6	52.4	↓↓
RBCs count x 10 ¹² /L	5.69	5.54	↓↓
Hb	14.4	13.8	↓
HCT %	44.6	43.6	↓
MCV	78.4	78.7	↑
RDW _{-SD}	34.1	33.6	↓
Platelets count x 10 ³	308	321	↑
MPV	8.0	7.9	↓

Table 9 hematological flinging in subject 5.

Table 10 illustrate biochemical finding in subject 5; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
Blood sugar	89	82	↓
ALP	103	97	↓↓
GOT	35	40	↑
GPT	27	29	↑↑
Urea	26	27	↑
Creatinine	0.6	0.7	↑
Na ⁺⁺	139.7	143.6	↑↑
K ⁺⁺	4.42	4.18	↓↓
Cl ⁻	104.9	107.2	↑

Table 10 biochemical flinging in subject 5

Table 11 illustrate hematological finding in subject 6; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
WBCs count x 10 ⁹ /L	6.3	6.3	=
Lymphocytes %	29.6	42.1	↑↑↑
Granular %	65.8	52.3	↓↓
RBCs count x 10 ¹² /L	4.62	4.69	↓
Hb	13.2	13.4	↑
HCT %	41.1	41.6	↑
MCV	89.1	88.7	↓
RDW- _{SD}	47.8	46.9	↓
Platelets count x 10 ³	215	199	↓↓
MPV	8.2	8.6	↑

Table 11 hematological flinging in subject 6

Table 12 illustrate biochemical finding in subject 6; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
Blood sugar	89	101	↑
ALP	127	133	↑
GOT	19	18	↓
GPT	18	19	↓
Urea	31	33	↑
Creatinine	0.8	0.8	=
Na ⁺⁺	141	139.9	↓
K ⁺⁺	4.23	4.23	=
Cl ⁻	102	99.8	↓

Table 12 biochemical flinging in subject 6.

Table 13 illustrate hematological finding in subject 7; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
WBCs count x 10 ⁹ /L	8.3	7.0	↓ ↓
Lymphocytes %	38.5	39.7	↑ ↑
Granular %	52.8	50.5	↓ ↓
RBCs count x 10 ¹² /L	4.96	4.62	↓
Hb	13.9	12.9	↓ ↓
HCT %	42.8	39.9	↓ ↓
MCV	86.4	86.4	=
RDW _{-SD}	45.2	47.8	↑
Platelets count x 10 ³	238	209	↓
MPV	8.1	7.9	↓

Table 13 hematological flinging in subject 7.

Table 14 illustrate biochemical finding in subject 7; before and after cupping with range of test change.

Test	Test result before cupping	Test result after cupping	Range of change
Blood sugar	99	109	↑
ALP	204	189	↓ ↓
GOT	15	13	↓
GPT	16	13	↓
Urea	26	28	↑
Creatinine	0.8	0.8	=
Na ⁺⁺	139.4	139.4	=
K ⁺⁺	4.3	4.14	↓ ↓
Cl ⁻	99	101	↑

Table 14 biochemical flinging in subject 7.

Discussion

The origin of cupping is argument issue; anyway; it is ancient medicine back to thousands years ago; it is safe procedure with minimum side

effect. It is improve life and recently wide countries practice cupping for treatment of many diseases.

This study based on comparing tests results for each volunteer separately after and before wet cupping. We take in concern daily activity, feeding and emotion that may alter the results and we recommended all volunteers to maintain their activity, feeding and emotion same as possible during period of blood collection before and after cupping.

In this study; remarkable increase seen in total numbers of white blood cells (WBCs) in all subject with exception subject 6,7; where the number is unchanged with subject 6; while in subject 7 notable decrease were observed.

The number of Lymphocytes in percentage were notable increase seen in all cases with exception with subject 1 were lymphocytes weighty decreased observed.

Change of Granular cells in percentage after cupping were increased in subjects 1,2 and 3; the range of change were significantly increased; while in subjects 4,5,6 and 7 the number in percentage were decreased and the range were notable decreased.

Regarding to total number of red blood cells (RBCs) slightly increase occur in three subjects and decreased in the other four subjects; the range of both increase or decrease were insignificantly. Notable Hemoglobin level (Hb) decrease after cupping in two cases (subject 2,5) and the range of decrease were significant; in the other cases hemoglobin slightly/insignificantly elevated. In concern with hematocrit (Hct) tests; No notable change observed; the range of change were insignificant increase in three subject and insignificant decrease in other four subjects. Standard deviation of Red cells distribution width (RDW) the range of change were similar as observed in hemoglobin.

In platelets count; the number of platelets significantly decreased in four cases and slightly decreased in subject 7; in otherwise the number of platelets elevated in five cases; while the another two cases the range of change were slightly increased. The decrease of platelets number may attributed to increase consumption to heal wounds during cupping procedure. The range of change in mean platelets volume(MPV) were similar in that of platelets count.

Overall mentioned above we found that lymphocytes and granular cells number were affected by fire cupping and in the majority were increased significantly. While the number of red blood cells (RBCs) in the majority not affected or slightly affected. Similar affect observed in the other hematological tests. Regarding platelets count; memorable change occur in most cases; in others slightly changed; where the number overall were decreased and this may due to increase demand caused by skin wounds during procedure.

In biochemical tests; No significant change observed in Liver enzymes (ALP, GOT and GPT); the results after cupping were fluctuate in some cases slightly rise and in others slightly fall. NO significant change seen in all results that may indicate to rapid direct effect on the liver enzymes. In renal function test (RFTs); both urea and creatinine results after wet cupping No significant change observed and the results comparing before and after cupping fluctuate some are equal in others slightly increased or decreased. Similar observation seen in serum electrolytes (Na^+ , K^+ and Cl^-) and the effect of cupping same as in urea and creatinine.

In this study; the range of change in the majority were insignificantly this may related to the period of blood collection specifically after procedure of cupping; in such studies blood same should be collected in interval; one week at least for few months to observe the body response and the effect of cupping. In our study we collect blood once; one day after cupping and this may affect our results and finding .

The obvious finding that can be observed from all tables in chapter 3; that the human being are not effected in same minor. wet cupping either; human may effected in different levels.

Conclusion

Wet cupping as an alternative medicine has an effect on white blood cells and the number increased after cupping and similar finding seen in lymphocytes and granular cells numbers.

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