An aerial photo of Abha City

Pattern and Frequency of Hospital Acquired Infections in Pediatric Intensive Care Unit at Abha Maternity and Children Hospital, Saudi Arabia

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# Editorial

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This issue is rich with papers from various countries in the region including Saudi Arabia, Qatar, Yemen, Iraq, Turkey, Lebanon and Australia. It deals with topics of interest to primary care physicians.

El-Gamal F.M et al., did a cross-sectional study, where a convenient non-probability sample was selected. The study was conducted in a cement manufacturing factory at the North of Jeddah city and at a medical college. Each subject was asked a personal questionnaire (to collect socio-demographic, and health data), an occupational questionnaire, and the MRC questionnaire on respiratory symptoms and smoking habit, and ISAAC core questionnaire on asthma and allergy. Smoking was significantly associated with chronic cough (OR=3.68; 95% CI: 0.99, 15.11' and $p < 0.05$), chronic phlegm production (OR=8.83; 95% CI: 2.33, 33.51, and $p < 0.001$), shortness of breath on exertion (OR=4.18; 95% CI: 1.49, 11.66, and $p < 0.006$), and eczema (OR=6.43; 95% CI: 1.33, 31.14, and $p < 0.021$). After allowing for age, height, weight and cement dust exposure, smoking subjects had significantly lower FEV1% compared to nonsmokers (Beta= -3.45%, $p < 0.05$). The authors concluded that early effects of smoking increased chronic respiratory symptoms and occurrence of eczema. FEV1% is the

early effects of smoking increased chronic respiratory symptoms and occurrence of eczema. FEV1% is the early affected lung function index in smokers, denoting airflow limitation. Cement exposure under the current environmental factory conditions seems to be safe.

Alshehri A et al. did a cross-sectional study to determine the practice of laboratory tests in emergency room requested by emergency physician at King Faisal Hospital, Taif, KSA. The checklist included items about demographic data, presence of chronic diseases, laboratory tests requested, and whether these tests were normal was used for data collection. CBC was requested for 97.9% of patients, LFT was requested for 82.9%. Urea/creatinine test was requested for 84.1% of the participants and electrolytes testing was requested for 88.5% of them. Vitamin D testing was requested for 42% of the participants and blood sugar testing was requested for 12.1% of them. The authors concluded that there was an overuse of laboratory tests at the ED which necessitates to choose the necessary analyses for each patient and to implement education and training of physicians on the ways to decrease unnecessary lab test ordering.

Al-Harthi A.K et al. did a cross sectional study using an electronic questionnaire which was distributed to 384 women in the reproductive age at Taif City with an age ranging from 18 to 56 years. The aim of this study was to explore the prevalence of CS, and to assess the extent of Saudi women's awareness and attitude towards the long-term and short-term complications of caesarean sections. Of the participants, 68.8% prefer normal delivery, 77.6% saw that cesarean section is more harmful than normal delivery, and 39.8% saw that cesarean section is safer for the mother and the baby. For the participants who had previous CS (38% of the sample), and 16.9% had CS for health causes and complications for the fetus. About 18% of them said that constant pain was the common complication of CS, 47.9% saw that uterine adhesion is the most common complication of a CS in the long-term, while 44.1% saw that delay and lack of breastfeeding is the most common complications of the CS on the child. The authors call for health education of all women about advantages and disadvantages of CS to enable mothers to make the proper decision.

Al Zahib Y.H et al., did a cross-sectional that included 404 Saudi adults aged 19- 65 years who attended PHC centers in Abha City. The objective is to describe the physical activity (PA) profile and its determinants among attendants of primary healthcare (PHC) centers in Abha City, Saudi Arabia. A self-administered questionnaire was designed by the researchers and was used for data collection. Most participants (80%) reported low level of PA, whereas 17.1% reported moderate PA. High level of PA was reported among only 12 participants (3%). Vigorous physical activities were practiced by only 4% of participants, whereas moderate physical activities were practiced by only 3%, and walking was practiced by 49.8%. The authors concluded that most Saudi adults attending PHC centers in Abha City have low level of PA. Males have significantly higher PA than females. There are several barriers against PA. Overcoming these barriers will contribute to improvement in PA among the Saudi population.

Younis, M.S et al., look at the quality of life of older patients attending a general hospital in Baghdad/Iraq. The number of older people is increasing worldwide due to the improvement in health care services, even in developing countries. The World Bank reported that life expectancy at birth in high-income countries was 81 years and in the low -income countries 64 years and 72years in the Arab world countries during 2018. Within the two decades of 1998-2018: life expectancy at birth in Iraq was 71.7years for females 66.5 years for males, 72.4 years for females,68.4 years for males in Iraq subsequently. Due to the global demographic changes, a heightened interest in researching the elderly's welfare through the bio-psycho-social approach using multiple tools for assessment of different dimensions of QoL using generic and specific instruments to measure health-related QoL. Like other Arab countries, religious and cultural traditions and beliefs in Iraq ensure respect and protection to the elderly. Their family members (spouse, son, or daughter) are entitled to look after them prudently. Abyad, Ashour, & Abou-Saleh (2001), stated that sending older parents to nursing homes is perceived as immoral behavior and unwelcome step, in contrast, a loving and respectful attitude toward the older people enhances their

subjective and objective dimensions of QoL. The QoL of older people in Iraq warrants further study to fill the data gap and formulate a proper geriatric health care system.

Alwaedi N.M., et al., reported a case of Kocuria rhizophila is a Gram-positive microorganism infection in a new born. A 30-day old boy presented to the Maternity & Children's Hospital, Abha City, Saudi Arabia, with a history of cough and shortness of breath for two days, followed by apnea and cyanosis. On clinical examination, he was in moderate respiratory distress with compensated shock. He developed supraventricular tachycardia, which was controlled by adenosine. He was admitted to the Pediatric Intensive Care Unit (PICU). Blood culture showed positive growth with Kocuria rhizophila, sensitive to Gentamicin, Erythromycin, and Moxifloxacin. The patient developed respiratory distress and needed non-invasive respiratory support. At that time, antibiotics were upgraded with no significant improvement of clinical condition till Gentamycin was added on the second day, which led to dramatic response and the patient was shifted from PICU to the pediatric medical ward. The authors concluded that K. rhizophila can cause severe infections in pediatric patients that necessitate PICU admission. Therefore, it should be considered as a true pathogen and proper treatment should be provided to all susceptible pediatric patients.

A paper from Yemen looked at flexible intramedullary nails for treatment of femoral shaft fracture in children, Aden, Yemen. It was a retrospective study conducted in the orthopedic section at Algamhoria Teaching Hospital and 2 private hospitals in Aden. Patients numbered 37 and they were 22 [59.5%] males and 15 [40.5%] females. The mean age was 8.51 years. Motor vehicle accidents were responsible for the majority of cases (56.8%). Mean of fracture union was 12.14 weeks, the mean time of weight bearing was 4.65 weeks, also, the mean duration of knee flexion was 2.46 weeks. The mean time of removal nails was 7.26 months. The authors concluded that flexible intramedullary nail is a great choice for the treatment of pediatric patients (6–12 years old) with closed and opened femoral shaft fracture. It can provide a rapid recovery.

Almasadi M.M et al., did a retrospective analytical cohort study to determine the pattern and frequency of hospital acquired infection (HAI) in pediatric intensive care unit (PICU) at Abha maternity and children hospital. All pediatric patients from 1 month to 12 years who had HAI in PICU were included. Out of 585 pediatric patients admitted to PICU, Abha Maternity and Children hospital throughout the study period (1 March 2017 - 28 February 2018), 42 acquired infections with 79 episodes giving a rate of 7.2%, based on number of cases and 13.5% based on number of episodes. The age of 40.5% of them ranged between one and less than 6 months. More than half of them (53.7%) have stayed more than 30 days at the hospital. The number of HAI episodes was three or above among 54.8% of cases. The authors concluded that hospital acquired infection is not very rare in PICU units. Also, mortality rate is relatively high and is related to number of hospital acquired infection.

Dr Saad & Faiqa's systematic review aimed at looking at the effects of SGLT2i in adult patients with Type 2 diabetes and chronic kidney disease. The reviewers examined renal outcomes, which were end-stage renal disease (ESRD), renal failure, doubling serum creatinine, macroalbuminuria,

incident microalbuminuria, alteration in urine albumin-to-creatinine ratio (UACR), estimated glomerular filtrate rate (eGFR), dialysis, kidney transplant, or death related to renal disease. The extracted data were qualitatively synthesized. 18 studies that met the eligibility criteria were selected for review. In line with the strong evidence presented in previous meta-analyses, SGLT2i clearly demonstrated that it lowered the risk of developing ESRD, microalbuminuria, reduce the levels of eGFR and UACR compared to controls. The authors concluded that SGLT2i has positive renoprotective effects in patients with T2DM and CKD by reducing the risk of developing worsening albuminuria and decreasing the risk for ESRD compared to controls.

A paper from Iran looked at Coronavirus Environment vs Socio-Economic and Demographic Problems Followed: A Sociological Appraisal. The paper searches the cause and effect impacts of the newly-found Coronavirus. The word "Corona" is currently used by all the people (7.7 billion) over the age of at least 3. The unprecedented disease is reflecting a large number of effects, infecting and killing many people of the rich and the poor. The new phenomenon is continuing rapidly. It brings about recessions and closures in many businesses, and laying off many employees and workers, and that has created income and security problems for the families. The new environment has imprisoned families inside homes disrupting them from the normal and regular interactions. Poor economies will not easily be able to rehabilitate and reconstruct themselves. That is why a large migration wave will be quite likely to occur. Similarly, many countries will face increasing child labor and street children because of shortage of employment for the adults.

Helvaci M.R et al., tried to understand the most desired values of high density lipoproteins (HDL), low density lipoproteins (LDL), and triglycerides in the plasma. We studied 256 cases (153 females). The mean age, female ratio, body mass index (BMI), fasting plasma glucose (FPG), LDL, white coat hypertension (WCH), hypertension (HT), and diabetes mellitus (DM) were the highest in the fourth group. The authors concluded the highest mean age, female ratio, BMI, FPG, WCH, HT, and DM parallel to the highest HDL and LDL, and the highest CHD in contrast to the lowest HDL and LDL values may show initially positive but eventually negative acute phase proteins functions of HDL and LDL. Due to the lowest mean age, female ratio, BMI, FPG, WCH, DM, and CHD, the most desired values of HDL may be between 40 and 46 mg/dL. Additionally, the most desired values of LDL were in between 80 and 100 mg/dL, and the triglycerides were lower than 60 mg/dL in our previous studies.

The fourth paper on Parkinson's disease looked at the differential diagnosis and patient assessment. Early symptoms of PD are subtle and occur gradually. Patients may be tired, or experience a general malaise. We can note that we talk too softly or that they look messy and spidery in their handwriting. We may lose track of a word or thought or we may, for no obvious cause, feel irritable or discouraged. This early period can last a long time before the symptoms appear more classic and obvious. The onset of symptoms will take several years to go unnoticed. Tremor is always first detected, which usually causes the doctor's first appointment. Nevertheless, there is no tremor in up to 30 per cent of patients; this may lead to a misdiagnosis. In this review the approach to assessment and differential diagnosis of Parkinson disease are discussed.

# Pattern and Frequency of Hospital Acquired Infections in Pediatric Intensive Care Unit at Abha Maternity and Children Hospital, Saudi Arabia

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## Abstract

**Objectives:** To determine the pattern and frequency of hospital acquired infection (HAI) in pediatric intensive care unit (PICU) at Abha maternity and children hospital.

**Subjects and methods:** Retrospective analytical cohort study was carried out from 1 March 2017 to 28 February 2018 at Abha Maternity and Children hospital, Abha city, Kingdom of Saudi Arabia (KSA). All pediatric patients from 1 month to 12 years who had HAI in PICU were included. Information was collected regarding age, gender, length of hospital stay, underlying diseases, invasive procedures, types of HAI, causative organisms, and mortality rate. IBM SPSS software, version 25 was utilized for data entry and analysis.

**Results:** Out of 585 pediatric patients admitted to PICU, Abha Maternity and Children hospital throughout the study period (1 March 2017 - 28 February 2018), there were 42 acquired infections with 79 episodes, giving a rate of 7.2%, based on number of cases and 13.5% based on number of episodes. The age of 40.5% of them ranged between one and less than 6 months. More than half of them (53.7%) stayed more than 30 days at the hospital. The number of HAI episodes was three or above, among 54.8% of cases. Concerning the type of infection, the commonest reported types were central-line associated bloodstream infection and ventilator-associated infection (52.4%), followed by bloodstream infection (42.9%), catheter-associated urinary tract infection (CA-UTI) and urinary tract infection (UTI) (21.4%). Regarding the causative organisms, Klebsiella pneumonia was the most frequent (34.3%), followed by Pseudomonas (11.4%), Candida tropicalis (7.6%) and Candida famata (6.3%). The commonest causative organism for CA-UTI was Enterococcus faecium (25%) whereas that of UTI was Klebsiella pneumoniae (55.5%). For bloodstream infection and central line associated blood stream infection, the commonest causative organism was Klebsiella pneumoniae (33.3% and 36.4%), respectively.

**Conclusion:** Hospital acquired infection is not very rare in PICU units. Also, mortality rate is relatively high and is related to number of hospital acquired infections.

**Key words:** PICU, hospital acquired infection, Frequency, causative organism

## Introduction

Hospital acquired infections (HAI) are of important concern in the medical field, which places a great risk on patients and on the health care system (1). They are considered significant causes of morbidity and mortality in pediatric hospitals (2).

The recent medical developments including: increased use of broad spectrum antibiotics, urinary and central venous catheterization as well as endotracheal intubation put patients at an increased risk of contracting HAI in those who undergo long hospital stay and large treatment costs (3).

Although HAI in pediatric intensive care units occur universally, their frequencies vary greatly among different areas of the world. Indeed the prevalence might range from 6.1% to 26% (2,4-6). In developed countries, pediatric intensive care units' HAI rates in infants and children are lower than those reported for infants and children in developing countries. While in the Middle East, the incidence is 14.7% (2,4-6). Among these differences, highest incidence density was observed in the first 2 years of life. The three major sites of HAI are: blood stream, lower respiratory and urinary tract infections (7,8).

For instance, Klebsiella pneumoniae is found to be one of the common organisms isolated from blood stream infection followed by Coagulase-negative Staphylococci, and Pseudomonas aeruginosa respectively (8,9). Whereas, Pseudomonas aeruginosa followed by Staphylococcus aureus are the common HAI pathogens identified from lower respiratory tract infections (8,9). Furthermore the common HAI pathogens from urinary tract infections are E. coli followed by Candida albicans(8).

Incidence and prevalence of HAI could be decreased by 32% if infections surveillance were coupled with effective infection control programs (4). The frequencies of these hospital acquired infections among pediatric patients are variable in different countries and there is limited data available from KSA (7,9).

This study was carried out to determine the pattern and frequency of HAI in Pediatric Intensive Care Unit at Abha Maternity and Children Hospital (AMCH).

## Subjects and Methods

A retrospective analytical cohort study was carried out from 1 March 2017 to 28 February 2018 at Abha Maternity and Children hospital, Abha city, Saudi Arabia. It is a public hospital of 200 beds with pediatric intensive care unit presenting 15 beds, offering secondary care. The study was approved by AMCH ethical committee.

All pediatric patients aged from 1 month to 12 years who acquired HAI in PICU at Abha Maternity and Children Hospital were included. PICU-acquired HAI was defined according to the Center for Disease Control and Prevention (CDC) as infections that started after 48 hours from admission(10). All patients who were admitted with fever or who developed fever in the 1st 48 hours were excluded.

In order to establish the diagnosis of urinary tract infection, the patient must have at least one of the following with no other recognized causes: fever (>38°C), urgency, frequency, dysuria, and positive urine culture with counts ≥10υ colony-forming units per milliliter (CFU/ml) (10).

Patients who develop pneumonia with new pulmonary infiltrate on chest radiograph after 48 hours from admission are considered to have HAIs if they have two of the following: leukocytosis (>12,000/mm or leukopenia (<4.000 hyperthermia (>38° C) or hypothermia (<35° C), purulent sputum, tracheal aspirate bacterial count of ≥106CFU/ml.10 Bacteremia is confirmed by positive blood culture(10).

Data were collected using a specialized data collection form from infection control practitioner records and patients` medical records. The information included patients` age, gender, length of hospital stay, types of nosocomial infections, causative organisms, and the outcome.

Patients' names were not disclosed and all information about them was kept confidential.

IBM SPSS software, version 25 was utilized for data entry and analysis.

## Results

Out of 585 pediatric patients admitted to the PICU, Abha Maternity and Children hospital throughout the study period (1 March 2017 - 28 February 2018), 42 acquired infections with 79 episodes giving an incidence rate of 7.2%, based on number of patients as demonstrated in Figure 1 whereas if we consider the number of episodes, the rate would be 13.5%.

Table 1 presents the basic characteristics of the children with HAI. The age of 40.5% of them ranged between one and less than 6 months whereas that of 19% was 3 years or more. The cases were equally distributed between both genders. More than half of them (53.7%) stayed more than 30 days at the hospital.

The number of HAI episodes was three or above among 54.8% of cases whereas it was only one among 33.3% of them as illustrated in Figure 2. Concerning the type of infection, the commonest reported types were central-line associated bloodstream infection and ventilator-associated infection (52.4%), followed by bloodstream infection (42.9%), catheter-associated urinary tract infection and urinary tract infection (21.4%). (Figure 3)

Regarding the causative organisms, Klebsiella pneumoniae was the most frequent (34.3%), followed by Pseudomonas (11.4%), Candida tropicalis (7.6%) and Candida famata

(6.3%) as demonstrated in Table 2. The commonest causative organism for CA-UTI was Enterococcus faecium (25%) whereas that of UTI was Klebsiella pneumoniae (55.5%). For bloodstream infection and central line associated blood stream infection, the commonest causative organism was Klebsiella pneumoniae (33.3% and 36.4%), respectively. Also for ventilator-associated infection, Klebsiella pneumoniae was the commonest causative organism (31.8%). There was no statistically significant association between type of hospital-acquired infection and causative organism as illustrated in Table 3. As obvious from Figure 4, death rate was 48.8% whereas rate of home discharge was 46.3. There was a linear association between the number of HAI episodes and the mortality rate, p=0.017.

**Table 1: Basic characteristics of children with Hospital acquired infection, Abha Maternity and Children hospital, Abha city, Saudi Arabia (1 March 2017 - 28 February 2018)**

|  | No. | % |
|---|---|---|
| **Age** |  |  |
| 1-<6 months | 17 | 40.5 |
| 6-<12 months | 9 | 21.5 |
| 1-<3 years | 8 | 19.0 |
| ≥3 years | 8 | 19.0 |
| **Gender** |  |  |
| Male | 21 | 50.0 |
| Female | 21 | 50.0 |
| **Length of hospital stay (days) (n=41)*** |  |  |
| ≤30 | 19 | 46.3 |
| >30 | 22 | 53.7 |

* Missing information

**Table 2: Isolated causative organisms among children admitted to PICU, Abha Maternity and Children hospital, Abha city, Saudi Arabia (1 March 2017 - 28 February 2018)**

|  | Frequency N=79 | Percentage |
|---|---|---|
| Klebsiella pneumoniae | 27 | 34.3 |
| Pseudomonas | 9 | 11.4 |
| Candida tropicalis | 6 | 7.6 |
| E coli | 3 | 3.8 |
| Acinetobacter | 2 | 2.5 |
| Candida famata | 5 | 6.3 |
| Steno. Ciferrii | 2 | 2.5 |
| Serratia Marcescens | 2 | 2.5 |
| Candida Gullermandii | 2 | 2.5 |
| Staph. Aureus | 2 | 2.5 |
| Enterococcus faecium | 3 | 3.8 |
| Kluyvera Ascorbata | 1 | 1.3 |
| Others | 15 | 19.0 |

**Table 3: Association between the type of HAI and causative organisms among children admitted to PICU, Abha Maternity and Children hospital, Abha city, Saudi Arabia (1 March 2017 - 28 February 2018).**

| Type of nosocomial infection | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 N (%) | 6 N (%) | 5 N (%) | 4 N (%) | 3 N (%) | 2 N (%) | 1 N (%) | |
| 2 (100) | 7 (31.8) | 8 (36.4) | 5 (33.3) | 0 (0.0) | 5 (55.6) | 0 (0.0) | Klebsiella pneumoniae (n=27) |
| 0 (0.0) | 7 (31.8) | 0 (0.0) | 2 (13.3) | 0 (0.0) | 0 (0.0) | 0 (0.0) | Pseudomonas (n=9) |
| 0 (0.0) | 0 (0.0) | 1 (4.5) | 1 (6.7) | 0 (0.0) | 3 (33.3) | 1 (12.5) | Candida tropicalis (n=6) |
| 0 (0.0) | 1 (4.5) | 1 (4.5) | 0 (0.0) | 0 (0.0) | 1 (11.1) | 0 (0.0) | E coli (n=3) |
| 0 (0.0) | 1 (4.5) | 1 (4.5) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | Acinetobacter (n=2) |
| 0 (0.0) | 0 (0.0) | 3 (13.6) | 1 (6.7) | 0 (0.0) | 0 (0.0) | 1 (12.5) | Candida famata (n=5) |
| 0 (0.0) | 0 (0.0) | 1 (4.5) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 1 (12.5) | Steno. Ciferrii (n=2) |
| 0 (0.0) | 0 (0.0) | 2 (9.1) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | Serratia Marcescens (n=2) |
| 0 (0.0) | 0 (0.0) | 1 (4.5) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 1 (12.5) | Candida Gullermandii (n=2) |
| 0 (0.0) | 1 (4.5) | 0 (0.0) | 1 (6.7) | 0 (0.0) | 0 (0.0) | 0 (0.0) | Staph. Aureus (n=2) |
| 0 (0.0) | 0 (0.0) | 1 (4.5) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 2 (25.0) | Enterococcus faecium (n=3) |
| 0 (0.0) | 0 (0.0) | 0 (0.0) | 1 (6.7) | 0 (0.0) | 0 (0.0) | 0 (0.0) | Kluyvera Ascorbata (n=1) |
| 0 (0.0) | 5 (22.7) | 3 (13.6) | 4 (26.7) | 1 (100) | 0 (0.0) | 2 (25.0) | Others (n=15) |

1: Catheter associated urinary tract infection
2: Urinary tract infection
3: Surgical site infection
4: Bloodstream infection
5: Central line associated bloodstream infection
6: Ventilator associated pneumonia
7: Others

$\chi2=77.83$, df=72, p=0.299

**Table 4: Association between the number of HAI episodes and the outcome of HAI among children admitted to PICU, Abha Maternity and Children hospital, Abha city, Saudi Arabia (1 March 2017 - 28 February 2018).**

| Outcome | | | Episodes of HAI |
|---|---|---|---|
| At hospital N=2 N (%) | Death N=20 N (%) | Home discharge N=19 N (%) | |
| 0 (0.0) | 4 (30.8) | 9 (69.2) | One (n=13) |
| 0 (0.0) | 2 (40.0) | 3 (60.0) | Two (n=5) |
| 2 (8.7) | 14 (60.9) | 7 (30.4) | ≥Three (n=23) |

Chi-square for trend=5.67, p=0.017

**Figure 1: Frequency of Pediatric HAI, PICU, Abha Maternity and Children hospital, Abha city, Saudi Arabia (1 March 2017 - 28 February 2018)**
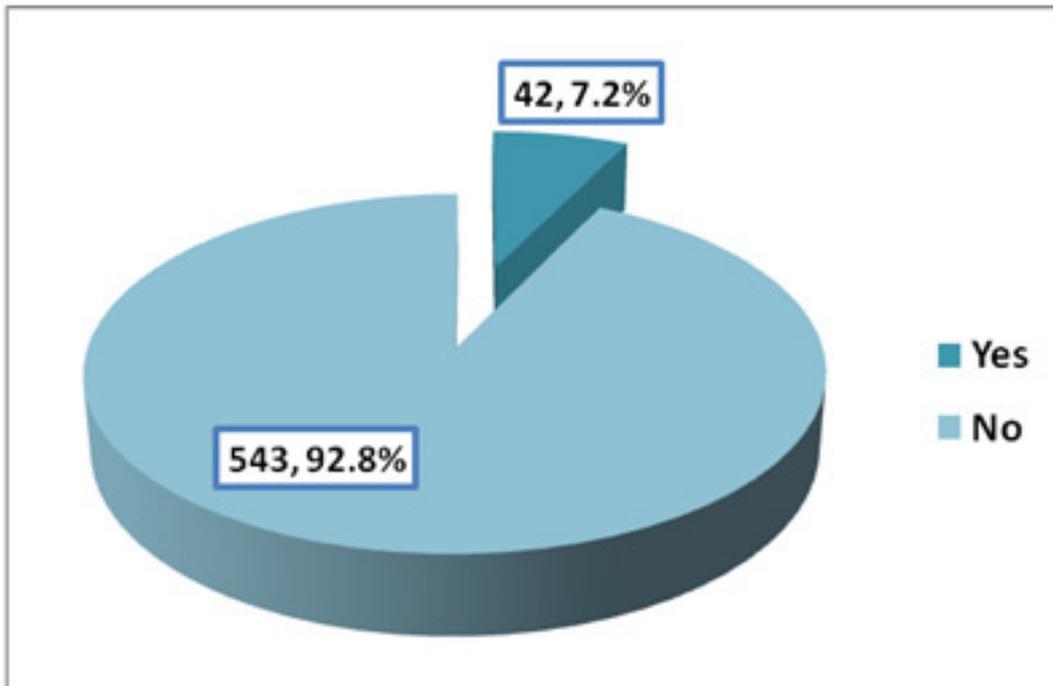


**Figure 2: Number of HAI episodes among children admitted to PICU, Abha Maternity and Children hospital, Abha city, Saudi Arabia (1 March 2017 - 28 February 2018)**
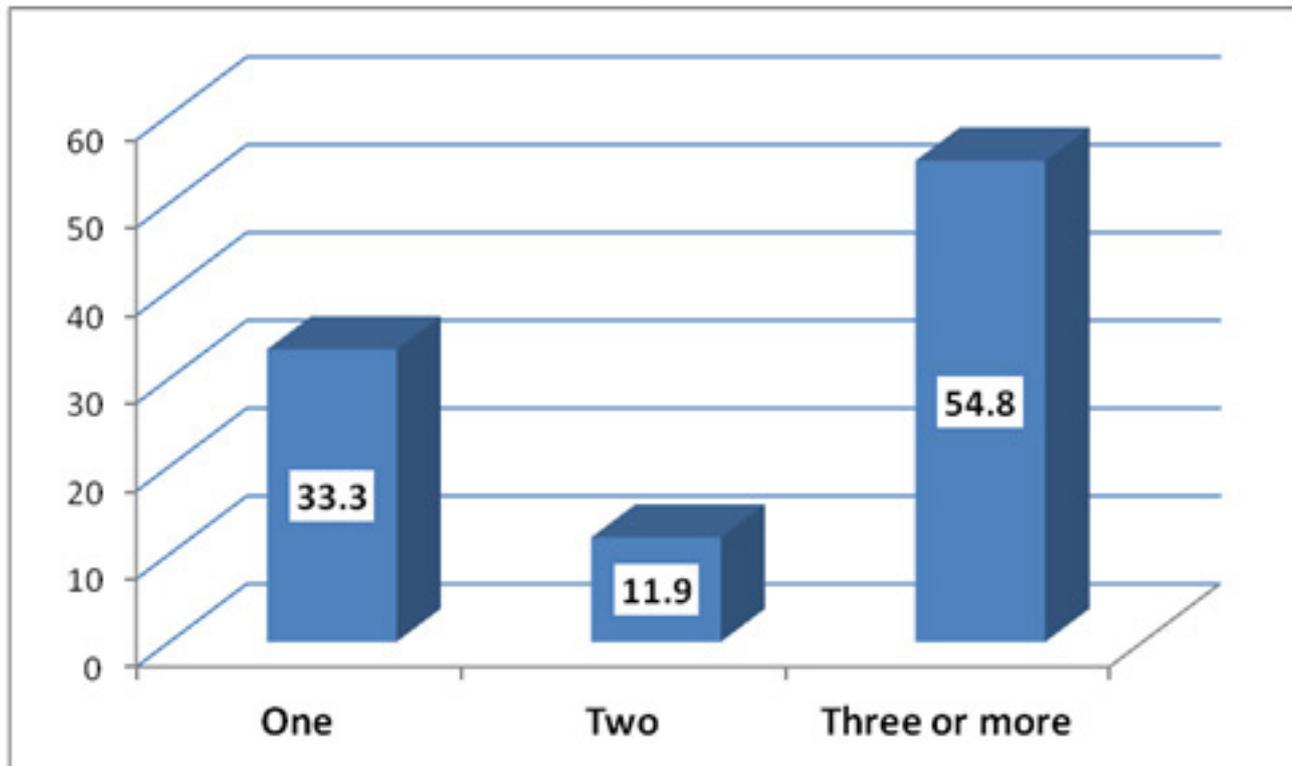
**Figure 3: Types of HAI among children admitted to PICU, Abha Maternity and Children hospital, Abha city, Saudi Arabia (1 March 2017 - 28 February 2018)**
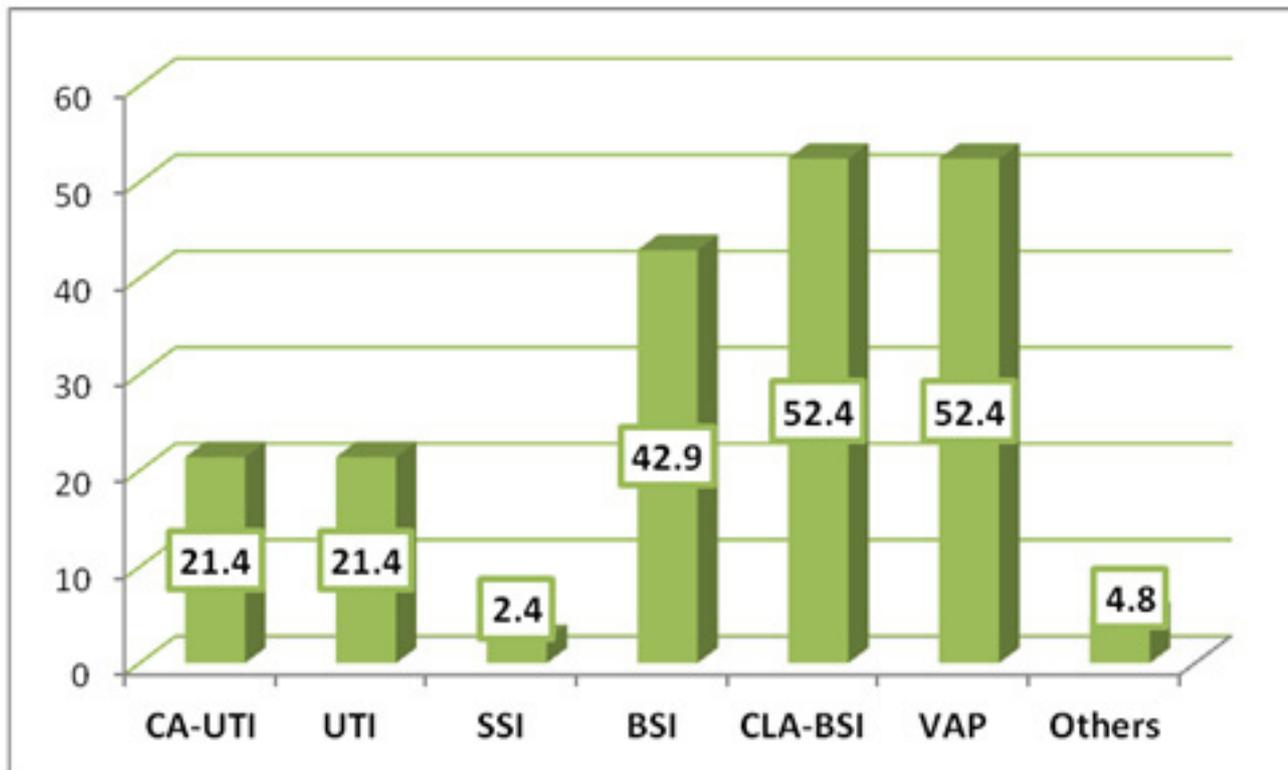


1: Catheter associated urinary tract infection
2: Urinary tract infection
3: Surgical site infection
4: Bloodstream infection
5: Central line associated bloodstream infection
6: Ventilator associated pneumonia
7: Others

**Figure 4: Outcome of HAI among children admitted to PICU, Abha Maternity and Children hospital, Abha city, Saudi Arabia (1 March 2017 - 28 February 2018)**
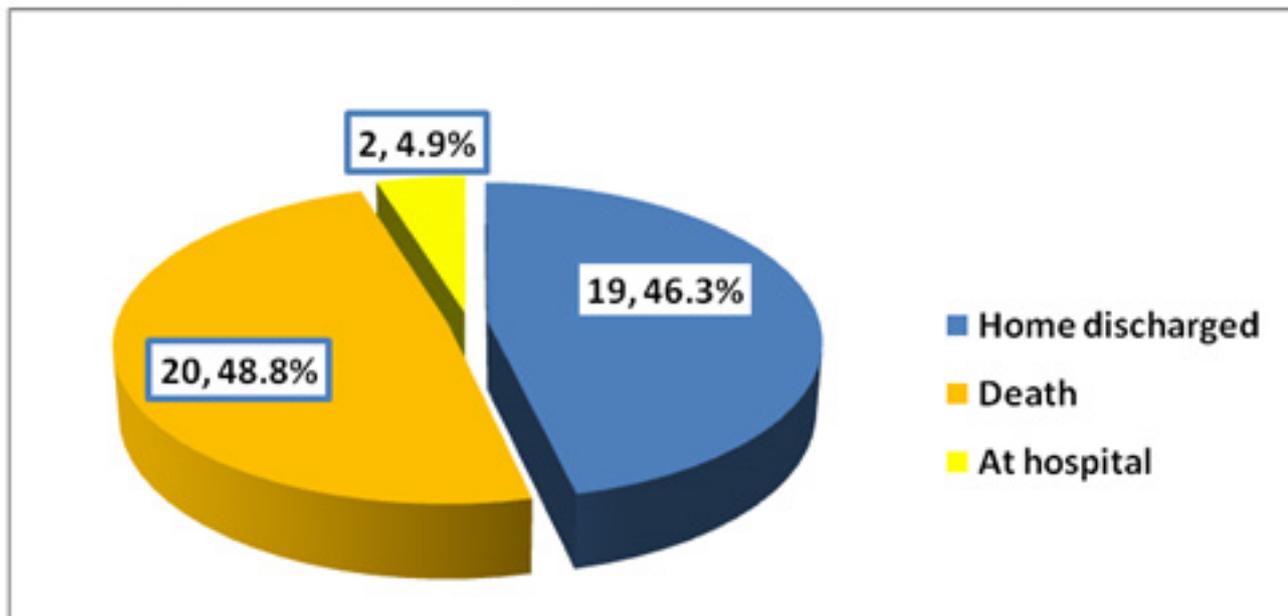
## Discussion

Pediatric HAI constitutes a major health problem as a result of associated high morbidity, mortality, and healthcare costs, particularly in pediatric intensive care units (PICU) (11). Despite patients in PICUs representing a small percentage of inpatients, they contribute to more than 20% of HAI (12).

There are numerous data regarding HAI in PICU, mainly expressed as infection rates per device/day or hospital/day (11,13). However, limited studies have been carried out in Saudi Arabia. Therefore, the present study was carried out to determine the pattern and frequency of HAI in the pediatric intensive care unit at Abha maternity and children hospital.

The rate of pediatric HAI in the present study was 7.2% which is comparable to the rates of other similar studies that ranged between 6.1% and 26% (6). Concerning the affected system, in accordance with numerous previous studies(8,11,14,15,16), bloodstream infections, were the most frequent, particularly central line associated infection, followed by respiratory system (ventilator-associated infection) and urinary tract infection (with catheter associated and without). In a previous Saudi study, the most common system affected was respiratory, followed by urinary tract infection and bloodstream infection. In a study carried out in Iran, the most common affected system was respiratory tract followed by urinary tract infection and bloodstream (2).

In this study, Klebsiella pneumoniae was the most frequent, followed by Pseudomonas, Candida tropicalis and Candida famata. In another study carried out in Saudi Arabia,(16) Klebsiella species were the commonest causative organisms for pediatric nosocomial infection, followed by Candida then Pseudomonas aeruginosa. In other studies, Coagulase-negative Staphylococcus species was the most frequent, followed by Klebsiella, Pseudomonas aeruginosa and Staphylococcus aureus (2,5,14).

The current study revealed that the commonest causative organism for VAI, was Klebsiella pneumoniae. Similarly, Klebsiella pneumoniae was the commonest causative organism for respiratory tract infection, followed by Pseudomonas in another Saudi study (16). Variable results have been reported from different international studies. Staphylococcus aureus and Pseudomonas were the most frequent reported causative organisms for respiratory tract infection in studies carried out by Richards et al (1999),(8) Porto et al (2012)(11) and Becerra et al (2010) (15).

It is reported in the present study that the commonest causative organism for bloodstream infection and central line associated BSI, was Klebsiella pneumoniae. This finding is in line with that reported by Alotaibi et al (2014) in Riyadh, Saudi Arabia (16). Different results were reported in other studies. For example, in Brazil, E. fecalis and E. coli was the commonest causative organism, followed by Staphylococcus epidermis (11). In another Brazilian study,

Candida species were the commonest causative organisms (15). In Estonia and USA, the most common organism was Coagulase-negative Staphylococcus(17, 8).

For CA-UTI, the most frequently reported causative organism was Enterococcus faecium whereas for UTI, it was Klebsiella pneumoniae in this study. In Riyadh (KSA), Klebsiella pneumoniae was the most common organism in UTI, followed by Candida and E. coli (16). Yeast and E. coli were the commonest organism for UTI reported in other studies (8,11,15).

Death rate in the present study was 48.8% and there was a linear association between the number of HAI episodes and the mortality rate. In a study carried out in Riyadh (16), KSA, higher mortality rate was reported (77%). In other international studies, mortality rate was below 40% (2,4,15,17). Further in-depth study is recommended to investigate the possible reasons for the relatively higher mortality rate observed in our study as well as in another Saudi study carried out in Riyadh compared to other overseas studies.

Some limitations of this study have to be discussed. Firstly, the relatively small number of children with HAI, which reduces the statistical power of the study. Secondly, information on the bacterial sensitivity was lacking as the present study depended upon having information from medical records, where this information was lacking. Finally, the study was carried out in one health institution which impacts the generalizability of results over other places.

In conclusion, HAI is not very rare in PICU units, particularly central-line associated bloodstream infection, ventilator-associated infection and catheter-associated urinary tract infection. Also, mortality rate is relatively high and is related to the number of HAI. Further studies are needed including a larger sample size and different institutions regarding PICU HAI.

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# Emergency physician Practice of laboratory tests requesting at King Faisal Hospital Taif, KSA, 2020

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# Abstract

Background: Studies have found that unnecessary testing at the emergency department, King Faisal Hospital, was found to be expensive, inefficient, and requires additional technical resources.

Objectives: The aim of this study was to determine the practice of laboratory tests in emergency room requested by emergency physicians at King Faisal Hospital, Taif, KSA.

Methods: A cross-sectional study was done on 340 patient files that were checked for laboratory tests requested by the emergency doctors. The checklist included items about demographic data, presence of chronic diseases, laboratory tests requested, and whether these tests were normal, was used for data collection.

Results: CBC was requested for 97.9% of patients, LFT was requested for 82.9%, Urea/creatinine test was requested for 84.1% of the participants and electrolytes testing was requested for 88.5% of them.  Vitamin D testing was requested for 42% of the participants and blood sugar testing was requested for 12.1% of them. The mean number of lab. tests done for studied patients was (6.82 ± 1.86). Patients with chronic diseases and those with comorbidities had a significantly higher mean number of requested tests.

Conclusions: There was an overuse of laboratory tests at the ED which necessitates to choose the necessary analyses for each patient and to implement education and training of physicians on the ways to decrease unnecessary lab test ordering.

Key words: practice, laboratory, tests, emergency, room, Taif

## Introduction

Emergency room is the busiest area in the hospital. The staff working in the emergency room have feelings of anxiety due to several factors such as caring of the patients, taking responsibility, decision-making (as laboratory tests requested) (1). The Laboratory tests are an important key to diagnosis and prevention of a lot of diseases; also it represents an essential part of health care. We have recently noticed the use of more laboratory tests in emergency room patients (2,3).

Laboratory analyses differ from other techniques in certain aspects: first, there is only a slight probability of harming the patient; second, it is not easy to find consensus approved protocols among doctors to control their use; third, the techniques are easily available and are usually inexpensive; fourth, there are few objections to their implementation, and less (or no) regulation for their provision; and finally, oftentimes technological dissemination occurs before proper evaluation (4).

The increase in the use of laboratory services is attributed to factors impacting laboratories. This includes facilitated access, the introduction of autoanalyzers, development of new tests, and availability. Other factors increasing laboratory utilization include lack of physician training in clinic management, legal aspects, and demand from patients themselves who are increasingly becoming aware of health problems, such as old patients and those with comorbidities (5).

Laboratory tests in hospitals are the most important diagnostic tools for medical decision making at the Emergency Department. They are helpful and convenient for doctors; however, they can lead to overuse of tests and overdiagnosis (6).

Frequent problems that decrease both the efficiency and quality of laboratory diagnostic testing are: inappropriate utilization, abuse, and ignorance of diagnostic tests (7). It was found that 50% of physicians operating in emergency departments were

concerned about the possibility of malpractice litigation. Thus, among providers in subspecialties that are "high risk" for litigation were those working in emergency medicine (8). In addition, a study done by Sekhar and Vyas in 2013 has found that 52% of physicians order unnecessary tests and procedures out of concern over potential malpractice litigation, but without demonstrably better results in terms of patient care (9). Other studies found that excessive testing begets more testing as one test demonstrates an abnormality necessitating a second test for justification and further investigation with potential harm and little benefit to the patient (10).

Laboratory tests are among the ED's most important diagnostic tools for medical decision making, in addition to anamnesis and physical examination (11). A study was done in the Netherlands in 2014 to determine which laboratory tests are essential for optimal decision making at the Emergency Department of our hospital. The study found that a limited number of laboratory tests are considered indispensable for the Emergency Department such as CRP and leukocytes, urea and creatinin, sodium and potassium, and haemoglobin (6).

Epner et al (2013) noted that inappropriate test ordering can result in false positive findings resulting in diagnostic error and leading to a cascade of further unnecessary investigations with additional inconvenience and anxiety for the patients concerned (12).

An Irish study done in 2014 aimed to encourage Sensible Test Ordering Practice to reduce the requesting of selected pathology tests by 50% in the Emergency Department of a large Irish teaching hospital. The study demonstrated that the aim was achieved through quality improvement following identification and careful selection of the optimal intervention (13).

In the Kingdom of Saudi Arabia (KSA), A retrospective study was done in 2016 to investigate the major causes of pre-analytical errors that led to sample rejection at the clinical biochemistry department in the laboratory of Hera'a General Hospital, Makkah city. This study also detected an overall specimen rejection rate of 23.72% from the emergency department (ED), which might be related to workload and pressured environment in the ED (14).

As the unnecessary testing is expensive, inefficient, and requires additional technical resources (15), the aim of this study was to assess the practice of laboratory tests in the emergency room requested by emergency physicians at King Faisal Hospital, Taif, KSA, 2019.

## Methodology

**Study design and time frame:** This study was a cross-sectional study done from August to October 2019.
Study setting: This study was done at King Faisal Hospital, Taif, Saudi Arabia.

**Sampling methodology:** A simple random sampling methodology was used to choose the first patient file, where a randomly selected number between one, two or three was used. For example: if the number one was picked, the first file became the first one selected, and then a sample interval of 5 was used to systematically select files that would be included in the study.

Files of patients of both sexes, including those over the age of 18 who visited the emergency room with any complaints were included. The files of patients under the age of 18 and in critical conditions were excluded. After the exclusion criteria, 340 files were the study sample.

**Study instrument:** Data was collected through a predesigned checklist, where all laboratory tests requested by the emergency doctor were reviewed and recorded.

The variables included in the checklist were demographic data, questions related to chronic diseases, the analyses that were requested, whether the tests were normal or abnormal, and whether the expected diagnosis was reached or not and what was the expected diagnosis.

A pilot testing was done among 10 patient files. The experience of the questionnaire ensured that inconsistent questions were corrected and modified before managing to collect actual data.

**Ethical considerations:** Ethical approval for the study was obtained from the Research Ethics Committee of Academic Affairs and Training in Taif Health. Approval and permission were obtained from King Faisal Hospital in Taif. The confidentiality of the data was stressed and it was not used for anything except the study.

*Statistical analysis:* Data was analyzed using (SPSS) version 23. Qualitative data was expressed as numbers and percentages, and Chi- squared test ($\chi2$) was used to test the relationship between variables. Quantitative data was expressed as mean and standard deviation (Mean ± SD), where Mann-Whitney and Kruskal Wallis Tests were applied to test the relationship between variables. A p-value of <0.05 was considered as statistically significant.

## Results

(Table 1) shows that 65% of the studied sample were males, 35% had an age ranging from 18-30 years, and 81.1% were of Saudi nationality. Of the participants, 25.9% had chronic diseases, and 9.4% had multiple diseases comorbidities.

(Figure 1) shows that according to the diseases the participants had, 12.6% of patients had HTN, 12.4% had DM and 5.6% had CVD.

As for the lab. tests requested for the participants, CBC was requested for 97.9% of patients, where 19.4% of the requested tests were normal, LFT was requested for 82.9% where 65% of the requested tests were normal Urea/creatinine test was requested for 84.1% of the participants , where 52.6% of the test results were normal, and electrolytes testing was requested for 88.5% of the participants and for 43.2% of them the test was normal (Figure 2).

Vitamin D testing was requested for 42% of the participants, where 1.8% of the test results were normal, and blood sugar testing was requested for 12.1% of the participants and for 0.6 % of them the test was normal (Figure 3).

(Figure 4) shows that the possible diagnosis of the participants was CVD for 7.1%, renal colic for 5.9% of them. On the other hand, 45% of the participants were not diagnosed.

(Table 2) shows that the mean number of lab tests done for all patients was (6.82 ± 1.86). There was a highly significant relationship between the number of tests requested and the presence of chronic disease, comorbidities, where patients with chronic diseases and those with comorbidities had a higher mean number of requested tests (p=< 0.05). On the other hand, a non-significant relationship was found between the number of tests requested and whether these tests led to the accurate diagnoses (p=> 0.05).

**Table 1: Distribution of the studied patients according to their demographic characters and the presence of chronic diseases and comorbidities (No.=340)**

| Variable | No. (%) |
|---|---|
| **Gender** | |
| - Male | 221 (65) |
| - Female | 119 (35) |
| **Age** | |
| - 18-30 | 119 (35) |
| - 31-40 | 70 (20.6) |
| - 41-50 | 48 (14.1) |
| - above 50 | 103 (30.3) |
| **Nationality** | |
| - Saudi | 278 (81.1) |
| - Non-Saudi | 62 (18.2) |
| **Chronic diseases** | |
| - Absent | 252 (74.1) |
| - Present | 88 (25.9) |
| **Comorbidity** | |
| - Absent | 252 (74.1) |
| - One chronic disease | 56 (16.5) |
| - Multiple diseases | 32 (9.4) |

**Figure 1: Distribution of the studied patients according to diseases they had**
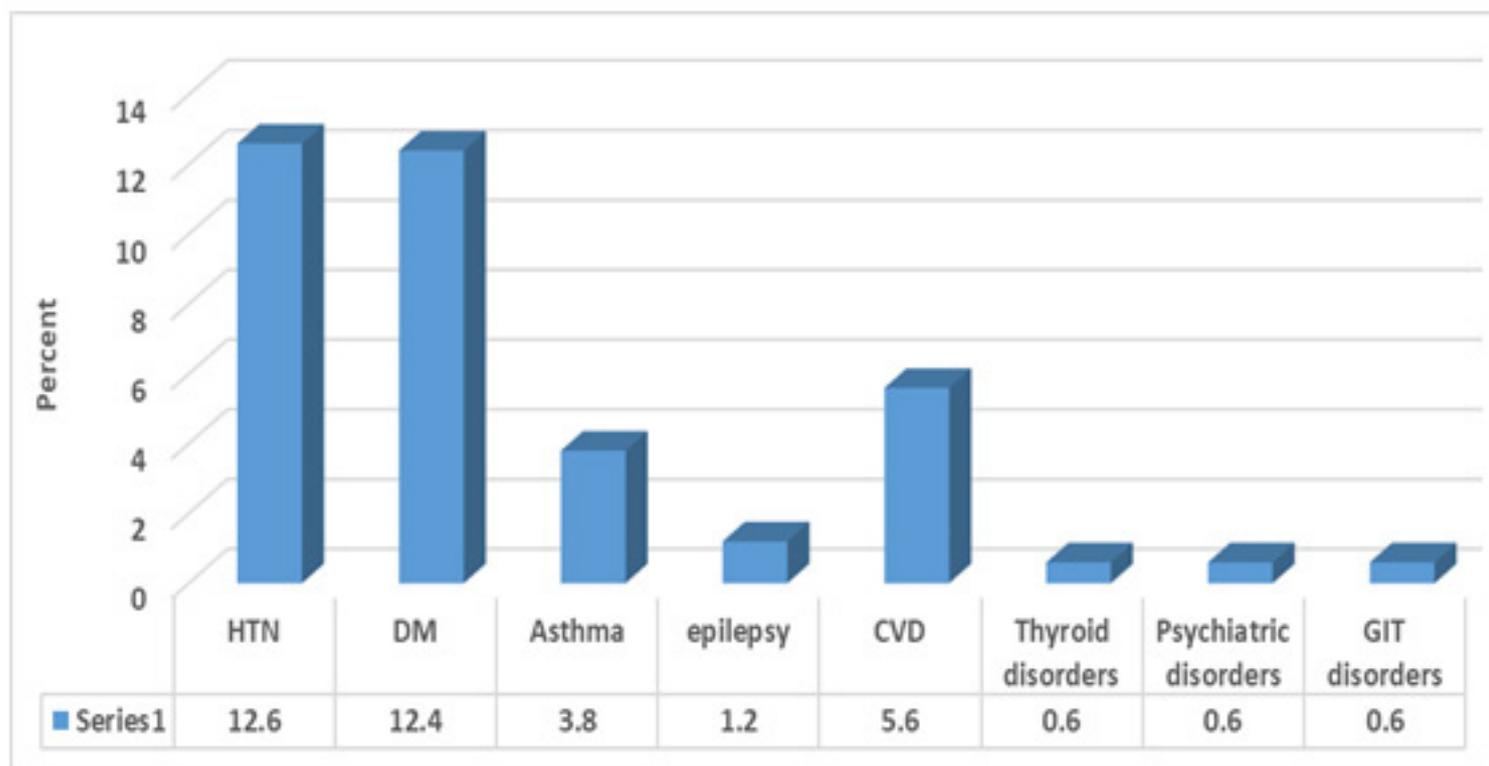


| | HTN | DM | Asthma | epilepsy | CVD | Thyroid disorders | Psychiatric disorders | GIT disorders |
|---|---|---|---|---|---|---|---|---|
| Series1 | 12.6 | 12.4 | 3.8 | 1.2 | 5.6 | 0.6 | 0.6 | 0.6 |

**Figure 2. Distribution of the studied patients according to the laboratory tests requested for them and the percent of normal results for every test**



| | CBC | LFT | RFT | TSH | Amylase | Lipase | Urea/Creatinine | Electrolyte | Cardiac Enzyme | Vitamin B12 |
|---|---|---|---|---|---|---|---|---|---|---|
| ■ Requested test | 97.9 | 82.9 | 87.9 | 2.4 | 45 | 37.4 | 84.1 | 88.5 | 40 | 0.6 |
| ■ Percent of normal tests | 19.4 | 65 | 70.6 | 1.5 | 40.9 | 26.2 | 52.6 | 43.2 | 23.8 | 0 |
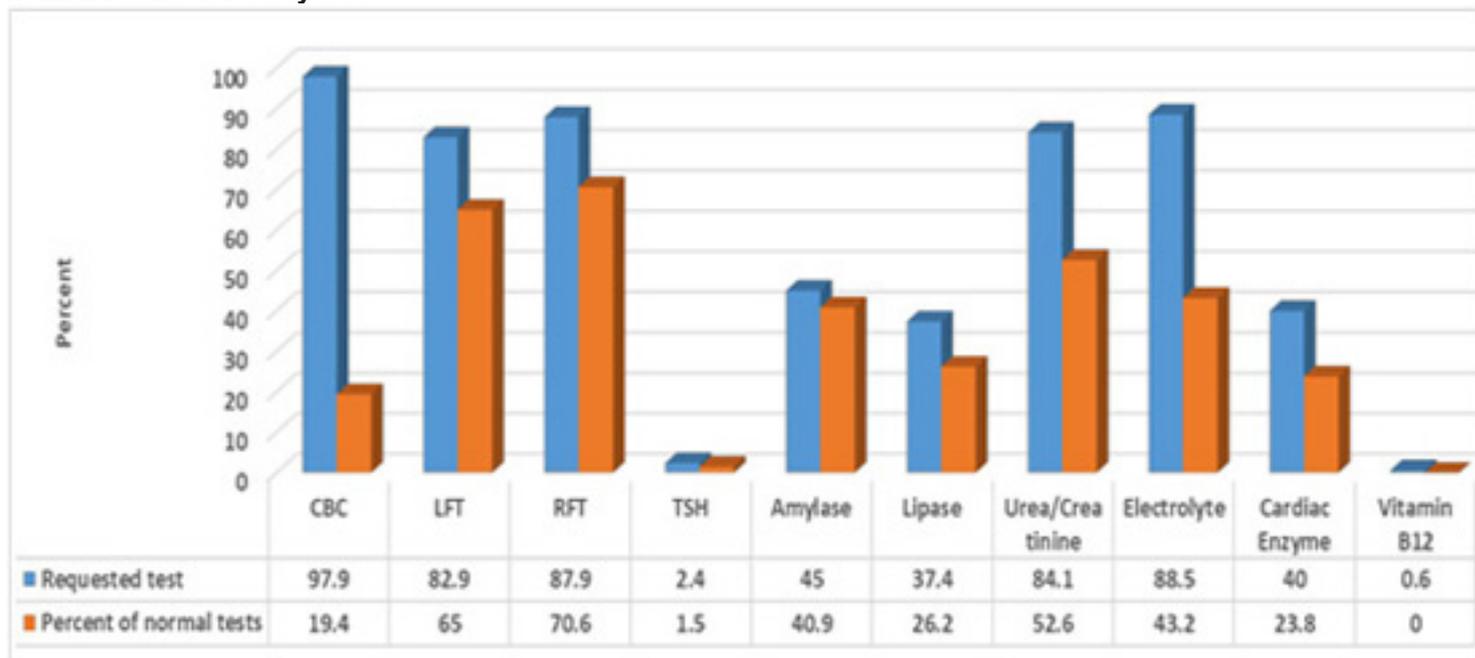
**Figure 3. Distribution of the studied patients according to the laboratory tests requested for them and the percent of normal results for every test….(continued)**



| | Vitamin D | Urine Analysis | Blood Sugar | Coagulation Profile | Lipid Profile | Uric Acid | Creatine kinase | Albumin | Brucella Test | FSH/LH | CRP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ■ Requested tests | 42 | 5.3 | 12.1 | 4.7 | 2.1 | 1.8 | 5.9 | 0.9 | 1.2 | 0.3 | 0.3 |
| ■ Percent of normal tests | 1.8 | 4.4 | 0.6 | 0.6 | 0.3 | 0.3 | 0 | 0 | 1.2 | 0 | 0.3 |
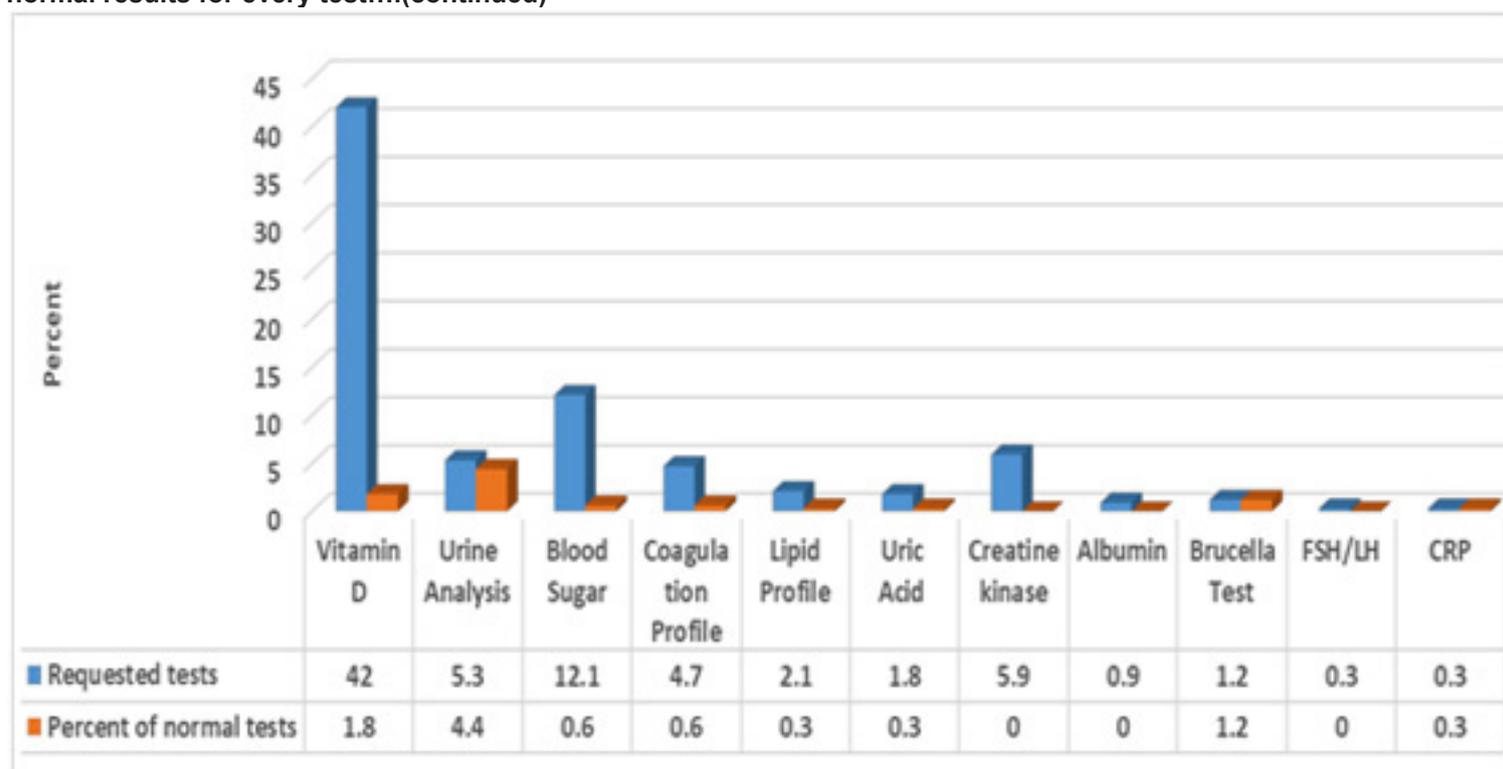
**Figure 4. Distribution of the studied patients according to the possible diagnosis**



| | UTI | Gastroenteritis | Renal Colic | Epilepsy | High Blood Sugar | RTI | High Blood Pressure | Arthritis | CVD | Not Diagnosed | Others |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Series1 | 2.9 | 5.6 | 5.9 | 2.9 | 4.1 | 3.2 | 1.8 | 2.9 | 7.1 | 45 | 18.5 |
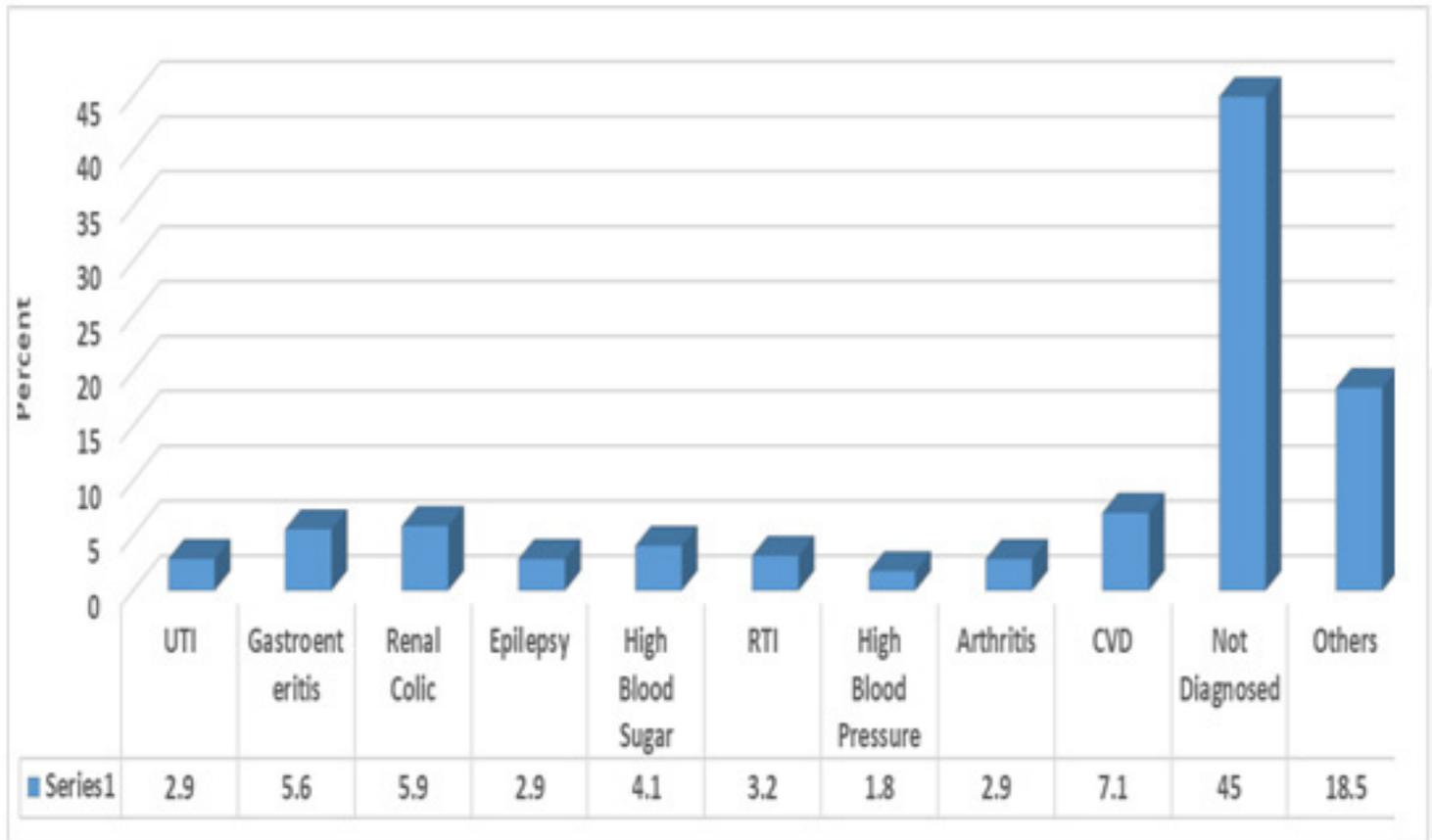
**Table 2. Relationship between the number of tests requested and the presence of chronic disease, comorbidities and whether the patient was diagnosed**

| Variable | (Number of tests requested) Mean ± SD | Test | p-value |
|---|---|---|---|
| Chronic diseases <br> - Absent <br> - Present | 633 ±1.62 <br> 8.8 ±1.2 | 8.03* | < 0.001 |
| Comorbidity <br> - Absent <br> - One disease <br> - Multiple diseases | 6.33 ±1.62 <br> 7.65 ±1.62 <br> 9.15± 1.76 | 72.77** | < 0.001 |
| Diagnoses <br> - Diagnosed <br> - Not diagnosed | 6.86 ±1.78 <br> 6.77 ± 1.95 | 0.2* | 0.84 |
| Mean number of lab tests done for all patients | 6.82 ± 1.86 | | |

N.B.:
* Mann-Whitney U
**Kruskal Wallis Test

## Discussion

The emergency laboratory is important in the management and diagnosis of the diseases of patients admitted to the emergency department. Characterized by high priority in processing and analysis, optimal and adequate use and request for laboratory tests contribute significantly to the overall quality and efficiency of laboratory services (16,17). Overuse of the laboratory tests is a noticeable event in many laboratories, especially in the ED. This may be due to doctors trying to provide the patient admitted to the ED with high-quality care, doctors are unwittingly subject to excessive demand for laboratory tests as well as a lack of awareness of the costs of laboratory testing (18).

The aim was to rationalize applications, reduce inappropriate testing and costs, as well as improve patient care. In this study, a comprehensive cross-sectional study of the requested lab tests by doctors in the ED at King Faisal Hospital in Taif city was done for 340 patients. All laboratory tests requested by doctors for these patients were reviewed, with a total of 2,052 laboratory tests for 340 patients.

In our study the frequencies the laboratory tests are requested for the studied patients, is similar to the most commonly used test requests as they are often requested together. As CBC was requested for 97.9% of patients, LFT was requested for 82.9%, electrolytes testing was requested for 88.5%, Urea/creatinine test was requested for 84.1%. These frequencies are in line with previous studies, where laboratory tests which are considered indispensable for the Emergency Department are: CRP, and leukocytes, urea and creatinin, sodium and potassium, and haemoglobin (6). It also agrees with a study conducted at the Zagreb University Hospital Center, where the most common tests were full blood count, urea nitrogen in the blood, creatinine, electrolytes and C-reactive protein, which are ordered together in 76% of patients (16). These studies demonstrated that doctors involved with the ED report that clinical chemical laboratory tests are among the most relevant tools for the purposes of diagnosis, following patient history and physical examination (11).

In the present study the frequency of requesting laboratory tests and the percentage of normal tests shows that there is a non-selective use of laboratory tests for patients admitted to the emergency department. As 65% of LFT tests were normal, 52.6% of Urea/creatinine tests were normal and 43.2% of electrolyte tests were normal.

This result goes along with a study done in Pakistan, where 62.2% of blood tests requested at the emergency department of a tertiary care hospital were found to be inappropriate, and only 3.8% influenced the diagnosis (19). Another study observed that more than half of abnormal results from laboratory tests ordered by physicians could be false-positive (2,20).

In the present work, the least requested test was the CRP and all tests were normal. This result = goes along with the American Academy of Allergy, Asthma & Immunology and the American Society of Clinical Pathology guidelines. The guidelines stated that incorrect tests that preferred substitutes include the CRP as it is more sensitive and specific for inflammatory conditions than erythrocyte sedimentation rate (ESR) (21).

The present study showed that patients with chronic diseases and those with comorbidities had a higher mean number of requested tests, and a non-significant relationship was found between the number of tests requested and whether the patient was diagnosed. This result agrees with previous study that showed that only a limited number of laboratory tests are essential for early medical decision making at the Emergency Department (6). And it is in line with a previous study done in Pakistan where 62.2% of investigations done on studied patients seen in the ER with one of the diagnoses covered by the Guidelines were inappropriate for the initial assessment of the patient. In this study, only 3% of the requested tests influenced patient care in the ER and 4% influenced the decision of admission (19).

The cause for inappropriate investigations could be the ER physicians themselves. A previous study found that 92% of ER doctors request imaging and laboratory tests for reassurance (22), and as a defensive medicine as 50% of physicians operating in emergency departments were concerned about the possibility of malpractice litigation (8). In addition, other studies found that 30% of ER physicians order unnecessary tests for reassurance and obtaining Information, and to avoid missing a low-probability diagnosis (8,23).

A study was done in KSA in 2014 to identify unnecessary laboratory tests ordered at King Faisal Specialist Hospital and Research Center, Jeddah, Saudi Arabia on one million laboratory tests done in 2012. This overutilization of lab tests in Saudi hospitals is shown by a previous study which found that more than 11% of requested tests were repeated, overutilized and unnecessary and could be removed. The three tests of CBC, Renal Profile and Blood Glucose accounted for 35% of all hospital inpatient lab tests (24).

The required inappropriate and non-selective tests can lead to a deterioration in the quality of care provided due to delays in diagnosis and false positive misleading results. In addition, they incur increased costs and burden on the laboratory (20).

**Limitations**
A limitation of the present study is the small sample size. That is why future studies with a larger sample is recommended

## Conclusion

In the present study CBC was requested for 97.9% of patients, LFT was requested for 82.9% (65% of tests were normal), electrolytes testing was requested for 88.5% (43.2% of tests were normal), and Urea/creatinine test was requested for 84.1% (.52.6% of tests were normal). Patients with chronic diseases and those with comorbidities had a higher mean number of requested tests, and a non-significant relationship was found between the number of tests requested and whether the patient was diagnosed. There was an overuse of laboratory tests at the ED which necessitates choosing the necessary analyses for each patient and to implement orientation, education and training of physicians on the ways to decrease unnecessary lab test ordering and the costs of the ordered tests.

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# The most desired values of high and low density lipoproteins and triglycerides in the plasma

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## Abstract

Background: We tried to understand the most desired values of high density lipoproteins (HDL), low density lipoproteins (LDL), and triglycerides in the plasma.

Methods: Patients with plasma HDL values lower than 40 mg/dL were collected into the first, lower than 46 mg/dL into the second, lower than 50 mg/dL into the third, and 50 mg/dL and higher into the fourth groups.

Results: We studied 256 cases (153 females). The mean age, female ratio, body mass index (BMI), fasting plasma glucose (FPG), LDL, white coat hypertension (WCH), hypertension (HT), and diabetes mellitus (DM) were the highest in the fourth group. Whereas coronary heart disease (CHD) was the highest in the first group in contrast to the lowest HDL and LDL values. The mean age, female ratio, BMI, FPG, WCH, DM, and CHD were the lowest in the second group. There was a positive correlation between plasma triglycerides values and smoking. Conclusions: The highest mean age, female ratio, BMI, FPG, WCH, HT, and DM parallel to the highest HDL and LDL, and the highest CHD in contrast to the lowest HDL and LDL values may show initially positive but eventually negative acute phase proteins functions of HDL and LDL. Due to the lowest mean age, female ratio, BMI, FPG, WCH, DM, and CHD, the most desired values of HDL may be between 40 and 46 mg/dL. Additionally, the most desired values of LDL were in between 80 and 100 mg/dL, and the triglycerides were lower than 60 mg/dL in our previous studies.

Key words: High density lipoproteins, low density lipoproteins, triglycerides, acute phase proteins, atherosclerosis, aging, metabolic syndrome

## Introduction

Chronic endothelial damage may be the most common type of vasculitis, and the leading cause of end-organ insufficiencies, aging, and death in the human being (1-4). Much higher blood pressure (BP) of the afferent vasculature may be the major underlying mechanism by inducing recurrent injuries on vascular endothelium. Probably, whole afferent vasculature including capillaries are mainly involved in the process. Therefore the term of venosclerosis is not as famous as atherosclerosis in the literature. Due to the chronic endothelial damage, inflammation, edema, and fibrosis, vascular walls thicken, their lumens narrow, and they lose their elastic nature, which eventually reduces blood flow to the terminal organs and increases systolic BP further. Some of the well-known underlying causes and indicators of the inflammatory process are physical inactivity, sedentary lifestyle, animal-rich diet, smoking, alcohol, overweight, hypertriglyceridemia, dyslipidemia, impaired fasting glucose, impaired glucose tolerance, white coat hypertension (WCH), chronic inflammation and infections, and prolonged cancers for the development of terminal consequences including obesity, hypertension (HT), diabetes mellitus (DM), cirrhosis, peripheric artery disease (PAD), chronic obstructive pulmonary disease (COPD), coronary heart disease (CHD), chronic renal disease (CRD), mesenteric ischemia, osteoporosis, stroke, other end-organ insufficiencies, early aging, and premature death (5-8). Although early withdrawal of the underlying causes can delay terminal consequences, after development of HT, DM, cirrhosis, COPD, CRD, CHD, PAD, mesenteric ischemia, osteoporosis, stroke, other end-organ insufficiencies, and aging, endothelial changes cannot be reversed completely due to their fibrotic nature. The underlying causes and terminal consequences are researched under the titles of metabolic syndrome, aging syndrome, and accelerated endothelial damage syndrome in the literature, extensively (9-11). Although their normal limits have not been determined clearly yet, increased plasma triglycerides values may be one of the most sensitive indicators of the metabolic syndrome (12-15). Due to the growing evidence about the strong association between higher plasma triglycerides and prevalence of CHD, Adult Treatment Panel (ATP) III determined lower cutpoints for triglycerides abnormalities than did ATP II (16, 17). Although ATP II determined the normal plasma triglycerides values as lower than 200 mg/dL in 1994 (17), World Health Organisation in 1999 (18) and ATP III in 2001 reduced the normal limits as lower than 150 mg/dL (16). Although these cutpoints, there are still suspicions about the safest values of plasma triglycerides in the plasma (13-15). Beside that despite the higher sensitivity of plasma triglycerides in the metabolic syndrome, basic functions and desired values of high density lipoproteins (HDL) and low density lipoproteins (LDL) are still suspicious (19). We tried to understand the most desired values of HDL, LDL, and triglycerides in the plasma.

## Material and Methods

The study was done in the Internal Medicine Polyclinic of the Dumlupinar University between August 2005 and March 2007. Consecutive patients at the age of 15 years and greater were included into the study. Medical history of the cases including HT, DM, COPD, and already used medications were learned, and a routine check up including fasting plasma glucose (FPG), HDL, LDL, and triglycerides was performed. Current daily smokers with six pack-months and cases with a past of three pack-years were accepted as smokers. Due to the very low prevalence of alcoholism in Turkey (20), we did not include regular alcohol intake into the study. Patients with devastating illnesses including type 1 DM, malignancies, acute or chronic renal failure, chronic liver diseases, hyper- or hypothyroidism, and heart failure were excluded to avoid their possible effects on body weight. Additionally, anti-hyperlipidemic drugs, metformin, and acarbose users were excluded to avoid their possible effects on blood lipid profiles and body weight (21, 22). Body mass index (BMI) of each case was calculated by the measurements of the Same Physician instead of verbal expressions. Weight in kilograms is divided by height in meters squared (16). Patients with an overnight FPG value of 126 mg/dL and higher on two occasions or already using antidiabetic medications were defined as diabetics (16). An oral glucose tolerance test with 75-gram glucose was performed in cases with a FPG value between 110 and 126 mg/dL, and diagnosis of cases with a 2-hour plasma glucose value of 200 mg/dL and greater is DM (16). Additionally, office blood pressure (OBP) was checked after a 5-minute rest in seated position with a mercury sphygmomanometer on three visits, and no smoking was permitted during the previous 2 hours. A 10-day twice daily measurement of blood pressure at home (HBP) was obtained in all cases, even in the normotensives in the office due to the risk of masked HT after a 10-minute education session about proper BP measurement techniques (23). An additional 24-hour ambulatory blood pressure monitoring was not taken due to the similar effectivity with the HBP measurements (3). Eventually, HT is defined as a mean BP of 140/90 mmHg and higher on HBP measurements, and WCH as an OBP of 140/90 mmHg and higher but a mean HBP measurement of lower than 140/90 mmHg (23). An exercise electrocardiogram is performed just in cases with an abnormal electrocardiogram and/or angina pectoris. Coronary angiography is taken just for the exercise electrocardiogram positive cases. So CHD is diagnosed either angiographically or with the Doppler echocardiographic findings as the already developed movement disorders in the cardiac walls. The spirometric pulmonary function tests were performed in required cases after the physical examination, and the criterion for diagnosis of COPD is post-bronchodilator forced expiratory volume in one second/forced vital capacity of less than 70% (24). Finally, patients with plasma HDL values lower than 40 mg/dL were collected into the first, lower than 46 mg/dL into the second, lower than 50 mg/dL into the third, and 50 mg/dL and higher into the fourth groups, respectively. The mean age, female ratio, smoking, BMI,

FPG, triglycerides, LDL, HDL, WCH, HT, DM, COPD, and CHD were detected in each group, and compared in between. Mann-Whitney U test, Independent-Samples T test, and comparison of proportions were used as the methods of statistical analyses.

## Results

The study included 256 cases (153 females and 103 males), totally. Parallel to the highest HDL values, the mean age, female ratio, BMI, FPG, LDL, WCH, HT, and DM were the highest in the fourth group. Whereas CHD was the highest in the first group in contrast to the lowest HDL and LDL values. Interestingly, the mean age, female ratio, BMI, FPG, WCH, DM, and CHD were the lowest in the second group. Triglycerides were the highest parallel to the highest prevalence of smoking in the second, and they were the lowest parallel to the lowest prevalence of smoking in the fourth groups. So there was a positive correlation between plasma triglycerides values and prevalence of smoking (Table 1).

## Discussion

Adipose tissue produces leptin, tumor necrosis factor-alpha, plasminogen activator inhibitor-1, and adiponectin-like cytokines acting as acute phase reactants in the plasma (25).

Excess weight-induced chronic low-grade vascular endothelial inflammation plays a significant role in the pathogenesis of accelerated atherosclerosis in the whole body (26). Additionally, excess weight leads to myocardial hypertrophy terminating with a decreased cardiac compliance. Combination of these cardiovascular risk factors eventually terminate with increased risks of arrhythmias, cardiac failure, and sudden cardiac death. Similarly, the prevalence of CHD and stroke increased parallel to the increased BMI in the other studies (27, 28), and risk of death from all causes including cancers increased throughout the range of moderate to severe weight excess in all age groups (29). The relationship between excess weight, elevated BP, and hypertriglyceridemia is described in the metabolic syndrome (12), and clinical manifestations of the syndrome include obesity, dyslipidemia, HT, insulin resistance, and proinflammatory and prothrombotic states (10). For example, prevalence of excess weight, DM, HT, and smoking were all higher in the hypertriglyceridemia group (200 mg/dL and higher) in one of our previous studies (30). On the other hand, the prevalence of hyperbetalipoproteinemia was similar both in the hypertriglyceridemia and control groups in the same study (30). Additionally, although the higher plasma trigycerides values, LDL values were also lower in the group with the plasma HDL levels lower than 40 mg/dL in the other study (p<0.001 for all) (31). Similarly, plasma triglycerides were higher in the first group with the lowest LDL and HDL values in the present study. On the other hand, the lowest

**Table 1: Characteristics of the study cases according to values of high density lipoproteins in the plasma**

| Variable | Lower than 40 mg/dL | p-value | Lower than 46 mg/dL | p-value | Lower than 50 mg/dL | p-value | 50 mg/dL and higher |
|---|---|---|---|---|---|---|---|
| Number | 75 | | 63 | | 45 | | 73 |
| Age (year) | 45.4 ±15.2 (16-79) | Ns* | 45.3 ±15.1 (19-78) | Ns | 46.5 ±13.5 (19-73) | 0.026 | 51.8 ± 11.6 (21-77) |
| Female ratio | 46.6% | Ns | 42.8% | 0.001> | 66.6% | 0.01> | 83.5% |
| Smoking | 34.6% | Ns | 36.5% | Ns | 24.4% | Ns | 17.8% |
| BMI† (kg/m²) | 27.2 ±4.5 (18.4-39.9) | Ns | 25.7 ±4.2 (18.6-34.3) | 0.024 | 27.7 ± 4.6 (19.6-36.0) | Ns | 29.3 ±6.1 (17.8-48.6) |
| FPG‡ (mg/dL) | 119.4 ±48.4 (76-287) | 0.006 | 97.6 ± 13.5 (67-154) | Ns | 114.9 ±59.0 (63-386) | Ns | 134.1 ±77.0 (74-400) |
| Triglycerides (mg/dL) | 162.7 ±92.8 (43-470) | Ns | 175.3 ±103.0 (27-617) | Ns | 144.9 ±72.2 (47-411) | Ns | 134.5 ±81.5 (37-418) |
| LDL§ (mg/dL) | 105.3 ± 33.1 (10-211) | 0.000 | 126.0 ±32.7 (39-197) | Ns | 134.7 ±36.6 (77-223) | Ns | 135.3 ±32.3 (54-239) |
| HDL‖ (mg/dL) | 34.1 ± 3.8 (22-39) | 0.000 | 42.8 ± 1.6 (40-45) | 0.000 | 47.5 ± 1.1 (46-49) | 0.000 | 58.2 ± 8.0 (50-91) |
| WCH** | 25.3% | Ns | 23.8% | Ns | 31.1% | Ns | 36.9% |
| HT*** | 10.6% | Ns | 11.1% | Ns | 17.7% | 0.05> | 28.7% |
| DM**** | 21.3% | 0.001> | 3.1% | 0.001> | 22.2% | Ns | 23.2% |
| COPD***** | 14.6% | Ns | 17.4% | Ns | 20.0% | Ns | 10.9% |
| CHD****** | 20.0% | 0.05> | 11.1% | Ns | 13.3% | Ns | 16.4% |

*Nonsignificant (p>0.05)   †Body mass index   ‡Fasting plasma glucose   §Low density lipoproteins   ‖High density lipoproteins
**White coat hypertension   ***Hypertension   ****Diabetes mellitus   *****Chronic obstructive pulmonary disease   ******Coronary heart disease

triglycerides value of the fourth group can be explained by the lowest prevalence of smoking and male ratio since there is a significant relationship between hypertriglyceridemia, smoking, and male ratio in the literature (32).

Alcohol and smoking cause a chronic inflammatory process on the vascular endothelium depending on the concentrations of products of alcohol and smoke in the blood. So both of them can cause an accelerated atherosclerosis, end-organ insufficiencies, early aging, and premature death. Thus both of them should be added into the major components of the metabolic syndrome. Atherosclerotic effects of smoking are the most obvious in Buerger's disease. It is an obliterative vasculitis characterized by inflammatory changes in the small and medium-sized arteries and veins, and it has never been reported in the absence of smoking in the literature. On the other hand, smoking in the human being and nicotine administration in animals may be associated with decreased BMI values. Nicotine supplied by patch after smoking cessation decreased caloric intake in a dose-related manner (33). According to an animal study, nicotine lengthens intermeal time and decreases amount of meal eaten (34). Additionally, the mean BMI seems to be the highest in the former, the lowest in the current, and medium in never smokers (35). Smoking may be associated with a postcessation weight gain (36). Similarly, although CHD was detected with similar prevalence in both genders, prevalence of smoking and COPD were higher in males against the higher BMI, LDL, triglycerides, WCH, HT, and DM in females (37). Similarly, the incidence of a myocardial infarction is increased six-fold in women and three-fold in men who smoke 20 cigarettes per day (38). In another definition, smoking may be more dangerous for women due to the associated weight excess and its consequences. So smoking is probably a powerful atherosclerotic risk factor with some suppressor effects on appetite (39). Smoking-induced weight loss may be related with the smoking-induced chronic vascular endothelial inflammation all over the body since loss of appetite is one of the major symptoms of the disseminated inflammation in the body. Physicians can even understand healing of the patients by means of normalizing appetite of them. Several toxic substances found in cigarette smoke get into the circulation by means of the respiratory tract, and cause a vascular endothelial inflammation until clearance from the circulation. But due to the repeated smoking habit, the clearance never terminates. So the patients become ill with loss of appetite, permanently. In another explanation, smoking-induced weight loss is an indicator of being ill instead of being healthy (33-35). After smoking cessation, appetite comes back with a prominent weight gain but the returned weight is their physiological weight, actually.

Although ATP III reduced the normal limits of plasma triglycerides as lower than 150 mg/dL in 2001 (16), much lower values may indicate better health conditions (13, 14). For example, in one of the above studies of ours (15), we included 875 cases (370 males), and the mean BMI was only normal in patients with plasma triglycerides values lower than 60 mg/dL. FPG, LDL, WCH, HT, DM, COPD, CHD, and CRD were all deteriorated parallel to the increased male ratio, smoking, aging, excess weight, and

plasma triglycerides values (15). Interestingly, the greatest number of deteriorations was observed just above the plasma triglycerides value of 60 mg/dL (15). Similar to the present study, prevalence of smoking was the highest in the group with the highest triglycerides values in the other study (14) which may also indicate the inflammatory role of smoking in the metabolic syndrome, since triglycerides may actually be one of the most sensitive acute phase reactants in the plasma. In the above study (14), the mean age, male ratio, smoking, BMI, FPG, WCH, HT, DM, and COPD increased parallel to the increased plasma triglycerides values from the first up to the fifth groups, gradually. On the other hand, increased plasma triglycerides values by aging may be secondary to the aging-induced decreased physical and mental stresses, which eventually terminate with onset of excess weight and its consequences. Although the borderline high triglycerides values (150-199 mg/dL) is seen together with physical inactivity and overweight, the high (200-499 mg/dL) and very high triglycerides values (500 mg/dL and greater) may be secondary to smoking, genetic factors, and terminal consequences of the metabolic syndrome such as obesity, DM, HT, COPD, cirrhosis, CRD, PAD, CHD, and stroke (16). But although the underlying causes of the borderline high, high, and very high plasma triglycerides values may be a little bit different, probably risks of the terminal consequences do not change in them. For example, prevalence of HT, DM, and COPD were the highest in the group with the highest triglycerides values in the above study (14). Eventually, although some authors reported that lipid assessment can be simplified as the measurements of total cholesterol and HDL values alone (40), the present study and most others indicated significant relationships between plasma triglycerides, HDL, and LDL values and terminal consequences of the metabolic syndrome (31, 41).

Cholesterol, triglycerides, and phospholipids are the major lipids of the body. Cholesterol is an essential structural component of the animal cell membrane, bile acids, adrenal and gonadal steroid hormones, and vitamin D. Triglycerides are the major lipids of the fat tissue of the body. Phospholipids are triglycerides that are covalently bound to a phosphate group, and regulate membrane permeability, remove cholesterol from the body, provide signal transmission across the membranes, act as detergents, and help in solubilization of cholesterol. Cholesterol, triglycerides, and phospholipids do not circulate freely in the plasma, instead they are bound to proteins, and transported as lipoproteins. There are five major classes of lipoproteins in the plasma. Chylomicrons carry exogenous triglycerides to the liver via the thoracic duct. Very low density lipoproteins (VLDL) are produced in liver, and carry endogenous triglycerides to the peripheral organs. In the capillaries of adipocytes and muscle tissue, VLDL are converted into intermediate density lipoproteins (IDL) by removal of 90% of triglycerides by lipases. Then IDL are degraded into LDL by removal of more triglycerides. So VLDL are the main source of LDL in the plasma, and LDL deliver cholesterol from the liver to the peripheral organs. Although the liver removes the majority of LDL from the circulation, a small amount is uptaken by scavenger receptors of the macrophages that migrate into the arterial

walls, and become the foam cells of atherosclerotic plaques. HDL remove fats and cholesterol from cells including the arterial wall atheroma, and carry the cholesterol back to the liver and steroidogenic organs such as adrenals, ovaries, and testes for excretion, re-utilization, and disposal. All of the carrier lipoproteins are under dynamic control, and are readily affected by diet, illness, drug, and weight excess. Thus lipid analysis should be performed during a steady state. But the metabolic syndrome alone is a low grade inflammatory process on vascular endothelium. Thus the metabolic syndrome alone may be a cause of abnormal lipoproteins levels in the plasma. On the other hand, although HDL are commonly called  'the good cholesterol' due to their role in removing excess cholesterol from the blood and protecting the arterial wall against atherosclerosis (42), recent studies did not show similar results, and low plasma HDL values may alert us to searching for some inflammatory conditions in the body (43-45). Normally, HDL show various anti-atherogenic properties including reverse cholesterol transport and anti-oxidative and anti-inflammatory properties (43). However, HDL may become 'dysfunctional' in pathological conditions which means that relative composition of lipids and proteins, as well as the enzymatic activities of HDL are altered (43). For example, properties of HDL are compromised in patients with DM due to the oxidative modification and glycation of HDL, as well as the transformation of HDL proteomes into the proinflammatory proteins. Interestingly, the mean FPG values and prevalences of DM were only 97.6 mg/dL and 3.1% in the group with the HDL values between 40 and 46 mg/dL against 124.0 mg/dL and 22.2% of the other groups in the present study (p= 0.002 and p<0.001, respectively). Additionally, three highly effective agents for increasing HDL levels including niacin, fibrates, and cholesteryl ester transfer protein inhibitors did not reduce all cause mortality, CHD mortality, myocardial infarction, and stroke (46). In other words, while higher HDL values may correlate with better cardiovascular health, specifically increasing one's HDL may not increase cardiovascular health (46). So they may actually be some indicators instead of the main actors in the metabolic syndrome. Beside that, HDL particles that bear apolipoprotein C3 are associated with increased risk of CHD (47). For example, although the similar mean age, gender distribution, smoking, and BMI in both groups, DM and CHD were higher in the group with the plasma HDL values lower than 40 mg/dL in the above study (31). Similarly, although the lower mean age, BMI, FPG, LDL, and HDL, the highest CHD of the first group may also indicate eventual functions of HDL as the negative acute phase proteins (APP) in the present study.

APP are a group of proteins whose plasma concentrations increase (positive APP) or decrease (negative APP) as a response to inflammation, infection, and tissue damage (48, 49). In case of inflammation, infection, and tissue damage, neutrophils and macrophages release cytokines into the blood. The liver responds by producing many positive APP to them. At the same time, productions of some other proteins are suppressed. Therefore these proteins are called negative APP. Some of the well-known negative APP are albumin, transferrin, retinol-binding protein, antithrombin, and transcortin. The suppression of such proteins is also used as an indicator of inflammation. The physiological role of suppressed synthesis of such proteins may be protection of amino acids for production of positive APP, sufficiently. Due to the same underlying cause, production of HDL and LDL may also be suppressed in the liver. In this way, although the similar mean age, gender distribution, smoking, and BMI in both groups, the higher triglycerides, DM, and CHD against the significantly lower HDL and LDL values can be explained in the above study (31). Similarly, although the lower mean age, BMI, FPG, LDL, and HDL, the highest CHD of the first group can also be explained by the same theory in the present study. Beside that although the mean triglycerides, fibrinogen, C-reactive protein, and glucose values were higher in cases with ischemic stroke, the oxidized LDL values did not correlate with the age, stroke severity, and outcome in another study (50). Additionally, significant alterations occurred in the lipid metabolism and lipoproteins compositions during infections, and plasma triglycerides increased whereas HDL and LDL decreased in another study (51). Furthermore, a 10 mg/dL increase of plasma LDL value was associated with a 3% lower risk of hemorrhagic stroke in another study (52). Similarly, in one of the previous studies (53), we included 815 cases (477 females), totally. The highest prevalence of HT and DM parallel to the increased plasma LDL and HDL values, and the highest prevalence of COPD, CHD, and CRD in contrast to the lowest plasma values of LDL and HDL may show initially positive but eventually negative APP functions of LDL and HDL in the metabolic syndrome, and the most desired values of LDL were in between 80 and 100 mg/dL in the plasma (53).

As a conclusion, the highest mean age, female ratio, BMI, FPG, WCH, HT, and DM parallel to the highest HDL and LDL, and the highest CHD in contrast to the lowest HDL and LDL values may show initially positive but eventually negative APP functions of HDL and LDL. Due to the lowest mean age, female ratio, BMI, FPG, WCH, DM, and CHD, the most desired values of HDL may be between 40 and 46 mg/dL. Additionally, the most desired values of LDL were in between 80 and 100 mg/dL, and the triglycerides were lower than 60 mg/dL in our previous studies.

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# Quality of life of older patients attending a general hospital in Baghdad/Iraq

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# Abstract

**Background:** The older population in Iraq is under researched and studies about quality of life (QoL) are not available. The attitude of older people towards their QoL is individualistic and can be influenced by cognitive and emotional factors within the social and cultural context.

**Objectives:** To assess the QoL of a group of 60+years old outpatients and identify its association with socio-demographic and clinical variables

**Methods:** A cross-sectional study was conducted on 300 consenting male and female outpatients in Medical City Hospital, Baghdad 2019, through a direct interview using the Arabic modified version of the World Health Organization Quality of Life (WHO-QOL-BREF). The association of QoL with the socio-demographic and clinical variables were tested. Data were statistically analyzed using tools for the mean score, variance analysis, t-test, and chi-square test. The results were discussed accordingly.

**Results & Conclusion:** The participants' mean age was 67.2±6.3 years, with a comparable male to female ratio. Most of the patients were married, educated, financially independent. Chronic medical disorders affected around half of the patients, 15% of them had psychiatric disorders. More than half of the patients showed a moderate (acceptable) level of subjective satisfaction with their QoL. The QoL was significantly affected by the gender, level of education, occupation, socioeconomic status, and with joint and respiratory problems. This study emphasized the decisive role of family confinement, social support, and autonomy in promoting QoL and mitigating the adverse effect of aging through adaptation and resilience. Future studies are called for to fill the data gap and help in developing better health and a social care system for older people in Iraq.

**Key words:** Quality of Life, older patients, Iraq

## Introduction

According to the World Health Organization (WHO), most developed countries have accepted the chronological age of 65+ years as a definition of 'elderly.' The United Nations (U.N.) agreed cutoff is 60+ years to refer to the older population since it represented a more accurate portrayal of significant life changes like retirement from work, loss of one's spouse, and social isolation[1]. The number of older people is increasing worldwide due to the improvement in health care services, even in developing countries. The World Bank reported that life expectancy at birth in high-income countries was 81 years and in the low-income countries 64 years and 72 years in the Arab world countries during 2018 [2]. At 1998, life expectancy at birth in Iraq was 71.7 years for females and 66.5 years for males and within two decades ; 2018 has risen to72.4 years for females, 68.4 years for males     (3). Although age-related disabilities may cause loss of social role and marginalization, many studies have indicated that aging alone does not necessarily impact the QoL negatively. Many elderly can enjoy a state of physical and mental well-being. The mechanism of how older adults evaluate their QoL can be highly individualistic, subjective, and inconclusive [4]. Garcia et al. have commented that "the individual opinion about well-being is the best means of knowledge"[5]. The older people are expressing their satisfaction with their lifestyle and differ in their mindset. Due to the global demographic changes, a heightened interest in researching the elderly's welfare through the bio-psycho-social approach using multiple tools for assessment of different dimensions of QoL using generic and specific instruments to measure health-related QoL.[6,7].In 1993, the WHO invented the WHOQOL-100 instrument. It was employed and proven valid in hundreds of studies on broad sectors of the population, and modified to many languages and versions [8]. The WHO defines QoL as an individual's perception of their position in life in the context of the culture and value systems they live in, in consideration of their goals and expectations. This broad concept incorporates an individual's physical health, psychological state, social relationships and correlations to the environment .The WHOQOL scale serves different purposes and helps in formulating comprehensive health policies; its use in clinical and non-clinical settings involves study groups from the elderly population [9]. Like other Arab countries, religious and cultural traditions and beliefs in Iraq ensure respect and protection to the elderly. Their family members (spouse, son, or daughter) are entitled to look after them prudently. Abyad, Ashour, and Abou-Saleh (2001), stated that sending older parents to nursing homes is perceived as immoral behavior and an unwelcome step[10]; in contrast, a loving and respectful attitude toward the older people enhances their subjective and objective dimensions of QoL. Many previous studies employed the original WHOQOL-100, WHOQOL-BREF, and the modified WHOQOL-OLD in Western countries. However, such studies are not much available in Iraq, where people of 56+ years old constituted 3.55% of the general population in 2018 [11]. The QoL of older people in Iraq warrants further study to fill the data gap and formulate a proper geriatric health care system.

## Methods

**Study setting**

This study is a part of a research project submitted to the Iraqi Council of Medical Specializations (ICMS) to fulfill the fellowship requirements in psychiatry. Formal and ethical approval was granted by the Scientific and Ethics Committee of the ICMS. This work was carried out at the Geriatric Outpatient Clinic in the Medical City Teaching Hospital, Baghdad. Usually, about 20 patients 60+ years old attend the clinic daily seen by two specialized doctors who book them for follow-up. The patients were offered the option to register in this study and signed a statement of consent. The participants were directly interviewed privately for 20 minutes using the Arabic version of the WHOQOL-BREF instrument, along with a separate form of sociodemographic and clinical characteristics. Enrolled patients were also subjected to the Mini-Mental State Examination to assess cognitive functioning   . Patients with hearing or speech disabilities were excluded. 300 male and female patients participated in this study and completed the questionnaire forms from 1st March to 31st July 2019. Patients with psychiatric disorders were referred to the consultant psychiatrist for diagnosis following the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) guidelines.

**Study tools**

The WHOQOL-BREF questionnaire consists of 26 scored items distributed in four domains: 1-physical health, 2-psychological health, 3-social, and 4-environment. The mean score of each domain is a result of cumulative scores of included items rating the subjective satisfaction of QoL in a positive direction (i.e., the higher the score, the better QoL). The raw data was submitted for statistical analysis using the Statistical Package for Social Scientific, version 25 (SPSS-25). Simple measures of frequency analyzed data, percentage, range (minimum-maximum values) mean scores, analysis of the variance, t-test, and chi-square test. The significance of difference (qualitative data) was tested using Pearson's chi-square test ($x2$-test) to apply Yates's correction or Fisher exact test whenever applicable. Likert Scale of 0-5 continuum (Strongly agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly disagree (1), was used to measure the responses in a summative assessment. A P-value of less than 0.05 was statistically significant. [8,9].

## Results

A total of 300-outpatients participated with the response rate of 100%. The mean age was 67.2±6.3 years with comparable male: female ratio, mostly married and literate. 14% of the patients were government and self-employed, and the majority resided in Baghdad with their families with an 'adequate' income as shown in Table 1. Most of the patients have chronic medical disorders, mostly hypertension, diabetes mellitus (D.M.), back and joint problems, while psychiatric disorders represented 15.7% of disorders, as shown in Table 2. The mean score of four domains were as follows: Mean ±SD (range);

1-Physical: 21.0 ± 3.6 (12-28),

2-Psychological: 12.0 ± 2.1 (5-17),

3-Social: 6.9 ± 2.1 (2-10),

4-Environment: 20.2 ± 4.4 (8-32) .

The total mean scores were; 60.7 ± 8.9 (34-79). The response of "acceptable " rating the level of subjective satisfaction with QoL was comparable in the four domains; the highest level of the response " good " is in the social (47.7%); while the response of "poor" is the highest (49.7%) in the environment domain as shown in Figure 1. When testing the co-relation of sociodemographic characteristics with QoL, a statistically significant association (P-value <0.05) is found with gender, education, occupation, and socioeconomic status. A significant association is found with having a current or chronic medical disorder in general, to specify, back and joint problems, recovered CVA, diseases of the respiratory system.

## Table 1. Socio-Demographic characteristics of the older patients attending Medical City Hospital in Baghdad

| Age (years) | Range | No | % |
|---|---|---|---|
| | <65y | 122 | 40.7 |
| | 65-74 | 141 | 47 |
| | 75-80+ | 37 | 12.3 |
| | Male | 160 | 53.3 |
| | Female | 140 | 46.7 |
| Marital status | Never married | 12 | 4.0 |
| | Married | 201 | 67.0 |
| | Widowed & divorced | 87 | 29 |
| Education | Illiterate | 59 | 19.7 |
| | Primary | 78 | 26.0 |
| | Secondary | 78 | 26 |
| | College/university | 80 | 26.7 |
| | Higher education | 5 | 1.7 |
| Occupation | Retired | 140 | 46.7 |
| | Self-employed | 14 | 4.7 |
| | Unemployed | 118 | 39.4 |
| | Government employee | 28 | 9.3 |
| Socio-economic status | Adequate | 145 | 48.3 |
| | Good/ Very good | 78 | 26 |
| | Not adequate | 77 | 25.7 |
| Residence | Urban | 258 | 86.0 |
| | Sub-urban | 29 | 9.7 |
| | Rural | 13 | 4.3 |
| Type of living | With close family member | 254 | 84.7 |
| | With relative | 22 | 7.3 |
| | Alone | 24 | 8.0 |

Mean ± SD (Range) 67.2±6.3 (60-89)

| Table 2. Clinical Characteristics of the older patients attending Medical City Hospital in Baghdad | | |
|---|---|---|
| **Associated Medical Disorders** | **No** | **%** |
| | | |
| **Current Medical Problem** | 52 | 17.3 |
| **Chronic Medical Disorder** | 218 | 72.7 |
| Diabetes mellitus(DM) | 134 | 44.7 |
| Hypertension | 174 | 58 |
| Back &joint problem | 137 | 45.7 |
| Recovered (CVA) | 3 | 1.0 |
| Cardiovascular diseases | 62 | 20.6 |
| Benign Prostatic Hypertrophy (BPH) | 10 | 6.3 |
| Malignancy | 4 | 1.3 |
| Thyroid dysfunction | 11 | 3.7 |
| Respiratory disease | 36 | 12 |
| Gastrointestinal disorders | 34 | 11.3 |
| Ophthalmological problem | 3 | 1.0 |
| Urinary tract problem | 6 | 2.0 |
| **Psychiatric Disorders** | | |
| Anxiety | 10 | 3.4 |
| Depression | 12 | 4 |
| Obsessive-Compulsive Disorder | 4 | 1.4 |
| Stable psychotic disorder | 9 | 3 |
| Somatizations | 12 | 3.9 |

## Table 3. Association QoL level of satisfaction with the socio-demographic characteristics of the patients

| | | Poor (<60) | | Acceptable (60-79) | | Good (=>80) | | P value |
|---|---|---|---|---|---|---|---|---|
| **Age (years)** | **Range** | **No** | **%** | **No** | **%** | **No** | **%** | |
| | <65 years | 45 | 34.4 | 77 | 45.6 | - | - | |
| | 65-74 | 64 | 48.8 | 77 | 45.6 | - | - | |
| | 75-80+ | 22 | 16.8 | 15 | 8.8 | - | - | 0.151 |
| **Gender** | Male | 59 | 45.0 | 101 | 59.8 | - | - | 0.011* |
| | Female | 72 | 55.0 | 68 | 40.2 | - | - | |
| **Marital status** | Single | 4 | 3.1 | 8 | 4.7 | - | - | |
| | Married | 79 | 60.3 | 122 | 72.2 | - | - | 0.076 |
| | Widowed & divorced | 48 | 36.6 | 39 | 23 | - | - | |
| **Education** | Illiterate | 40 | 30.5 | 19 | 11.2 | - | - | |
| | Primary school | 39 | 29.8 | 39 | 23.1 | - | - | 0.0001* |
| | Secondary school | 22 | 16.8 | 56 | 32.2 | - | - | |
| | College/university graduate | 29 | 22.1 | 51 | 30.2 | - | - | |
| | Higher education | 1 | 8.0 | 4 | 2.4 | - | - | |
| **Occupation** | Retired | 47 | 35.9 | 93 | 55.0 | - | - | |
| | Self-employed | 5 | 3.8 | 9 | 5.3 | - | - | |
| | Unemployed | 72 | 5517.6 | 46 | 27.2 | - | - | 0.0001* |
| | Governmental employee | 7 | 5.3 | 21 | 12.4 | - | - | |
| **Socio-Economic Status** | Adequate | 59 | 45.0 | 86 | 50.9 | - | - | 0.0001* |
| | Good/ Very good | 13 | 9.9 | 65 | 38.5 | - | - | |
| | Not adequate | 59 | 45.0 | 18 | 10.7 | - | - | |
| **Residence** | Urban | 107 | 81.7 | 151 | 89.3 | - | - | |
| | Sub-urban | 16 | 12.2 | 13 | 7.7 | - | - | 0.153 |
| | Rural | 8 | 6.1 | 5 | 3.0 | - | - | |
| **Living circumstances** | With family member | 109 | 83.2 | 145 | 85.8 | - | - | |
| | With relatives | 11 | 8.4 | 11 | 6.5 | - | - | 0.793 |
| | Alone | 11 | 8.4 | 13 | 7.7 | - | - | |

*Significant difference between proportions using Pearson Chi-square test at 0.05 level.

| Table 4. Associations of QoL level of satisfaction with clinical characteristics of the patients | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Poor (<60) | | Acceptable (60-79) | | Good (=>80) | | P value |
| Associated Medical Disorders | | No | % | No | % | No | % | P Value |
| Current Medical Problem | | 9 | 6.9 | 43 | 25.4 | - | - | |
| Chronic Medical Disorder | | 104 | 79.4 | 114 | 67.5 | - | - | 0.0001* |
| DM | Yes | 65 | 49.6 | 69 | 40.8 | - | - | |
| | No | 66 | 50.4 | 100 | 59.2 | - | - | 0.129 |
| Hypertension | Yes | 81 | 61.8 | 93 | 55.0 | - | - | |
| | No | 50 | 38.2 | 76 | 45.0 | - | - | 0.236 |
| Joint Problem | Yes | 80 | 42.7 | 57 | 25.4 | - | - | |
| | No | 111 | 57.3 | 154 | 74.6 | - | - | 0.001* |
| Recovered CVA | Yes | 3 | 2.3 | - | - | - | - | |
| | No | 128 | 97.7 | 169 | 100 | - | - | 0.048* |
| Cardiovascular diseases | Yes | 32 | 12.2 | 30 | 9.5 | - | - | |
| | No | 115 | 87.8 | 154 | 90.5 | - | - | 0.445 |
| BPH | Yes | 5 | 8.5 | 5 | 5.0 | - | - | |
| | No | 54 | 91.5 | 96 | 95.0 | - | - | 0.374 |
| Malignancy | Yes | 1 | 0.8 | 3 | 1.8 | - | - | |
| | No | 130 | 99.2 | 166 | 98.2 | - | - | 0.449 |
| Thyroid disorder | Yes | 5 | 3.8 | 6 | 3.6 | - | - | |
| | No | 126 | 96.2 | 163 | 96.4 | - | - | 0.903 |
| Disease of respiratory system | Yes | 10 | 7.6 | 26 | 15.4 | - | - | |
| | No | 121 | 92.4 | 143 | 84.6 | - | - | 0.040* |
| Gastrointestinal disorder | Yes | 17 | 5.3 | 17 | 3.6 | - | - | |
| | No | 125 | 94.7 | 163 | 96.4 | - | - | 0.449 |
| Ophthalmological Problem | Yes | 1 | 0.8 | 2 | 1.2 | - | - | |
| | No | 130 | 99.2 | 167 | 98.8 | - | - | 0.717 |
| Urinary tract problem | Yes | 4 | 3.1 | 2 | 1.2 | - | - | |
| | No | 127 | 96.9 | 167 | 98.8 | - | - | 0.251 |
| Psychiatric Disorders | | | | | | - | - | |
| Anxiety | | 6 | 26.6 | 4 | 25.0 | - | - | |
| Depression | | 8 | 34.2 | 4 | 34.6 | - | - | |
| OCD | | 1 | 1.3 | 3 | 5.8 | - | - | 0.540 |
| Recovered psychotic disorder | | 6 | 11.4 | 3 | 13.4 | - | - | |
| Somatization disorder | | 7 | 6.3 | - | - | - | - | |

*Significant difference between proportions using Pearson Chi-square test at 0.05 level.

Figure 1. Distribution of the mean scores of QoL in the four domains
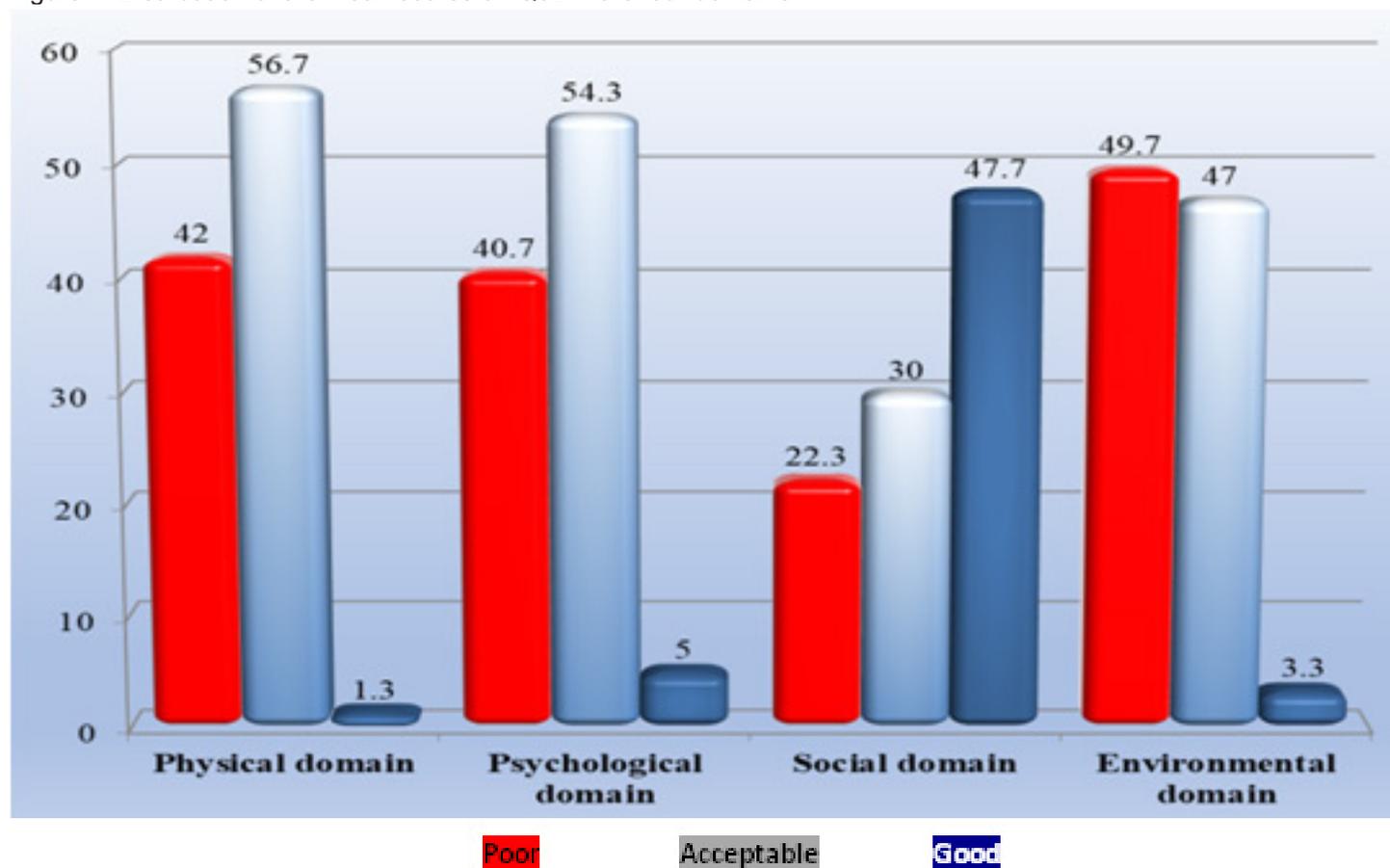


## Discussion

The Arabic modified version of the WHOQOL-BREF instrument was implemented in Iraq for the first time, two decades ago [12], and many Arab authors found it useful to apply to different population sectors [13,14]. In a cross-sectional study, we chose a convenient sample of older patients attending the geriatric clinic in a central teaching hospital in Baghdad. This represents a sociodemographic profile of which most of them were urban, educated, financially independent: either live on pension or working and reside with their families. The high level of literacy can be attributed to the national campaign for eradication of illiteracy during the 1970s and free college education [15,16]. Hypertension, D.M., back and joint problems affected most of the attendees to this clinic. The prevalence of psychiatric disorders in this group is much lower than what Andreas et al., Volkert et al. revealed in their studies [17,18]. It is also lower than Ibrahim et al. found in the elderly residing with their families or others residing in nursing homes in Baghdad [19]. Al Abbudi and Ezzat found high rates of depression, dementia, and schizophrenia among elderly attending a psychiatric hospital [20]. Shihab, Sabah, & Natiq reported a comparable prevalence; 23%, among elderly attending primary health care centers in Baghdad [21]. This variation could be attributed to differences in methodology and culture. Patients with severe psychiatric disorders usually attend consultation psychiatric clinics, and patients with dementia were excluded from this study. Most of the patients perceived their QoL as "acceptable " in general and "good" in the domain of social relationships attributed to the social support and confinement provided by their families, financial

autonomy, and absence of disabling medical conditions. These factors seem to enhance the social position and the morale of the elderly in general [4,6,10,22,23]. Raazi J et al. and Qadri et al. also found 'acceptable and good" levels of QoL of elderly in India [24,25]. The total mean score for the four domains in this study: 60.7 ± 8.9 (34-79), is higher than what Onunkwor et al. found, 51.8 (±2.7), in his study about residents in elderly homes in Malaysia [26]. Netuveli & Blane, Garcia, et al., and Knesebeck et al., indicated that financial independence, self-realization, comfortable social contact, and shared leisure activities are the leading factors in promoting QoL [4,5,27]. These factors were also manifested by the significant association of QoL with education, occupation, socioeconomic status: P-value (0. 0001). Among the medical conditions that negatively affect the QoL: back and joint problems had the highest association with QoL, P value 0.001, followed by CVA and diseases of the respiratory system. Hypertension and D.M. did not affect the patient's satisfaction with their QoL, like what Kumar et al. found in India [22]. Also, Wandell et al., and Al-Shehri et al. concluded that D.M. affects the QoL mostly through its complications in their studies in Nordic countries, and Saudi Arabia [28,29]. The difference in association with a different dimension of QoL confirms the effect of individual variation in life profile and self-perception across different cultures [23,30,31]. In Iraq, nursing homes for the elderly are few and underdeveloped, and most people perceived their residents as ''abandoned'' against religious beliefs and social tradition [10,32]. Therefore, vulnerable elderly or those who live alone because of war losses or forced displacement are in urgent need of proper health and social care by the government and civil society [32].

## Conclusion

The overall level of subjective satisfaction with their QoL was 'acceptable' or average, comparable to previous studies. The positive sociodemographic characteristics and the stability of their medical problems promote the moral and social position.

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# Physical activity profile among Saudi adults in Abha City, Saudi Arabia

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# Abstract

**Objective:** To describe the physical activity (PA) profile and its determinants among attendants of primary healthcare (PHC) centers in Abha City, Saudi Arabia.

**Subjects and methods:** A cross-sectional study design was followed to include 404 Saudi adults aged 19-65 years who attended PHC centers in Abha City. A self-administered questionnaire was designed by the researchers and was used for data collection. It consisted of three parts, i.e., personal characteristics, participants' PA assessment by the Arabic short form of the International Physical Activity Questionnaire  (IPAQ), while the third part included inquiry about barriers against PA.

**Results:** Most participants (80%) reported low level of PA, whereas 17.1% reported moderate PA. High level of PA was reported among only 12 participants (3%). Vigorous physical activities were practiced by only 4% of participants, whereas moderate physical activities were practiced by only 3%, and walking was practiced by 49.8%. Regarding duration of sitting (minutes/day), 40.3% reported sitting periods more than 360 minutes/day. Moderate and high physical activities were more practiced by males than females (21.5% and 3.4% versus 12.6% and 2.5%, respectively, p=0.046). Barriers to PA included unavailability of suitable places to exercise, being not sure of the ability to exercise efficiently, believing that exercise is hard work, and being embarrassed to exercise.

**Conclusions:** Most Saudi adults attending PHC centers in Abha City have low level of PA. Males have significantly higher PA than females. There are several barriers against PA. Overcoming these barriers will contribute to improvement in PA among the Saudi population.

**Key words:** Physical activity, IPAQ, Primary health care, Risk factors, Saudi Arabia.

## Introduction

Physical activity (PA) represents a wide range of body movements generated by the skeletal muscles and utilization of energy above the baseline level. It includes routine daily activities, exercise, and active sports (1). Exercise is an active repetitive form of PA that is designed to improve the body fitness (2). PA, particularly exercise, enhances health and well-being through improving bone quality, strengthening muscles, increasing the capacity of cardiovascular system, and reducing depression and anxiety (3, 4).

Scientific evidence has supported introducing exercise as the essential components of health promotion programs directed toward the general population (1). The American Heart Association (AHA) recommends "at least 150 minutes per week of moderate intensity aerobic activity or 75 minutes of vigorous activity for optimal health"(5).

In Saudi Arabia, studies showed low PA and a general tendency to sedentary life style, which leads to increasing rates of obesity, diabetes mellitus, and cardiovascular diseases (6-11). The cultural factors represent the main obstacle for adults to exercise and to sustain the physically active lifestyle, despite many health education campaigns having been conducted. A study found that only 15% of Saudi college males practice adequate PA to gain substantial health benefits(12).

The present study aimed to describe the physical activity profile and its determinants among attendants of primary healthcare centers in Abha City, Saudi Arabia.

## Subjects and Methods

Following a cross-sectional design, this study was conducted at primary health care (PHC) centers belonging to the Ministry of Health (MOH) in Abha City, Kingdom of Saudi Arabia (KSA). The target population of the present study were patients attending PHC centers since they constitute a more representative sample for the Saudi population than patients who attend general or specialized hospitals.

The inclusion criteria were being Saudi adult patients, aged 19-65 years, who attend governmental PHC centers in Abha City.

Using Epi-Info software (Version 7), and an estimated prevalence of physical activity of 54% (13), at 95% confidence level, and 5% estimated error, the minimum sample size for the present study was calculated to be 382 participants. However, the sample size was increased to 404 participants to compensate for any possible missing data.

Data collection was performed during January – May, 2019. Two PHC centers were selected by a simple random method technique. A systematic sampling technique was followed to select patients from a waiting list in the selected PHC centers. As patient frequency was about 25 patients per day for each center, 5 patients were selected daily from each PHC center (i.e., every fifth patient).

Based on thorough review of relevant literature, a self-administered questionnaire was designed by the researchers and was used for data collection. It consisted of three parts, as follows:
**1-** Socio-demographic characteristics of participants: Age, gender, marital status, educational level, job, smoking history, history of chronic diseases. Participants' weight and height measurements were assessed by trained nurses. Body mass index (BMI) was calculated and classified into: Underweight (BMI <18.5 kg/m2), Normal (BMI 18.5–24.9 kg/ m2), Overweight (BMI 25–29.9 kg/ m2), or Obese (BMI ≥ 30 kg/m2).
**2-** The Short Form  of the International Physical Activity Questionnaire (IPAQ) (14). .

The IPAQ short version estimates how much health enhancing physical activity, including daily life activities and exercise, the person has undertaken over the previous 7 days. The reliability and validity of the questionnaire was tested across 12 countries(15). The findings suggest that it is an acceptable tool for use in many settings and in different languages, and is suitable for use in regional, national and international monitoring and surveillance system and for use in research projects and public health program planning and evaluation (16) .

The IPAQ included questions about PA of 3 intensities (i.e., vigorous physical activity, moderate physical activity, and walking). The physicians had to estimate how many days (frequency) he/she was physically active and the average time (duration) that he/she spent being physically active on these days. We calculated the total physical activity, MET or metabolic equivalent (MET min/week), as suggested in the Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire for the sum of walking, and moderate, and vigorous physical activity(17).

The tool asks for times that the individual spent in walking, moderate- and vigorous-intensity physical activities. The volume of activity can be computed by weighting each type of activity by its energy requirements (METs). METs are multiples of resting metabolic rate and a MET- minute is computed by multiplying the MET score of activity by the minutes performed (14). Metabolic equivalent (MET) is a unit used to estimate the metabolic cost (oxygen consumption) of physical activity. One MET equals the resting metabolic rate of approximately 1 kcal/kg/h. MET-minutes is the rate of energy expenditure expressed as METs per minute multiplied by minutes of a specific activity (18).

Using the Ainsworth et al. compendium of the average MET score for each type of activity, the following values were used for the analysis of IPAQ data (19):
•         walking at work = 3.3 METs,
•         cycling for transportation = 6.0 METs,

- moderate yard work = 4.0 METs,
- vigorous intensity in leisure = 8.0 METs

IPAQ classifies the subjects to three categorical (ordinal) levels based on intensity, duration and the frequency of the physical activity (15) .

**3-** Barriers for being physically active (12 items) as well as reasons for being physically active (7 items). Respondents who had low PA were asked to mention the barriers for being physically active. A 5-Likert scale ranging from strongly agree "1" to strongly disagree"5" was used in this part.

The statistical Package for Social Sciences (IBM, SPSS version 25) was used for data entry and analysis. Descriptive statistics (e.g., frequency, percentage, mean, range, standard deviation) and analytic statistics using chi-square test were applied. P-values <0.05 were considered as statistically significant.

The researchers fulfilled all the required official approvals prior to study conduction. Verbal consent to participate in the study was asked from each participant. All participants had the right not to participate in the study or to withdraw from it prior to completion. The researcher explained the purpose to all respondents. Confidentiality and privacy were guaranteed for all participants throughout all steps of the research. This study was carried out at the full expense of the researchers, and there is no conflict of interest.

## Results

Table 1 summarizes the personal characteristics of 404 participants. Slightly more than half of them (50.7%) were males. Their age ranged between 19 and 65 years with a Mean±SD of 35.2 ±10 years. Almost two-thirds (69.1%) were married. The majority (87.6%) were university educated. More than half of participants (53.5%) were a government employee, whereas 10.1% were retired. Prevalence rate of current smoking among participants was 10.1%, whereas that of ex-smoking was 5.2%. There was history of chronic diseases among 13.9% of the participants. More than one-third of participants (38.4%) were overweight, whereas 32.4% were obese. Most participants (80%) reported low level of physical activity, whereas 17.1% reported moderate level of physical activity. High level of physical activity was reported among only twelve participants (3%).

As shown in Figure 1, vigorous physical activities (e.g., heavy lifting, digging, aerobics) were practiced by only 4% of patients, whereas moderate physical activities (e.g., carrying light loads, bicycling at a regular pace) were practiced by only 3% of participants, whereas walking was practiced by 49.8%.

Regarding duration of sitting (minutes/day), Figure 2 shows that 40.3% of participants reported sitting periods more than 360 minutes/day.

Table 2 shows that moderate and high physical activities were significantly more practiced by males than females (21.5% and 3.4% versus 12.6% and 2.5%, respectively, p=0.046). However, there was no statistically significant associations between participants' physical activity and their age, marital status, educational level, body mass index, history of chronic diseases, or history of smoking.

Table 3 shows that the commonest barriers of practicing physical activities as reported by those who had low physical activity (n=323) was presence of too few suitable places to exercise in their region (58.5%), followed by being not sure of their ability to exercise efficiently (37.2%), believing that exercise is hard work and they would be fatigued by it (35%) and they are too embarrassed to exercise (30.3%). Not sufficient energy for exercise because of health problems and having other recreational activities to do with friends were mentioned by 28.8% and 26.3% of the participants, respectively, as barriers for practicing physical activities.

**Table 1: Personal characteristics of the participants (n=404)**

| Personal characteristics | | No. | % |
|---|---|---|---|
| Gender | | | |
| • | Male | 205 | 50.7 |
| • | Female | 199 | 49.3 |
| Age (years) | | | |
| • | 19-25 | 77 | 19.1 |
| • | 26-35 | 139 | 34.4 |
| • | 36-45 | 129 | 31.9 |
| • | >45 | 59 | 14.6 |
| • | Range | 18-65 | |
| • | Mean±SD | 35.2±10.0 | |
| Marital status | | | |
| • | Single | 109 | 27.0 |
| • | Married | 279 | 69.1 |
| • | Divorced/widowed | 16 | 3.9 |
| Educational level | | | |
| • | Below secondary school | 8 | 2.0 |
| • | Secondary school | 42 | 10.4 |
| • | University | 354 | 87.6 |
| Job | | | |
| • | Housewife | 33 | 8.2 |
| • | Not working | 79 | 19.6 |
| • | Governmental employee | 216 | 53.5 |
| • | Private sector employee | 35 | 8.7 |
| • | Retired | 41 | 10.1 |
| Smoking history | | | |
| • | Current Smoker | 44 | 10.9 |
| • | Ex-smoker | 21 | 5.2 |
| • | Non-Smoker | 339 | 83.9 |
| History of chronic diseases | | 56 | 13.9 |
| Body mass index | | | |
| • | Underweight | 12 | 3.0 |
| • | Normal | 106 | 26.2 |
| • | Overweight | 155 | 38.4 |
| • | Obese | 131 | 32.4 |
| Levels of physical activity | | | |
| • | Low | 323 | 80.0 |
| • | Moderate | 69 | 17.1 |
| • | High | 12 | 3.0 |

**Figure 1: Types of physical activities practiced by attendants of primary health care centers in Abha City, Saudi Arabia**
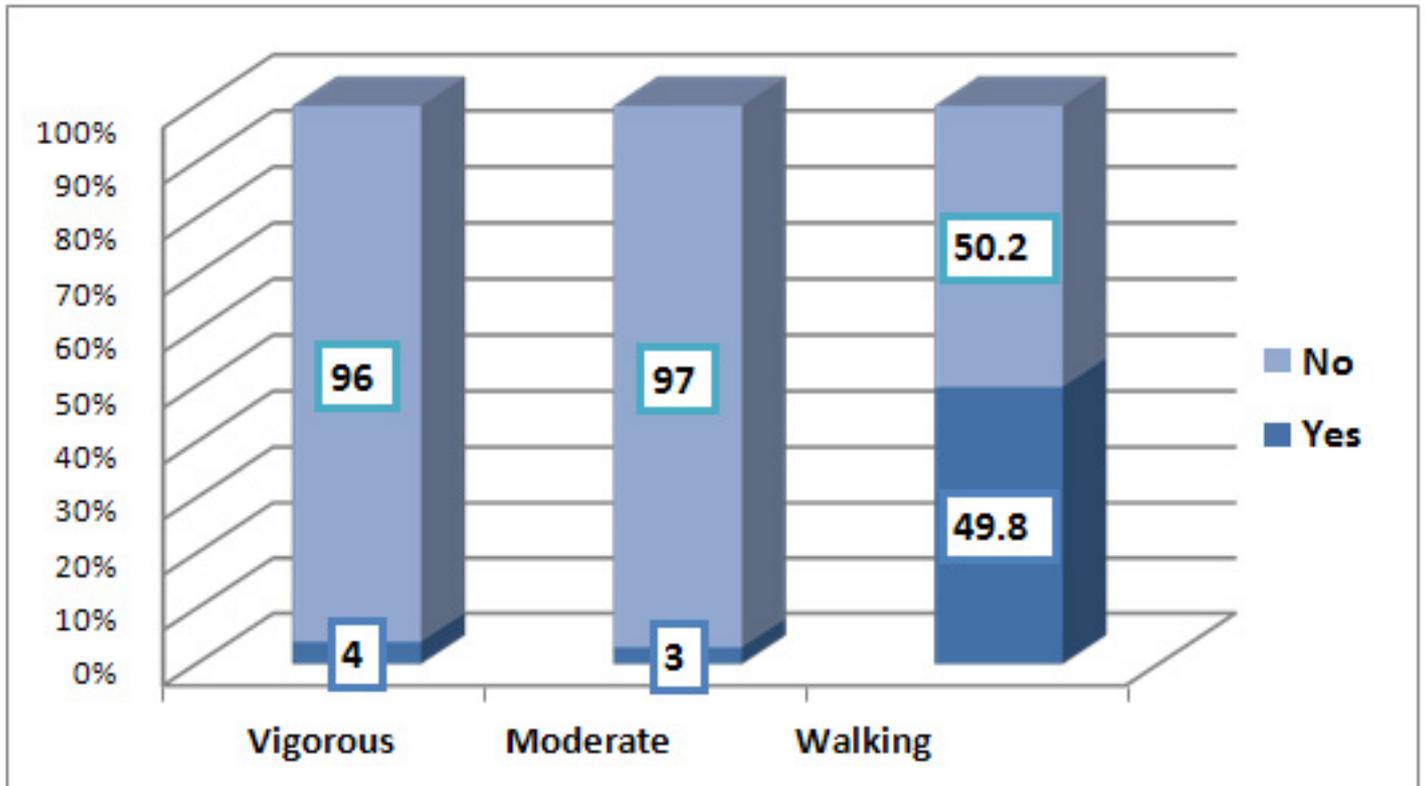


**Figure 2: Duration of sitting (in minutes/day) among attendants of primary health care centers in Abha City, Saudi Arabia**
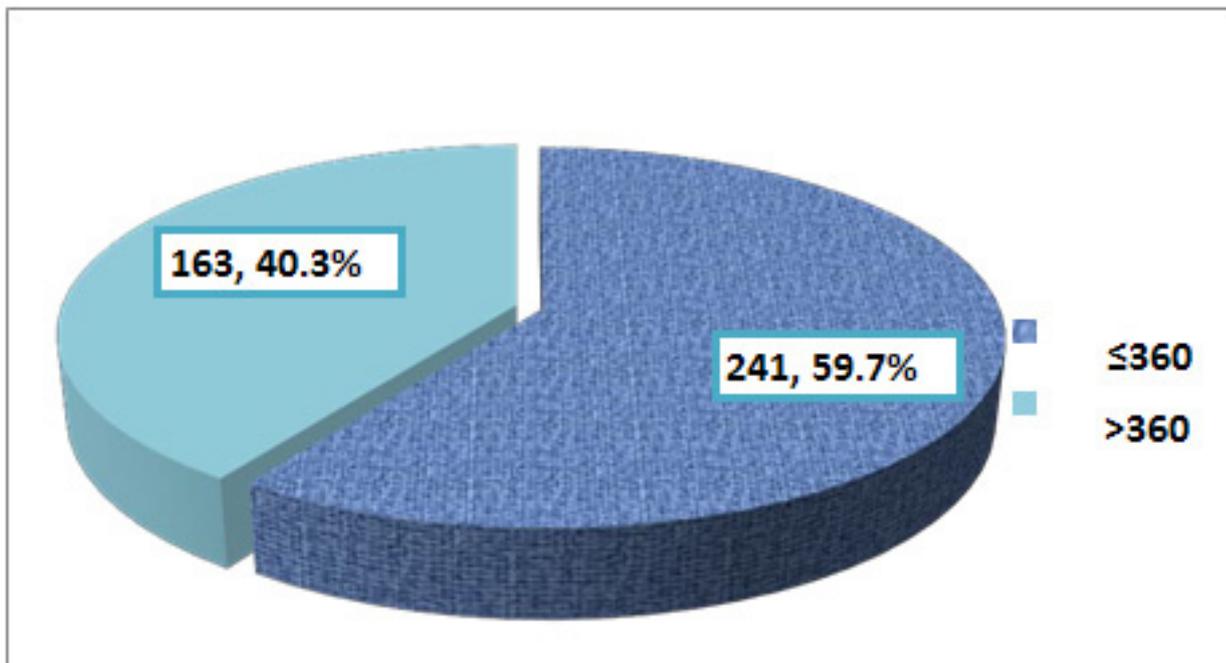
**Table 2: Association between physical activity and personal characteristics of attendants of primary health care centers in Abha City, Saudi Arabia**

| Personal characteristics | Levels of physical activity | | | P |
|---|---|---|---|---|
| | Low (n=323) | Moderate (n=69) | High (n=12) | Value |
| | No. (%) | No. (%) | No. (%) | |
| **Age (in years)** | | | | |
| • 18-25 | 58 (75.3) | 19 (24.7) | 0 (0.0) | |
| • 26-35 | 112 (80.6) | 22 (15.8) | 5 (3.6) | |
| • 36-45 | 101 (78.3) | 22 (17.1) | 6 (4.7) | |
| • >45 | 52 (88.1) | 6 (10.2) | 1 (1.7) | 0.165 |
| **Gender** | | | | |
| • Male | 164 (75.1) | 44 (21.5) | 7 (3.4) | |
| • Female | 169 (84.9) | 25 (12.6) | 5 (2.5) | 0.046 |
| **Marital status** | | | | |
| • Single | 84 (77.1) | 24 (22.0) | 1 (0.9) | |
| • Married | 226 (81.0) | 43 (15.4) | 10 (3.6) | |
| • Divorced/widowed | 13 (81.3) | 2 (12.5) | 1 (6.3) | 0.304 |
| **Educational level** | | | | |
| • Below secondary level | 7 (87.5) | 1 (12.5) | 0 (0.0) | |
| • Secondary | 30 (71.4) | 12 (28.6) | 0 (0.0) | |
| • University | 286 (80.8) | 56 (15.8) | 12 (3.4) | 0.211 |
| **Body mass index** | | | | |
| • Underweight | 10 (83.3) | 2 (16.7) | 0 (0.0) | |
| • Normal | 83 (78.3) | 20 (18.9) | 3 (2.8) | |
| • Overweight | 124 (80.0) | 27 (17.4) | 4 (2.6) | |
| • Obesity | 106 (80.9) | 20 (15.3) | 5 (3.8) | 0.972 |
| **History of chronic diseases** | | | | |
| • No | 279 (80.2) | 60 (17.2) | 9 (2.6) | |
| • Yes | 44 (78.6) | 9 (16.1) | 3 (5.4) | 0.522 |
| **History of smoking** | | | | |
| • Non-smoker (n=339) | 271 (79.9) | 57 (16.8) | 11 (3.2) | |
| • Smoker (n=44) | 36 (81.8) | 8 (18.2) | 0 (0.0) | |
| • Ex-smoker (n=21) | 16 (76.2) | 4 (19.0) | 1 (4.8) | 0.778 |

**Table 3: Barriers against practicing physical activity among attendants of primary health care centers in Abha city, Saudi Arabia (n=323)**

| Barriers | No. | % |
|---|---|---|
| Exercise is hard work. I am fatigued by it | 113 | 35.0 |
| I have not sufficient energy for exercise because of health problems | 93 | 28.8 |
| I have other recreational activities to do with friends | 85 | 26.3 |
| I am too embarrassed to exercise | 98 | 30.3 |
| I am not sure of my ability to exercise efficiently | 120 | 37.2 |
| There are too few suitable places to exercise in my region | 189 | 58.5 |
| I have no exercise facilities at home | 18 | 5.6 |
| My family and friends do not encourage exercising | 23 | 7.1 |
| I am giving priority to study and work than exercise | 11 | 3.4 |
| I have no time to exercise because of my academic curriculum and work | 7 | 2.2 |
| I have no time to exercise because of my family and social relationships | 8 | 2.5 |
| It costs too much money to exercise | 13 | 4.0 |

## Discussion

The present study revealed that most participants (80%) had low level of PA, whereas only 3% had high level of physical activity. Regarding the type of PA, vigorous activities were practiced by only 4% of participants, whereas moderate activities and walking were practiced by 3% and 49.8%, respectively.

The low PA observed in this study is not surprising, as it has been reported by several other studies carried out in Saudi Arabia among the general population.

In Riyadh, Saudi Arabia, Al-Hazzaa (20) reported that very few Saudi adults were vigorously active. However, nearly half of the population was moderately active and walk for at least 30 minutes or more per day. The prevalence of physical inactivity among both genders was 40.6%.

In an earlier study, Al-Hazzaa reported that prevalence of inactivity in Saudi Arabia ranged between 43.3% and 99% (21). Moreover, Al-Zalabani reported a rate of physical inactivity among the Saudi population as 66.6% (22). In accordance with our findings, a Saudi study carried out among adults aged between 30-70 years reported a high level of physical inactivity reaching up to 96.1% (23).

In the Gulf Cooperation Council countries, the prevalence of PA ranged between 39.0% and 42.1% for men and 26.3% to 28.4% for women(24).

A study carried out in Brazil among adults aged 20 years and above, using the IPAQ short-form instrument found that prevalence of physical inactivity was 41.1% (25). In Sri Lanka,(26) it was reported that 60% of the study subjects were in the 'highly active' category, while only 11% were 'inactive'. In South Asian countries, a systematic review (27) concluded that the overall prevalence of physical inactivity ranged between 18.5% and 88.4% in India, 60.1% in Pakistan and 11%-31.8% in Sri Lanka. In Iran, Nikniaz et al. (28) reported that 28.47% of adults were inactive, 27.96% were minimally active, and 43.55% had health-enhancing PA. In Poland, Łobaszewski et al. (29) observed that 43% of adults had not walked for at least 10 minutes in their leisure time during the last week. The majority did not engage in any moderate or vigorous PA.

Differences between rates of PA reported in the present study and those reported in other studies could be attributed to either a real variation in the PA or due to differences in methodology applied, sampling techniques, study population characteristics, assessment tools or methods of data collection.

In the current study, moderate and high physical activities were more practiced by male patients compared to female patients. Similarly, Al-Nozha et al. (23) reported that females aged between 30 and 70 years were significantly more inactive, compared to males (98.1% versus 93.9%, respectively). Also, Al-Hazzaa (20) reported that males were less engaged in moderate PA than females, whereas females were less engaged in vigorous PA compared with males. Al-Zalabani et al. (22) reported that prevalence of physical inactivity was higher in females than males (72.9% versus 60.1%, respectively).

In Sri Lanka, Katulanda et al. (26) reported that males had significantly higher weekly total MET minutes than females. In South Asian countries, females were more inactive compared to males (27). In Iran, Nikniaz and colleagues (28) reported that compared with women, men had significantly higher odds of being physically active.

The lower prevalence of PA among women in the present study was expected and it is most likely caused by cultural and social factors rather than biological factors, (30, 31) as in Saudi Arabia, within its conservative culture, women have restrictions to movement outside their homes and limited opportunities to attend health centers (32). Additionally, because of the hot climate most of the year, there is high dependency on air-conditioned automobiles. Moreover, having domestic assistants among most families seems to contribute to the low levels of PA among females (33).

In this study, although participants aged between 36 and 45 years were the most physically active, the difference from other age groups was not statistically significant. Al-Nozha et al. (23) observed that, with increasing age, physical inactivity increases. Al-Hazzaa (20) also reported that advancing age was significantly associated with physical inactivity. Al-Zalabani et al. (22) observed that people in the 55-64 year age group had a higher prevalence of physical inactivity compared to the other age groups. In Sri Lanka, those aged 70 years or above were more likely to be physically inactive (26).

Educational level was not significantly associated with level of PA in the present study. Other studies such as Al-Nozha et al. (23) observed that less educated adults were more physical inactive than more educated adults. Al Zalabani et al. (22) reported that people with higher education were less physically active in univariate analysis. However, after adjustment for confounders, this significance disappeared. In Sri Lanka, Katulanda et al. (26) reported that adults with tertiary education had lowest mean weekly total MET minutes. In Poland, Łobaszewski et al. (29) observed that adults with higher level of education were more physically active.

In the present study, body mass index and having chronic disease were not significantly associated with the PA level. This finding is in disagreement with those reported by several studies. In Sri Lanka, Katulanda et al. (26) reported that obese patients and those with hypertension, diabetes or metabolic syndrome were significantly associated with the risk of being physically inactive. In Iran, Nikniaz and colleagues (28) reported that normal weight adults were significantly more likely to participate in a high intense PA.

The difference between our findings and those of other studies may be attributed by that obesity among the Saudi population may be due to nutritional factors, such as overconsumption of unhealthy fast food, soft drinks, energy drinks, etc. (34).

In the present study, the commonest barriers to practicing physical activities as reported by participants who had low PA were presence of too few suitable places to exercise in their region, being not sure of their ability to exercise efficiently, believing that exercise is hard work and they are fatigued by it and they are too embarrassed to exercise. Other studies revealed lack of suitable places, time, financial limits and lack of facilities as a barrier to PA (35-37).

Among strengths of the present study was the use of IPAQ- short from Questionnaire-Arabic version to estimate the level of total PA, as it is a valid international tool. However, the self-reported nature of data collection regarding PA which may lead to over- or under-reporting of PA is considered a limitation. Moreover, the followed cross-sectional design is good for hypothesis generation rather than hypothesis testing. Finally, this study included attendants of PHC centers, thus the generalizability of our results should be taken with caution.

In conclusion, most Saudi adults attending PHC centers, in Abha City have a low level of PA. Males have significantly higher PA than females. There are several barriers against PA, including presence of few suitable places to exercise, being not sure of their ability to exercise efficiently, believing that exercise is hard work, and being embarrassed to exercise in public. Overcoming these barriers may contribute to the improvement of PA among the Saudi population. Moreover, since PA was lower among females, this group should be particularly addressed such as providing suitable places for both genders, particularly females, to practice physical exercise inside the health care facilities.

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# Coronavirus Environment vs Socio-Economic and Demographic Problems Followed: A Sociological Appraisal

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## Abstract

The paper searches the cause and effect impacts of the newly-found Coronavirus. The word "Corona" is currently used by all the people (7.7 billion) over the age of at least 3. The unprecedented disease is reflecting a large number of effects, infecting and killing many people of the rich and the poor. The new phenomenon is continuing rapidly. It brings about recessions and closures in many businesses, and laying off many employees and workers, and that has created income and security problems for the families. The new environment has imprisoned families inside homes, disrupting them from their normal and regular interactions. Such people are becoming frustrated indoors. The people confined at home are usually exposed and vulnerable to psychological disorders. Almost all those at school age, are banned from attending schools and higher educational institutions at all levels. So, the educational institutions are also losing much. The new phenomenon needs sociological appraisal from various viewpoints. What is currently happening, will create problems in post-Corona age. One of the problems that will demographically impact the world nations is "migration". Many people of the poor countries will move to more developed countries where they hope to earn their living. So, social demographers need to mind the future scenario. Poor economies will not easily be able to rehabilitate and reconstruct themselves. That is why a large migration wave will be quite likely to occur. Similarly, many countries will face increasing child labor and street children because of shortage of employment for the adults. The method of research used in the present research is of qualitative type--collecting the data through library resources and other media. Findings show that everybody is exposed to being affected, infected and killed through the Coronavirus.

Key words: Coronavirus. Migration. Recession. Child labor. Social demography.

## Introduction

The pandemic of newly-emerged coronavirus is observed almost everywhere in the world. The new virus has surprised all people in every country from top to bottom. All the means available have been used to control it, but yet increasing number of people are reported dead every day. The virus is changing every norm and value in different countries. All the socio-economic frames are being affected because of its deadly risks. Increasingly people are currently vulnerable via the coronavirus. Many (more elderly) lose lives in every corner of the world. So, corona deaths are changing relations in families; changing the real value of natural death, and surprisingly making many indifferent to the event of death. Increasing numbers of aging people who really need each other in old age, lose a spouse that is a great loss in the rest of their lives. Many marriage traditions are suspended and do not take place in due time. Coronavirus has also declined many deals and businesses leading to unemployment for an increasing number of people. The scenario is also leading to stressful deliveries and child bearing. Sociologically speaking, the phenomenon is facing a shortage of medical staff. Such a vacuum has contributed to the call back of many retired doctors and nurses to serve in their previous jobs. Similarly, lack of beds in hospitals has entailed not admitting many regular patients in need of treatment. Likewise, many medical staff while highly vulnerable against the corona infection, in some cases, die by the virus.

## Method of Research

The method used in preparing the present article is of qualitative type. In that, various paradigms have been used to find out the necessary facts and figures on coronavirus. Qualitative research as an accepted method of inquiry is well used in sociological investigations. The coronavirus issue is widely broadcast on different media, and people are objectively involved with that. Data on the issue is ever changing as it is a pandemic and constantly diffusing worldwide. In the current research, the researcher tried to access the most relevant sources to find the most relevant data to build the literature required. The data fed in the present article is hopefully reliable. The researcher hopes other sociologists will enter the issue, and propose constructive guidelines to calm and improve the present situation. Though literature on the issue is not limited, the author tried to investigate many different resources in order to elicit the necessary information to build up the text.

## Coronavirus vs Migration

Migration as a demographic event that happens when and where there is a work stress. So, after the defeat of Coronavirus, the weaker countries will not be in a position to provide jobs for those 15 years old and over. By then, increasing job seekers will move to the developed countries in search of jobs. Such migrations will take place for the sake of social mobility, economic achievements, familial relations, and educational attainments among the members of young generations etc.

But, as social demographers predict, granting refugee status would also be controversial. Due to antipathy towards the admission of migrants and refugees, a complicated situation will emerge. So, due prediction should be made. Anti-immigration mobilization and attitudes are what the world will witness in post-Coronavirus age. However, the Coronavirus-hit countries of the developing world will also lack young man power to build and develop their countries. Though the global world was created before, further cultural merges will take place. The Internet and social media have facilitated and created venues for migration, and at the same time, they could cause anti-immigrant perspectives. However, if harsh immigrant policies are adopted, confusion and conflicts will emerge.

Moreover, Coronavirus has changed attitudes toward natural death, changed family relations, loneliness, changed attitudes toward marriage. It has also changed business relations, disrupted deals, contracts and the like which all will lead to migration thereafter.

## Natural Death vs Covid-19 Death

The increasing and sudden deaths occurring because of coronavirus have decreased the value weight of natural deaths. People have almost created demotions towards the natural deaths in themselves. The survivors are not much affected and worried after the death of a family member as compared with the past patterns. So, a heavier vehicle has lowered the importance of the natural one. At the time of coronavirus, every individual thinks he/she will soon be infected and die by a sudden contact. So, everything is unstable at this critical time. However, during the non-coronavirus time, people used to take a lesson from the deaths of their near and dear, but the new type of deaths do not leave behind any such lessons.

At the time of pandemic deaths, empathy and sympathy decrease, and many people just think of their very immediate nears. The current phenomenon is a new experience for many people and nations since 1950 at least. Many of the existing people have not seen even cholera and malaria epidemics. In the past, even at the time of any epidemic outbreak, as there was not any motorized commuting, it only took the people of a certain location, and the spread was not as such.

**Table 1: Selected Countries by Total Cases and Total Deaths. March 28 and May 28, 2020**

| Country | Total Cases 28-Mar-2020 | Total Deaths 28-Mar-2020 | Total Cases 28-May-2020 | Total Deaths 28-May-2020 |
|---|---|---|---|---|
| World | 621.592 | 28.791 | 5.841.820 | 359.22 |
| USA | 105.161 | 1.722 | 1.752.091 | 102.525 |
| Italy | 86.498 | 9.134 | 231.732 | 33.142 |
| China | 81.394 | 3.295 | 82.995 | 4.634 |
| Spain | 72.248 | 5.812 | 283.849 | 27.118 |
| Germany | 53.340 | 399 | 182.202 | 8.552 |
| France | 32.964 | 1.995 | 182.913 | 28.596 |
| UK | 17.089 | 1.019 | 269.127 | 37.837 |
| Switzerland | 13.377 | 242 | 30.796 | 1.919 |
| Netherlands | 9.762 | 639 | 45.950 | 5.903 |
| Canada | 4.757 | 55 | 88.476 | 6.873 |
| Australia | 3.635 | 14 | 7.150 | 103 |
| Japan | 1.499 | 17 | 16.651 | 858 |
| South Africa | 1.170 | 01 | 25.937 | 552 |
| India | 933 | 20 | 164.936 | 4.673 |

Source: World meter Coronavirus, Population. March 28, 2020.
Novel Coronavirus (2019-n CoV) Situation Reports, World Health Organization (WHO).

## Appearance of Lonely Men and Women

Coronavirus while killing one partner, the other remaining party feels lonely and isolated. He/she has to support the family later in terms of economy, finance, emotions etc. In the post-Corona era, the countries would be able to have survivors under their supportive umbrella. As it mostly happens to elderly people, those who remain alive have a large number of problems including income, care, food preparation, sympathy, feeling of isolation, shortage of family integration etc. Such a situation would be more difficult for women than men who are Corona-hit. While men can usually marry after losing a spouse, women usually do not get such an opportunity. Such poverty would be there more in traditional developing countries rather than the modern developed countries where there are fewer stigmas and socio-cultural taboos. In developing countries where not many elderly people are insured, and do not often receive regular pensions, Coronavirus has the worse impacts on the families of Corona-infected people. Those suffering from dementia or Alzheimer's disease will be in a harder situation at the time of Coronavirus. They won't be able to keep aside, or remain at home like other people. Moreover, if a spouse of one of them dies by Coronavirus, there will not be a close care-giver to provide help and services to the one who survived. So, such patients will not have any close family member to monitor them. People with Alzheimer's disease may forget to wash their hands, or take other recommended precautions to prevent the illness/Coronavirus. Similarly, COVID-19 may worsen cognitive impairment due to dementia.

## Suspension of Marriages

Coronavirus risks have caused many marriages to be postponed, and in many cases downsized. Developing countries such as India, Pakistan, Bangladesh etc. with large populations and rich traditions, usually have increasing marriage ceremonies and parties for many days. But, many of them have been deferred to control and prevent the immediate spread of disease. Such a postponement creates problems and losses for the families and the people concerned. In many cases the would-be marriages are annulled. However, despite the Western world where cohabitation is a social norm, marriage industry must actively take place in time in developing countries. Many planned weddings for a year are suspended or even cancelled/divorced as happened in some Chinese cases. It is even worrying for the Western world too, to cancel many decided plans, or cancel or defer any marriage occasions. Because of Coronavirus risk, almost all marriage halls have remained closed in countries like India and Pakistan. According to the details, a nine-member family attending a marriage ceremony were infected by the deadly Virus (Web Desk, Mar 21, 2020). So, through the appearance of Coronavirus threat, increasingly trips are halted and cancelled.

## Deals and Businesses

Coronavirus has caused many businesses to decline or lock down. Cinemas, restaurants, halls for ceremonies, increasingly shops and stores are among the major businesses closed. Such closures have contributed to the unemployment of a large number of workers, So, such an increasing number of unemployed people affects a large number of families; their access to food items, basic needs, para-educational means etc. Many dealers and small business men and women too, have lost, or may lose their jobs. Such hard times severely impact their careers, their spiritual norms and values.

Similarly, closure of educational institutions and universities has kept back students and the scientific development in different areas. Though many educational institutions have switched to an online system of educational transfer, yet it is not successful for many lecturers and students in many fields of education.

However, thousands of educational institutions across the world are currently remaining closed (Global Citizen, 2020). In countries like China pupils are learning through intimate live video chats, while others are tapping into the "broadcast of primary school lessons on public television". China has also created a "cloud learning program" that teaches its national curriculum.

Because of closures, many disadvantaged students are being deprived of getting the free school meals. Similarly, under such circumstances, many children in certain nations can also be at the risk of "child marriage" and "child labor".

## Stressful Child Birth

Coronavirus patients engaging increasing numbers of hospital beds has negatively impacted the would-be mothers across the world. Medical facilities which are widely used by the Corona patients have weakened the chance of those who want to urgently use the hospital facilities. Coronavirus impact is wide and multi-dimensional; the result of which will be declared later.

***The Child birth process is usually a complicated process including the birth to a baby***
Preterm, Premature, Labor that does not progress, Abnormal heart rate of the baby, Perineal tears, Excessive bleeding and many more are the problems needing proper and in place hospitalization.

Similarly, some women have herpes after delivery which really needs hospital attention for both; the mother and the newborn infant (Medline plus, 2020). All such complications need nursing and hospital services. During the Coronavirus emergency many such medical urgencies are denied. During pregnancy, some common cold or a skin infection may appear. Though they may not cause serious problems, yet it needs medical attention, care, and treatment. Preterm births sometimes lead to low birth weight that needs immediate and proper protection and treatment. So, shortage of hospital arrangements would endanger the life of the newborn infant, followed by psychological problems/inconvenience for the mother.

## Shortage of hospital beds

The outbreak of Coronavirus has decreased the number of hospital beds for the ordinary patients. Hospital-beds shortages are there even in developed countries in these days. Many non-Coronavirus patients cannot be admitted into hospitals for ordinary treatment. For poor countries, ICU beds are difficult expenses. Hospitals can manage their own hospital bed capacity. Shortage of capacity in care units is well felt with special reference to the developing countries. Lack of bed availability, drug shortages and many more is now faced via the Coronavirus appearance in all countries. People are in-doors for protection and precautions also lead to psychological difficulties for many of the families concerned. Around the world, every health care system is struggling with rising costs. These pressures are mainly focused on the arriving patients. Therefore, families must take care not to lose their health and well-being (New York Times, 2020).

Countries like Italy with a widespread Coronavirus patients, and one-in-five being a cigarette smoker, the scenario has created complicated problems. Overall, the shortage of hospital beds is well realized. Unfortunately, many developing countries lack the budget to increase their strategic plans for health service provisions. Priority is given according to a cluster of factors including need, emergencies, and patient volume. In addition, capacity building and strengthening is quite vital for the improvement of hospital services and treatment of Coronavirus (BMC Health Services Research, 2006).

## Overwork of the medical staff

Since the outbreak of Coronavirus, medical doctors, nurses, and other staff have been busy round-the-clock with checking and treatment of virus patients. They have not had leave, holidays and the like. They tirelessly work, and some of them even die because of contacts and infections. In China, while 3,400 healthcare workers got Coronavirus, 13 healthcare workers died because of that (Holly Secon, March 4, 2020). Other countries face such problems and deaths too. Medical staff are also exposed to death threats. Some of such staff had postponed weddings to treat the Corona patients. Similarly, 93 healthcare workers in California who came into contact with one patient, before the patient was diagnosed, were put under quarantine or isolation for 14 days.

The United States being the epicenter of the global pandemic, reportedly on 26-Mar-2020 had more than 82,000 positive infected patients, and surprisingly China, Spain and Italy are the hardest-hit countries via the Coronavirus (Newsletters.cnn.com, March 27, 2020). Similarly, as reported on 28-Mar-2020, Italy had the toll of more than one death every 2 minutes (BBC March

28, 2020). Spain's death toll tops China's; the number of Coronavirus infected has been reported there as 57,521 patients/cases on 26-Mar-2020. Also, the number of deaths in Italy has been as reported 9,134 on 26-Mar-2020 (Al Jazeera, 2020).

During the crisis of Coronavirus, many hardworking doctors are facing shortages of equipment, proper masks and protective body suits. In China, because of shortages, some doctors had to wear diapers to avoid having to take off the equipment and make it last longer in Wuhan, China (Japan Times, 2020). Socio-demographically speaking, Coronavirus is mostly killing older people, and much of the high-experienced and skilled labor capital evacuates. Such pandemic challenges cannot be easily compensated for (IUSSP, 2020).

## Conclusion

Coronavirus as a never-contemplated phenomenon has surrounded all countries of the world, and is requiring sacrifices at global level; poor and rich, high ranking, low ranking, educated and uneducated, but mostly the elderly people. The merciless virus is targeting all the countries, causing closures, recessions, poverty, and increasing challenges of all sorts, in quality and quantity. Coronavirus is paralyzing tourism, economies, production, scientific development etc. Coronavirus has also impacted natural death patterns too in many countries. The new phenomenon has led to the appearance of loneliness of many men and women across the world after the death of one spouse. Increasing labor forces have been laid off in many countries. Similarly, many marriages and weddings have been postponed or cancelled especially in developing countries such as Bangladesh and India. Due to Coronavirus, increasing numbers of businesses and trade deals have ceased or slowed. Families also at home and in confinement get disturbed and psychologically impaired. Coronavirus has also created difficulties and challenges for child birth. The operation has become highly stressful, with a great shortage of arrangements in many cases. Another problem well sensed is the lack of hospital beds; and the difficulty to get into hospitals with the threats involved. Another difficulty that has emerged because of the Virus diffusion and outbreak, is the overwork of the medical staff, and the burden they should tolerate.

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# Flexible intramedullary nails for treatment of femoral shaft fracture in children, Aden, Yemen

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## Abstract

Background: Femoral shaft fractures in children constitute less than 2% of all fractures in children. Objective: To describe the characteristics variables of children with femoral shaft fracture and to assess the results following treatment by flexible intramedullary nail.

Patients and method: It was a retrospective study conducted in the orthopedic section at Algamhoria Teaching Hospital and 2 private hospitals in Aden. We retrieved the patients' records of children with femoral shaft fracture and we found 37 cases (6 – 12 years old) who were treated with flexible intramedullary nails during a period of three years, from January 2014 to December 2016.

Results: Total patients were 37 and they were 22 [59.5%] males and 15 [40.5%] females.
The mean age was 8.51 years. The mean age of males was 9.09 years and the females 7.67 years (p < 0.05). In nineteen (51.4%) cases, the fracture occurred at the middle third. Types of fracture were oblique 19 (51.4%) and transverse fracture 18 (48.6%). Motor vehicle accidents were responsible for the majority of cases (56.8%).

Mean of fracture union was 12.14 weeks, the mean time of weight bearing was 4.65 weeks, also the mean duration of knee flexion was 2.46 weeks. The mean time of removal nails was 7.26 months. Twenty seven (73.0%) cases were closed and 10 (27.0%) cases were opened.

We found bursa over the site of nail entry in 6 (16.2%) cases, limb lengthening of 2 cm in 2 cases and 1.5 cm in another 2 cases. The rest 33 (89.2%) had no limb length discrepancy.

There were 3 (8.1%) cases of entrance pin infection and malalignment in 2 (5.4%) cases.

Conclusions: Flexible intramedullary nail is a great choice for the treatment of pediatric patients (6–12 years old) with closed and opened femoral shaft fracture. It can provide a rapid recovery.

Key words: Femoral shaft fracture, children, treatment, flexible intramedullary nail, Aden

## Introduction

Femoral shaft fractures in children constitute less than 2% of all fractures in children [1]; yet they are a significant burden on healthcare systems and families as they are the most common fractures requiring hospitalization in children [2,3]. These injuries often require prolonged immobilisation or surgery [2].

The mechanism is typically high-energy trauma, such as a fall from a height or motor vehicle collision. The fractures are located in the diaphysis, and surgical intervention is typically necessary [3].

Fractures of femur in children occur most frequently in the middle third of the shaft. According to Hinton et al, the annual rate of femoral shaft fractures in children is 19.5 per 100,000 [4].

Femoral shaft fractures treatment goals in children are achieving bone union with length, alignment and limb's function restoration, without losing movements of adjacent joints. Femoral shaft fracture is an incapacitating pediatric injury [5]. Femoral shaft fractures, including subtrochanteric and supracondylar fractures, represent approximately 1.6% of all body injuries in children. The annual rate of femur shaft fractures in children was 1 per 5,000 [6]. However, incidence appears to show minor variations in its geographical distribution.

Orthopaedic surgeons have long maintained that all children who have sustained a diaphyseal fracture of femur recover with conservative treatment, given the excellent remodeling ability of immature bone in children. But time and experience of many surgeons have shown that diaphyseal femur fractures in children do not always recover completely with conservative treatment [7]. Angulations, shortenings and mal-rotations are not always corrected by conservative treatment [8].

A variety of methods have been introduced to treat pediatric femur fractures, including spica casting, traction followed by spica casting, internal fixation with plate, intramedullary nailing, and external fixation. Controversy exists regarding the most optimal surgical treatment for femoral shaft fractures in children [9]. The treatment should be decided based on age, fracture location and pattern, associated injuries, socioeconomic situation, as well as the preference of surgeons [10].

During the past two decades, flexible intramedullary nailing has become a popular choice for the fixation of femoral shaft fractures in children [11].

This study was intended to describe the characteristics variables of children with femoral shaft fracture and to assess the results following treatment of fracture by flexible intramedullary nail and the complications.

## Patients and Method

This study was designed as a retrospective study. It was conducted in the orthopedic section at Algamhoria Teaching Hospital and 2 private hospitals in Aden.

We retrieved the patients' records of children with femoral shaft fracture and we found 37 cases between the age group 6 – 12 years who were seen and treated by the author with flexible intramedullary nails during a period of three years, from January 2014 to December 2016.

Data collected included patient demographics, fracture characteristics, treatment, complications and outcomes.

The collected data were tabulated and statistical analysis using SPSS 17 was done by estimating rates, frequency, percentage, and means with standard deviations. Statistical significance was set at a p-value < 0.05.

## Results

During the period January 2014 to December 2016 we had operations on 37 cases of femoral shaft fractures with intramedullary flexible nails, and they were 22[59.5%] males and 15[40.5%] females.

The mean age of patients was 8.51 years with a minimum age of 6 years and maximum age of 12 years.

The mean age of male patients was 9.09 years and the female patients 7.67 years; the difference between means was statistically significant (p < 0.05).

We grouped the patients into 2 age groups 6 – 9 years and 10 – 12 years and we found the age group 6 - 9 years predominant (70.3%). Most of the patients were from Aden governorate 23(62.2%). All data were listed in Table 1.

Table 2 reveals that in 19 (51.4%) cases the fracture occurred at the middle third and at the proximal and distal third for each 9 (24.3%).

The types of fracture were oblique 19(51.4%) and transverse fracture 18(48.6%).

Fracture involved the right side in 19(51.4%) patients and the left side in 18 (48.6%). Motor vehicle accidents (either in cars, bicycles, or as a pedestrian) are responsible for the majority of femoral shaft fractures 21 (56.8%) followed by fall from a height 10 (27.0%) and other 6 (16.2%).

Fracture union ranged from 8 to 16 weeks (mean 12.14 weeks), and the time of weight bearing ranged between 3 to 6 weeks (mean 4.65 weeks), also, the duration of knee flexion ranged between 1 – 4 weeks (mean 2.46 weeks). The time of removal nails among our patients ranged between 6 to 10 months and the mean time was 7.26 months. All mentioned data were listed in Table 3.

In reduction of fracture 27 (73.0%) cases were closed and 10 (27.0%) cases were open.

There was formation of bursa over the site of nail entry in 6 (16.2%) cases. We found limb lengthening of 2 cm in 2 cases and 1.5 cm in another 2 cases. In those cases, fractures were in the middle third of femur in 2 cases and proximal third in 1 case, also distal third of femur in 1 case.

The rest 33 (89.2%) had no limb length discrepancy.

There were 3 (8.1%) cases of entrance pin infection. We also found malalignment in 2 (5.4%) cases, as shown in Table 4.

**Table 1: Characteristic variables of children with femoral shaft fracture (n =37)**

| Variables | Range | Mean ± SD | No | % |
|---|---|---|---|---|
| Sex: | | | | |
| Males | | | 22 | 59.5 |
| Females | | | 15 | 40.5 |
| Age range (years): | 6 − 12 | | | |
| Mean Age (years): | | | | |
| Age of all patients | | 8.51 ±1.77 | | |
| Age of males | | 9.09 ±1.87 | | |
| Age of females | | 7.67 ±1.24 | | |
| P-value | | P = 0.014 | | |
| Age groups (years): | | | | |
| 6 − 9 | | | 26 | 70.3 |
| 10 − 12 | | | 11 | 29.7 |
| Residency: | | | | |
| Aden | | | 23 | 62.2 |
| Other governorates | | | 14 | 37.8 |

**Table 2: Distribution of characteristics of femoral shaft fracture (n=37)**

| Variables | No | % |
|---|---|---|
| Fracture location: | | |
| Middle third | 19 | 51.4 |
| Distal third | 9 | 24.3 |
| Proximal third | 9 | 24.3 |
| Fracture type: | | |
| Oblique | 19 | 51.4 |
| Transverse | 18 | 48.6 |
| Side of fracture: | | |
| Right side | 19 | 51.4 |
| Left side | 18 | 48.6 |
| Cause: | | |
| Motor vehicle accidents | 21 | 56.8 |
| Fall from a height | 10 | 27.0 |
| Other | 6 | 16.2 |

**Table 3: Range and means of postoperative results**

| Variables | Range | Mean ± SD |
|---|---|---|
| Time of union (weeks) | 8 − 16 | 12.14 ±2.43 |
| Weight bearing (weeks) | 3 − 6 | 4.65 ±1.11 |
| Knee flexion (weeks) | 1 − 4 | 2.46 ±1.04 |
| Time of removal nails (months) | 6 - 10 | 7.26 ±1.05 |

**Table 4: Distribution of reductions and complications (n=37)**

| Variables | No | % |
|---|---|---|
| *Reduction:* | | |
| Close | 27 | 73.0 |
| Open | 10 | 27.0 |
| *Complication:* | | |
| Bursa at entrance | 6 | 16.2 |
| Lengthening | 4 | 10.8 |
| Entrance pin infection | 3 | 8.1 |
| Malalignment | 2 | 5.4 |
| None | 22 | 59.5 |

## Discussion

During the past two decades, flexible intramedullary nailing has become a popular choice for the fixation of femoral shaft fractures in children [11]. Flexible nailing offers many advantages, including minimal invasiveness, short hospital stays, early mobilization, and fewer complications [12].

The flexible intramedullary nails are load sharing devices which offer good fixation (relative stability and subsequent fracture union by indirect bone healing/callus formation), are relatively cheaper and have a short learning curve as it is relatively easy to insert and remove these nails [13]. Bone growth is affected minimally, as the need to cross physis can be avoided with these nails; the mean femur overgrowth is 1.2 mm. Operating time and blood loss is significantly reduced [13,14].

In our study there were 22 (59.5%) males and 15 (40.5%) females. The sex incidence is comparable to other studies in the literature. El-Adl et al [15] reported in their study that out of 66 patients, there were 48 (72.7%) males and 18 (27.3%) females. Also, Hwaizi et al [16] reported in their study that males were 31 (77.5%) and females were 9 (22.5%).

We found in the present study the mean age of patients was 8.51 years with a minimum age of 6 years and maximum age of 12 years.

The mean age of male patients was 9.09 years and the female patients 7.67 years; the difference between means was statistically significant (p < 0.05). Similar findings were reported by others [17-21].

We grouped the patients in-to 2 age groups 6 – 9 years and 10 – 12 years and we found the age group 6 - 9 years predominant (70.3%). Al-Azzawi [22] from Iraq reported in his study that the age of the patients range between four months and ten years; the age group (6-8) years is the most common.

In the current study we found that in 19 (51.4%) cases the fracture occurred at the middle third and at the proximal and distal thirld for each 9 (24.3%).

Hassan et al [19] reported in their study from Egypt that more than two-thirds of the fractures occurred in the middle third.

Also, Khanna et al [23] reported in their study from India that (77.78%) patients had fracture of middle third, 6 (13.34%) had fracture of proximal third and 4 (8.89%) had fracture of distal third of femoral shaft.

Vishwanath et al [24] reported that fractures involving the middle l/3rd accounted for 26 (52%) cases, proximal 1/3rd 17(34%) and distal l/3rd 07 (14%) of cases.

Govindasamy et al [25] found 36 (75%) fractures were in the middle third followed by, 7 (14.6%) proximal third and 5 (10.4%) distal-third fractures.

Tamrakar et al [21] reported in their published study in Nepal that 19 fractures (54.3%) occurred on the middle third, 9 (25.7%) on the proximal third and 7 (20%) on the distal third of the femur.

We found also in our study the types of fracture were oblique (51.4%) and transverse fracture (48.6%).

This finding is similar to findings by others [24] and differs from that reported by Khanna et al [23] in which (68.89%) patients had transverse fracture, (26.67%) had short oblique fracture and (4.45%) had minimally comminuted fracture.

In the present study we found fracture involved the right side in 19(51.4%) patients and the left side in 18 (48.6%). Similar to our finding it was found by Mohammad et al [26] from India in which 13 (61.9%) fractures were on right side and 8 (38.1%) fractures were on left side, and by Chitgopkar [27] from Saudi Arabia where there were 8 on the right side and 7 on the left side.

Khanna et al [23] mentioned that right side was more commonly affected (64.4%) than left.

Tamrakar et al [21] from Nepal found in their study that 20 (71.4%) femoral fractures occurred on the right side whereas ten (28.6%) were on the left side.

We found in our study that motor vehicle accidents (either in cars, bicycles, or as a pedestrian) are responsible for the majority of femoral shaft fractures 21 (56.8%) followed by fall from a height 10 (27.0%) and other, 6 (16.2%).

We found in our study that motor vehicle accidents (either in cars, bicycles, or as a pedestrian) are responsible for the majority of femoral shaft fractures 21 (56.8%) followed by fall from a height 10 (27.0%) and other, 6 (16.2%).

Chitgopkar [27] reported in his study that 14 (87.5%) children had met with a road traffic accident and 2 (12.5%) had a fall from a height. Khanna et al [23] reported that the most common mode of injury was road traffic accidents (68.9%).

Govindasamy et al [25] found in their study from India that the most common mechanism of injury was road traffic accident (70%) followed by fall from height (30%).

In the current study fracture union ranged from 8 to 16 weeks (mean 12.14 weeks).

Our result is consistent with the result of Govindasamy et al [25] in which all fractures were united within 12 weeks of fixation with no non-union or delayed union.

Oh et al observed that all 31 fractures in his series healed within 12 weeks without delayed union [28].

Tamrakar et al [21] reported in their study from Nepal that all femoral fractures united radiologically with a mean duration of 8.17 weeks (range: 6 to 10 weeks) and clinically with a mean duration of 9.83 weeks (range: 8 to 12 weeks).

Also, in our study we found the time of weight bearing ranged between 3 to 6 weeks (mean 4.65 weeks). Khanna et al [23] reported that full weight bearing was possible in a mean time of 8.7 weeks (range; 7-12 weeks).

Also, the duration of knee flexion ranged between 1 – 4 weeks (mean 2.46 weeks).

Govindasamy et al [25] reported that functional range of movement of knee was achieved in an average of 8.6 weeks (6 – 14 weeks).

In our study the time of removal of nails among our patients ranged between 6 to 10 months and the mean time was 7.26 months.

Our finding is consistent with the finding reported by Luo et al [12] in which the average removal of implants time was 7.8 months (range, 3–20 months).

We found in our study 27 (73.0%) cases were closed reduction and 10 (27.0%) cases were open reduction.

A similar finding was reported by Tamrakar et al [21] from Nepal that 27 (77.1%) fractures were operated with closed reduction whereas eight (22.9%) fractures required mini-open at the fracture site.

We found in our study limb lengthening of 2 cm in 2 cases and 1.5 cm in another 2 cases. The rest 33 (89.2%) had no limb length discrepancy. In those cases, fractures were in the middle third.

Similar to this finding was reported by Singh et al [29] in which three patients had limb length discrepancy, 1 case had overgrowth of 0.5 cm and another up to 0.5 -2.0 cms. 1 case had shortening of 7 mm due to shortening in the tibial component because of segmental ipsilateral tibia fracture. The rest 17 (85%) had no limb length discrepancy.

Also, our study showed formation of bursa over the site of nail entry in 6 (16.2%) cases. Kapil et al [17] reported in their study, regarding the complications, there was formation of bursa over the site of nail entry in 6 (21.4%) cases because of friction between the tip of nail and skin. There were 3 (8.1%) cases of entrance pin infection in our study. Vishwanath et al [24] reported in their study that superficial infection was seen in 4 (8%) cases, which was controlled by antibiotics and regular dressings on alternate days within a week.

We also found in our present study malalignment in 2 (5.4%) cases.

Lohiya et al [30] mentioned in their study that angulation measured at final follow up in both coronal and saggital planes revealed significant malalignment in 3 (4.1%) cases however minor malalignment was observed in 29 (39.7%) cases.

## Conclusion

We concluded that flexible intramedullary nail is a great choice for the treatment of pediatric patients (6–12 years old) with closed and opened femoral shaft fractures.

This technique can provide a rapid recovery and leads to decrease in the incidence of malunion, nonunion and functionally important limb length discrepancy. It also satisfies many of the parents of the patients who insisted on perfect alignment at initial treatment. In addition to those benefits it has little psychological impact on the children and is cost-effective.

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# Sodium-Glucose Cotransporter 2 Inhibitors and their Renal benefits in type 2 diabetes. A Systematic Review

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## Abstract

**Background:** Existing studies show that the hyperglycemia-reducing effect of sodium-glucose cotransporter 2 inhibitor (SGLT2i) is dependent on glomerular filtration. Previous studies have shown that SGLT2 are not very effective in controlling blood sugars in patients with impaired renal function. As such, SGLT2i are not recommended for patients with advanced CKD.

**Objective:** This systematic review aims at looking at the effects of SGLT2i in adult patients with Type 2 diabetes and chronic kidney disease.

**Methods:** We searched Cochrane Central Register of Controlled Trials, PubMed, MEDLINE, and Google Scholar to identify various trials, which had reported renal outcome trials for SGLT2i. The reviewers examined renal outcomes, which were end-stage renal disease (ESRD), renal failure, doubling serum creatinine, macroalbuminuria, incident microalbuminuria, alteration in urine albumin-to-creatinine ratio (UACR), estimated glomerular filtrate rate (eGFR), dialysis, kidney transplant, or death related to renal disease. The extracted data were qualitatively synthesized.

**Results:** 18 studies that met the eligibility criteria were selected for review. In line with the strong evidence presented in previous meta-analyses, SGLT2i clearly demonstrated that it lowered the risk of developing ESRD, microalbuminuria, and reduced the levels of eGFR and UACR compared to controls.

**Conclusion:** SGLT2i has positive renoprotective effects in patients with T2DM and CKD by reducing the risk of developing worsening albuminuria and decreasing the risk for ESRD compared to controls.

**Key words:** randomized controlled trial, RCT, type 2 diabetes mellitus, T2DM, odium-glucose cotransporter 2 inhibitors, SGLT2, canagliflozin, dapagliflozin, empagliflozin, ertugliflozin, albuminuria , renal failure, chronic kidney disease, end-stage renal failure

## Background

Diabetes mellitus is a metabolic disorder that results when the body either develops resistance to its own insulin or can't produce enough to help metabolize the glucose in the body. Type 2 Diabetes mellitus, accounts for 90% of all cases and affects at least 463 million people globally, and it is expected that it will effect 578 million and 700 million people worldwide by 2030 and 2045, respectively(1). T2DM is a primary cause for developing chronic kidney failure (CKD) and cardiovascular disease (CVD), as well as a core predictor of frequent hospital admissions, morbidity, and mortality(2, 3). Until relatively recently, the use of pharmacological agents to control blood glucose levels in T2DM patients had limited data on renal and cardiovascular benefits in fact some drugs were associated with adverse effects such as hypoglycemia and cardiovascular-associated fatalities with sulfonylureas, cardiac heart failure (CHF) with thiazolidinediones, and proliferative retinopathy with insulin(4-6). To address the deleterious side effects, the U.S Food and Drug Administration (FDA) devised novel anti-DM medication guidelines in 2008 that necessitated cardiovascular outcome clinical trials (CV0Ts) for new hyperglycemic-reducing agents to offer data on safety to make sure that new antihyperglycemic medications do not elevate the risk for ischemic stroke, myocardial infarction, or CVD-associated mortality (7).

A large share of numerous double blind, placebo-controlled clinical trials performed in the last 10-years have reported neutral effects on CV outcomes (8, 9). However some randomized controlled trials (RCTs) lead to the discovery of two medication classes: glucagon-like peptide (GLP)-1 receptor agonist and sodium (Na+)-glucose co-transporter-2-inhibitors (SGLT2i) (the focus of the present review) (3). The above drug classes decreased significant CV-related adverse events (10). According to Lo et al., SGLT2i is designed to impair reabsorption of filtered glucose load at the proximal tubule (7). Besides, SGLT2i alters intra-renal hemodynamics, causes intravascular volume contraction, and elevates natriuresis, which is likely to contribute to reducing albuminuria, body weight, and blood pressure (7, 11). Based on the above positive outcomes of SGLT2i, it is clear that its valuable effects cover beyond regulation of glycemia to reducing uric acid levels, body weight, lowering BP and intraglomerular hypotension, and promoting plasma volume contraction. As a result, the FDA has authorized four SGLT2i forms to confer renoprotection in patients with T2DM, including Steglatro (ertugliflozin), Jardiance (empagliflozin), Farxiga (dapagliflozin), and Invokana (canagliflozin) (7).

Numerous investigations have found positive effects of the aforementioned SGLT2i on renal function. Canagliflozin and empagliflozin were evaluated in two large RCTs, and both diminished the risk for albuminuria and the composite of chronic decline in renal function, renal replacement therapy (RRT) or kidney disease-related mortality compared with placebo (12-14). Heerspink et al. investigated the efficacy of canagliflozin in alleviating renal function impairment and reducing albuminuria independently of its glucose lowering effect in a secondary analysis of an RCT involving n = 1450 patients with T2DM on metformin and randomly allocated to either glimepiride up-titrated to 6-8 mg, canagliflozin 300 mg, or canagliflozin 100 mg once-daily (15). The administration of canagliflozin 300 or 100 mg/day compared to glimepiride 6-8 mg/day showed a deceleration in the progression of kidney disease over 2-years in individuals with T2DM. The authors concluded that canagliflozin confers renoprotective impacts independent of its glycemic effects.

Other large-scale CVOTs of SGLT2i, which were initially intended to fulfill the regulatory standards and guarantee CV safety, have reported promising impacts on an array of serum creatinine-based renal outcomes and albuminuria in patients at increased risk for atherosclerotic CVD (ASCVD) (13, 14, 16-19).

A large proportion of the patients in the above RCT were at low risk of medically significant renal events; consequently, the incidences of CKD were low, with a small number of participants needing RRT or dialysis in all the trails. Besides, since the aforementioned trials were also not primarily aimed to offer definitive data on renoprotective effects, renal endpoints were not explicitly umpired or pre-specified, and the difference between chronic and acute decline in estimated glomerular filtrate rate (eGFR) was not probable in each trial. Thus, it is challenging to conclude that the advantageous kidney effects of SGLT2i apply to all patients, particularly those with low CVD risk.

Moreover, studies examining single renal measures have reported inconsistent results. For instance, in Neal et al. the Canagliflozin Cardiovascular Assessment Study (CANVAS) it revealed the therapeutic effects of canagliflozin on renal, CV and safety outcomes. It was observed that canagliflozin led to a 40% decline in eGFR thus reducing the onset of microalbuminuria (12),(20). Similarly, in the Empagliflozin Cardiovascular Outcome Trial in T2DM Patients (EMPA-REG OUTCOME) trial, empagliflozin substantially diminished the odds for the onset of RRT but it did not show any influence on the initiation of microalbuminuria (13). In the above studies, renal measures were secondary endpoints, and the incidence of adverse events suggestive of ESKD was not enough to confer irrefutable data (12, 13, 20). Furthermore, the Dapagliflozin Effect on Cardiovascular Events-Thrombolysis in Myocardial Infarction 58 (DECLARE-TIMI58) RCT did not look at individual renal outcomes (19). Similarly, a significant number of subjects had normal albuminuria in the CVOTs of SGLT2i and, thus, the consistency of therapeutic effects across various levels of albuminuria remains unknown. In addition to the above concerns, current guidelines in Europe and North America commend metformin as the first-line therapy and SGLT2i as second-line treatment not only for individuals with ASCVD but also for patients with CHF (21, 22).

Furthermore, the hyperglycemia-reducing effect of SGLT2i is dependent on glomerular filtration, and previous evaluations have shown that SGLT2i glycemic effect is reduced in patients with chronic kidney disease (CKD). CKD is described as an estimated glomerular filtration rate (eGFR) less than 60 mL/min/1.73 m2 (23, 24). Consequently, SGLT2i agents are not presently prescribed in anyone with an eGFR < 60 mL/min/1.73 m2 (for ertugliflozin and dapagliflozin) and eGFR < 45 mL/min/1.73 m2 (for empagliflozin and canagliflozin) (25, 26). On the contrary, the effectiveness of SGLT2i at reducing proteinuria and the risk of worsening renal impairment may be sustained in diabetic patients with CKD (27). Since a large proportion of patients with CKD have the highest odds for ESRD and CVD (28), it is fundamental to understand the reno-protection benefits of SGLT2i. Therefore, the primary aim of the present systematic review is to evaluate the benefits of SGLT2i on kidney function in patients with T2DM and evaluate the influence of the latest evidence on current clinical guidelines when considering treatment for T2DM.

## Methods

### Search strategy
For the present systematic review, the guidelines recommended by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) were followed accordingly (29). Cochrane Central Register of Controlled Trials, PubMed, and EMBASE databases were searched to identify trials with renal outcome for SGLT2i issued between January 1, 2010-March 31, 2020 with full texts. The search terms applied for SGLT2i entailed SGLT2i or SGLT2 inhibitors or ertugliflozin or empagliflozin or dapagliflozin or canagliflozin (Supplementary Table 1). Additionally, the reference lists of the yielded studies were scrutinized for additional RCTs missed during the electronic search.

### Study selection and data extraction
Two reviewers (SR and FR) independently screened the abstracts and titles of the identified studies. Duplicate publications of the original RCTs were eliminated and RCTs reporting one of the following renal outcomes: ESRD, renal failure, doubling serum creatinine, macroalbuminuria, incident microalbuminuria, (UACR) urine albumin-to-creatinine ratio, eGFR, dialysis, kidney transplant, or death due to kidney disease, were selected.

Two authors (SR and FR) individually extracted data from the selected RCTs as per the standardized procedure. Target outcomes of interest encompassed alterations in eGFR and UACR, the occurrence of macroalbuminuria (UACR >300 mg/g), and microalbuminuria (UACR > 30mg/g), incident ESRD, and regression of albuminuria. Any discrepancies were addressed by consensus among the reviewers. Additionally, data about the authors, publication year, mean age and number of the participants, comparison and intervention treatment, and background anti-diabetic medications is summarized on page 65 onward.

### Assessment of study quality and data analysis
The Cochrane Risk of Bias tool was employed to evaluate the quality and risk of bias (30). Two reviewers classified the risk of bias of the sampled RCTs as inadequate (high risk of bias), unclear (unclear risk of bias), and adequate (low risk of bias) grounded on key elements of the clinical trials, namely: selective reporting, incomplete outcome data, blinding of participants and personnel, allocation concealment, random sequence generation, and other potential sources of bias (30). Any conflicts among the reviewers were addressed through consensus. The selected articles were qualitatively synthesized to identify common patterns.

## Results

### Characteristics of included studies
The final search yielded a total of 329 articles. After removing the duplicates, the titles and abstracts of 154 studies were individually screened. A total of 25 RCTs were identified, but 7 were excluded due to their post hoc/sub-analysis nature. Therefore, 18 RCTs that fulfilled the eligibility criteria were included in the study, as illustrated in figure 1 which depicts the PRISMA flow diagram and supplementary Table 2, the summary of papers included in the systematic review. The total number of participants was n = 14,104, including n = 7,366 and n = 5,892 patients randomized into the treatment and control cohorts, respectively. The study population, covered in the systematic review is mainly patients with T2DM with eGFR ≥ 15<90 mL/min/1.73m2. The baseline eGFR of the subjects was ≥ 45 mL/min/1.73m2 in nine studies (31-39), ≥ 30 mL/min/1.73m2 in seven studies (16, 40-45), ≥ 20 mL/min/1.73m2 in one study (46), and ≥ 15 mL/min/1.73m2 in another study (47). The mean age was 49.5-67 years. The number of subjects in each of the RCT varied from n = 42 to n = 4,401. One study was conducted over 2.62 years (16), three over 104 weeks (32, 38, 41), seven were carried out within 52 weeks (31, 36, 39, 42, 44, 47, 48), whereas the remaining had a follow-up period of between 12-28 weeks.

### Assessment of study quality and risk of bias
All the eighteen described sufficient blinding of researchers and participants, and 83% of the selected studies reported sufficient allocation masking and adequate random generation. Three RCTs failed to describe the approach of allocation blinding and sequence generation (39, 41, 44). Furthermore, three RCTs documented incomplete outcome results owing to losses to follow-up (36, 42, 48).

### Renal outcomes
SGLT2i substantially lowered the odds for the occurrence of ESRD, progression of microalbuminuria, and improved the levels of eGFR and UACR compared with the controls, with the beneficial impacts of the SGLT2 inhibitors principally steered by the findings of the largest RCT with canagliflozin (16). In the aforementioned study, SGLT2i substantially reduced the threat of deteriorating nephropathy compared with placebo or other forms of controls, including sitagliptin, exenatide, and glimepiride. A meta-analysis was not performed due to the homogeneity across the reviewed studies.

**Figure 1: Study screening and selection process**



Records identified through database searching

(n = 154)

       Cochrane (n = 154)
       EMBASE (n = 118)
       PubMed (n = 42)

Additional records identified through other sources (n = 15)

Records after duplicates removed
(n = 154)

Records screened
(n = 154)

Records excluded after screening titles and abstracts
(n = 129)

Full-text articles assessed for eligibility
(n = 25)

Full-text articles excluded for post hoc/sub-analysis
(n = 25)

Studies included in qualitative synthesis
(n = 18)

## Discussion

Overall, this systematic review illustrated that SGLT2i is allied to substantially reduced odds for the onset or worsening of albuminuria, worsening renal function compared to other antidiabetic therapies or placebo in adult patients with T2DM. Nonetheless, a large number of the appraised RCTs, showed improved levels of UACR in patients with a higher baseline compared to those with lower baseline UACR. While there were no substantial alterations in eGFR levels between pre- and post-treatment in both intervention and control cohorts, the various types of SGLT2i decelerated the drop in eGFR in participants with a higher eGFR at the start and over a prolonged research period (16, 41, 47, 48). The observed albuminuria-reducing consequence is clinically significant, and the expected SGLT2i-associated enhancements partly explicate it in variables otherwise linked to declined loss of protein in the urine, including body weight, HbA1c, and BP (49). Findings of pooled analyses attributed the SGLT2i-lowering impacts to a myriad of mechanisms, comprising a drop in uric acid levels, alterations in plasma volume expansion, systemic BP decrease, enhancement in tubule-interstitial fibrosis, and a decline in glomerular hyperfiltration (12, 50-52). In Fioretto et al.'s study, the treatment stage 3 kidney disease diabetics with dapagliflozin for over 52 weeks altered the levels of uric acid, eGFR, BP, and HbA1c (53). Empagliflozin reduced the UACR in patients with T2DM along with either macro- or microalbuminuria independent of body weight, BP, and HbA1c changes (49). Warner et al also reported a preservation of eGFR level in the treatment group with empagliflozin compared to placebo over a period of time (14). In CANVAS trial canagliflozin reduced the risk of albuminuria progression and demonstrated reduction in eGFR, the need for renal replacement therapy, or death due to renal disease (12). A recent review by S Kelly et al. demonstrated that the renal benefits of SGLT2 inhibitors were independent of CKD and reduced incidence of albuminuria (54). DECLARE TIMI 58 trial showed a protective effect in renal outcomes by 24% (19).

The alterations in kidney function after SGLT2i therapy was marked by a fast drop in eGFR in the initial four-five weeks, which gradually recovered back to baseline value over time (35, 41, 47, 48). This effect might be due to the hemodynamic impacts of SGLT2i therapy. Reduced glomerular hyperfiltration might be protective against advancing kidney disease since intraglomerular hyperfiltration has been linked to developing worsening diabetic kidney disease (41). As reported by Lin et al; dapagliflozin reduced the decline of eGFR by 40% from baseline over a 12 month period (55).

SGLT2i substantially decreased the odds for the progression of CKD to late-stage CKD compared to controls. Nonetheless a large proportion of patients in the reviewed articles were at low risk for ESRD; therefore, the impact of SGLT2i on the most critical patient-level renal outcome remains largely unknown. CREDENCE (canagliflozin and renal effects in diabetes with established nephropathy clinical evaluation) was intended to particularly fill the above evidence gap (16). This RCT illustrated that patients on already established ace inhibitors when given canagliflozin showed slowing of the chronic kidney disease and albuminuria. For the first time, the CREDENCE trial demonstrated that canagliflozin could help halt the progression of renal disease by 30%. This therapeutic approach diminished the need for CKD-associated necessity for dialysis. The trial also demonstrated reduced mortality related to ESRD (15) . Recently published meta-analysis on SGLT2i in patients with T2DM reported reduced event rates in both renal and cardiovascular systems and showed that renoprotection effect with this therapy was independent of its cardiovascular effects (56-58). Ongoing trials like DAPA CKD and EMPA-KIDNEY are looking at similar renal outcomes and have enrolled non diabetics as well.

With regards to safety, the reported adverse events (AEs) of interest comprised drug-associated genital infection, lower-extremity amputation, volume depletion events, fractures, and hypoglycemia. Canagliflozin, Ertugliflozin, Empagliflozin were associated with AEs associated with volume depletion and osmotic diuresis plus genital infections (36, 39). Dapagliflozin has been reported to increase risk of fractures (41). These drugs cannot be prescribed in patients with old age, those who have peripheral neuropathy, diabetic foot problems, those with recurrent urinary tract infections (UTI), peripheral vascular disease, osteopenia and/or osteoporosis, and patients with low eGFR at the start of treatment or patients already taking diuretics.

Although, SGLT2i does not currently have the license to be used in patients with eGFR<60ml/min/1.73m2, we believe that recent data supports that SGLT2i can safely be offered to diabetics with underlying CKD with eGFR value as low as 30 ml/min/min/1.73m2 (54, 58).

The current American Diabetic Association and European diabetic society prescribing guidance suggest the use of  SGLT2i as the first line agent in T2DM patients,with cardiovascular risk factors , irrespective of their HbA1c level(59).

From the above discussion we suggest using canagliflozin in treatment of type 2 diabetes due to its beneficial effect on the renal system.

## Conclusion

This systematic review reveals that SGLT2i have net protective effects on renal outcomes of patients with T2DM with underlying CKD. Notably, canagliflozin diminishes the risk for stage 4 CKD and the onset and progression of albuminuria over placebo or other antidiabetic medications. We believe that SGLT2i should be the preferred therapy in T2DM patients. The findings support data of  recently published meta-analyses that reported strong evidence that SGLT2i decreases the danger of the composite deterioration of renal function, renal mortality, or ESRD in patients with or without ASCVD (54, 50) .

Nevertheless, the findings of the systematic review should be interpreted with caution since a large share of the appraised RCTs were initially intended to explore the safety and hyperglycemia-reducing effects of SGLT2 inhibitors.

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**Supplementary Table 1: Search strategy.**

| Search strategy | RCTs of SGLT2 inhibitors in patients with type 2 diabetes and CKD were searched using the following key terms |
|---|---|
| EMBASE | SGLT-2 inhibitor OR SGLT2 inhibitor OR dapagliflozin OR canagliflozin OR ertugliflozin OR empagliflozin OR luseogliflozin OR remogliflozin OR sergliflozin OR tofogliflozin OR ipragliflozin |
| MEDLINE | SGLT-2 inhibitor OR SGLT2 inhibitor OR dapagliflozin OR canagliflozin OR ertugliflozin OR empagliflozin OR luseogliflozin OR remogliflozin OR sergliflozin OR tofogliflozin OR ipragliflozin |
| The Cochrane Central Register of Controlled Trials | SGLT-2 inhibitor OR SGLT2 inhibitor OR dapagliflozin OR canagliflozin OR ertugliflozin OR empagliflozin OR luseogliflozin OR remogliflozin OR sergliflozin OR tofogliflozin OR ipragliflozin |

**Supplementary Table 2: Characteristics of selected studies in the systematic review.**

| Author/year | Year | Intervention | Control | Background drugs | No age of subjects | follow-up (wks.) | Baseline eGFR mL/min/1.73m² | Results |
|---|---|---|---|---|---|---|---|---|
| Kohan et al (41). | 2014 | 10mg Dapagliflozin n =172 | Placebo n = 84 | OADs ± insulin ± GLP-1 RA ± pramlintide | n=252 mean age: 67.0 | 104 | ≥ 30, ≤59 | Dapagliflozin did not have a significant influence on glucose control in patients with advanced CKD. There was a moderate decline in FPG and HbA1c in patients with eGFR between 45-59 mL/min/1.73m². Dapagliflozin was associated with increased risk for fractures |
| Barnett et al (47). | 2014 | 10/25 mg Empagliflozin n =419 | Placebo n = 314 | OADs ± insulin ± GLP-1 RA | n = 741 mean = 63.9 years | 52 | ≥15 | In patients with stage 2, 3, & 4 CKD, small changes in eGFR occurred in the treatment cohorts but returned to baseline by the 3rd week follow-up after therapy completion. Alterations in UACR and eGFR occurred at follow-up and over the study period in patients with stage 2-4 CKD. Empagliflozin as add-on to prescribed antidiabetic drugs resulted in clinically significant improvement in blood pressure, bodyweight, and glycemic control in patients with T1DM2 plus stage 2 or 3 CKD. Small alterations in eGFR after a year's therapy reversed to baseline 3 weeks after completion of treatment. |
| Cefalu et al (48).48 | 2015 | 10 mg Dapagliflozin n = 455 | Placebo n = 459 | OADs (except TZD) ± insulin | n = 922 m age = 62.9 | 52 807 completed | ≥60 | Dapagliflozin demonstrated efficacy in a large share of patients who had mild (eGFR ≥60 to ≥90) or moderate (eGFR ≥30 to ≥60) CKD |
| Perkovic et al (16). | 2019 | 100 mg Canagliflozin n = 2,202 | Placebo n = 2,199 | OADs ± insulin ± GLP-1 RA | n = 4,401 m age − 63.0 | 2.62 years | ≥ 30, <90 | Canagliflozin was associated with 30% reduced risk for ESKD, doubling of creatinine levels and Renal or cardiovascular death in patients with T2DM than those in the placebo. |
| Roden et al (34). | 2013 | Empagliflozin 10/25 mg n = 448 | 100 mg sitagliptin or Placebo n =551 | None | n = 899 m = 54.9 | 24 weeks | ≥ 50 | There was no statistically significant change in eGFR or electrolyte concentration in either cohort. |
| Satirapoj et al (35). | 2018 | 10 mg Dapagliflozin n = 28 | Placebo n = 29 | None | n = 57 m =57.9 | 12 weeks | ≥ 60 | After 12 weeks, the mean UACR reduced significantly from 51.1 to 37.3 mg/g Cr in the treatment group. There was no substantial acute renal injury, hypotension, volume depletion in the treatment group. 10 mg Dapagliflozin exhibited a significant decline in albuminuria and a progressive drop in eGFR after the start of treatment |

| Study | Year | Intervention | Comparator | Background therapy | n / mean age | Duration (weeks) | eGFR | Findings |
|---|---|---|---|---|---|---|---|---|
| Forst et al. (36) | 2013 | 100/300 mg Canagliflozin n = 229 | Placebo n = 115 | Metformin + TZD | n = 344 m = 57.3 years | 52 | ≥ 55 | Canagliflozin 100/300 mg substantially reduced HbA1c than placebo at 26 weeks and the reductions were maintained at 52 weeks. Overall, adverse events (AEs) occurred in 76.5% and 76.3%, and 69.9% in the placebo, 100 mg, and 300 mg Canagliflozin, respectively. AEs associated with volume depletion and osmotic diuresis plus genital mycotic infections were significantly higher in the treatment group than in placebo. |
| Yale et al (42). | 2014 | 100/300 mg Canagliflozin n = 179 | Placebo n = 90 | OADs ± insulin ± GLP-1RA | n = 272 m = 68.5 | 52 | ≥ 30, < 50 | HbA1c was substantially lowered from baseline with 100 and 300 mg Canagliflozin compared to placebo at 26 weeks. 100 and 300 mg Canagliflozin resulted in a significant decline in FBG at week 26 with placebo. 100 and 300 mg Canagliflozin resulted in a significant decline in body weight at week 26, while placebo resulted in a moderate rise. Canagliflozin decreased UGE and $RT_G$ lowering in participants with stage 3 CKD than in subjects with normal renal function. The incidences of AEs did not change across all the groups. |
| Haring et al (43). | 2014 | 10 mg/25 mg empagliflozin n = 430 | Placebo n = 207 | Metformin | n = 638 m = 55.7 years | 24 | ≥ 30 | There was no significant change in eGFR levels in either cohorts. Nonetheless, the use of empagliflozin as an add on drug to metformin enhances glycemic control with reduced odds for hypoglycemia than placebo. Empagliflozin led to a loss of 2.1-2.5 kg of bodyweight than a placebo. |
| Frías et al (37). | 2016 | 10 mg dapagliflozin or 10 mg dapagliflozin plus exenatide n = 264 | Exenatide n = 231 | Metformin | n = 695 m = 54.3 | 28 | ≥ 60 | Dapagliflozin plus exenatide was superior to either dapagliflozin and exenatide in addressing the diverse glycemic features and CV causal factors poorly controlled T1DM. Nonetheless, it was attributed to slightly higher rates of AEs, mainly UTIs, nausea, and diarrhea. Dapagliflozin plus exenatide led to moderately lower eGFR than either dapagliflozin and exenatide, respectively. However, the change was not clinically significant. |

| Study | Intervention | Comparator | Background | n | Duration (weeks) | eGFR | Outcomes |
|---|---|---|---|---|---|---|---|
| Kashiwagi et al (44), 2015 | 50 mg Ipragliflozin n = 119 | Placebo n = 46 | OADs | n = 165 m 64.4 | 52 | ≥ 30, < 90 | At 24 weeks, 50 mg Ipragliflozin was allied to significant improvement in body weight and glycemic control than in the placebo. The effect of treatment in patients with mild CKD on glycemic control was not substantial by week 4. Ipragliflozin-induced glycosuria dropped with diminishing eGFR. Overall, Ipragliflozin enhanced glycemic control and decreased body weight in diabetic patients with mild or moderate CKD. Thus, Ipragliflozin is a recommended therapeutic option for diabetic patients with normal kidney function or mild CKD, but not for patients with moderate or stage 4 CKD |
| Han et al (45), 2018 | 50 mg Ipragliflozin n = 74 | Placebo n = 69 | Metformin and sitagliptin | n = 143 | 24 weeks | ≥ 30, < 90 | After 24 weeks, Ipragliflozin led to a significant drop in insulin resistance and pattern towards the enhanced beta-cell function. No significant changes in renal function or electrolyte balance in either groups. |
| Leiter et al (38), 2015 | 100/300 mg Canagliflozin n = 968 | 6 or 8 mg Glimepiride n = 482 | Metformin | n = 1,450 m = 49.5 | 104 | ≥ 55 | Decreases in eGFR occurred in all cohorts with a significant decline in the glimepiride than canagliflozin. 100/300 mg canagliflozin conferred long-term glycemic improvement in patients with T1DM on Metformin. 100/300 mg canagliflozin resulted in significant weight loss and systolic blood pressure than glimepiride |
| Stenlof et al (39), 2014 | 100/300 mg Canagliflozin n = 387 | Placebo or sitagliptin n = 192 | OAD mono-therapy (except TZD) OR Metformin + SU | n = 587 m = 55.4 | 52 | ≥ 50 | 100/300 mg canagliflozin resulted in a significant decline in systolic blood pressure and improvements in glycemic control over the 52 weeks than placebo or sitagliptin. Genital mycotic infections and AEs associated with osmotic diuresis were more prevalent in the treatment than in the control group. There was a significant drop in eGFR in the treatment cohort was associated with hemodynamic effect and not renal injury. |
| Pollock et al (46), 2019 | 10 mg dapagliflozin or 2.5 mg saxagliptin plus 10 mg dapagliflozin n = 308 | Placebo n = 153 | OADs ± insulin ± GLP-1 RA | n = 461 m = 64.5 | 24 | ≥ 20, ≤ 80 | In the placebo group, UACR remained relatively stable over the study period. Saxagliptin plus dapagliflozin was more effective than dapagliflozin and placebo alone. |

| Author | Year | Intervention | Comparator | Baseline | Duration (weeks) | eGFR | Findings |
|---|---|---|---|---|---|---|---|
| Ridderstråle et al (32). | 2014 | 25 mg Empagliflozin n =769 | 1-4 mg Glimepiride n = 780 | Metformin | n = 1,549 m =55.9 | 104 | ≥ 60 | Empagliflozin substantially reduced FPG over glimepiride at 52 and 104 weeks. Empagliflozin preserved renal function from the start to the completion of the study |
| Takashima et al (31). | 2018 | 100 mg canagliflozin n = 21 | Placebo n = 21 | OADs ± insulin | n = 42 m = 60 | 52 | ≥45, <90 | Treatment with 100 mg canagliflozin led to significant reduction in UACR levels Reductions in eGFR were noted more in the 100 mg canagliflozin than in the placebo cohort. |
| Lin et al (55). | 2019 | 10-25 mg Empagliflozin n=7264 10mg Dapagliflozin n=7264 | Placebo none | None | n=15248 m=61 | 78 | >15, <90 | Dapagliflozin lowered the risk of eGFR by 40% in 12 months across all levels of CKD. Also risk of AKI Risk of related hospitalization was lower in patients treated with Dapagliflozin. |

# Parkinson's Disease: An update on Pathophysiology, Epidemiology, Diagnosis and Management
# Part 4 : Differential Diagnosis and Patient Assessment

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## Abstract

Early symptoms of PD are subtle and occur gradually.  Patients may be tired, or experience a general malaise. Many may feel a little nervous or may have trouble getting out of a chair. We can note that they talk too softly or that they look messy and spidery in their handwriting. They may lose track of a word or thought or they may, for no obvious cause, feel irritable or discouraged. This early period can last a long time before the symptoms appear more classic and obvious.  The onset of symptoms will take several years to go unnoticed.  Symptoms usually impact only one side of the body for one or two years, then move to the other side. Tremor is always first detected, which usually causes the doctor's first appointment. Nevertheless, there is no tremor in up to 30 per cent of patients; this may lead to a misdiagnosis. In this review the approach to assessment and differential diagnosis of Parkinson disease are discussed.

Key words: Parkinson's disease, differential diagnosis patient assessment

## Patient Assessment

Early PD signs are mild, and gradually occur (Jankovic, 2008). Patients may be tired, or experience a general malaise. Many may feel a little nervous or may have trouble getting out of a chair. We can note that they talk too softly or that they look messy and spidery in their handwriting. They may lose track of a word or thought or they may, for no obvious cause, feel irritable or discouraged. This initial phase can last a long time before the symptoms appear more classic and obvious.

The first to note changes could be friends or family members. We can see that the face of the person lacks speech and movement ("masked face") or that the person stays for a long time in a certain position, or usually does not move an arm or leg. Perhaps they see the individual appears rigid, erratic and unusually slow.

The beginning of symptoms will take several years to become noticeable. Warning symptoms include finger stiffness or a sore shoulder followed by tense muscles. Pain could be a feature of that (Jankovic 2008). Symptoms usually impact only one side of the body for one or two years, then move to the other side. Tremor is always first detected, which usually causes the doctor's first appointment. Nevertheless, there is no tremor in up to 30 per cent of patients; this may lead to a misdiagnosis. When the disease progresses, the tremor that most patients feel may begins to interfere with everyday activities.

Patients may not be able to keep utensils straight, or may find it difficult to read a newspaper due to trembling. Once the patient is comfortable the tremor can get worse. Shaking is most pronounced a couple of seconds after hands rest on a table.

The clinical image between patients with PD can be extremely varied, allowing different motor subtypes to be defined: 'tremor dominant,' 'postural instability and gait difficulty' (PIGD) or 'indeterminate.' The interest in the identification / definition of PD subtypes is focused on their potential correlation with etiological or prognostic aspects and treatment response: for example, tremor-dominant PD was associated with slower progression and less impairment compared with PIGD (Fereshtehnejad & Postuma, 2017).

Even though PD has traditionally been described as a movement disorder, NMSs are an essential aspect of the clinical picture. NMSs differ from dysphagia and sialorrhoea to autonomic, gastrointestinal, sleep, auditory, cognitive, and neuropsychiatric conditions. NMSs continue to be under-identified by patients and under-researched by doctors; but, if correctly assessed, they are identified by the majority of patients and have a direct effect on health-related quality of life (HRQoL) and disability (Schapira et al., 2017, Balestrino & Martinez-Martin). Many other symptoms – known as 'prodromal / premotor symptoms' – may occur even 10 years before the diagnosis and onset of motor symptoms: hyposmia, fatigue, constipation, and

rapid eye movement sleep behavior disorder (RBD) are the most commonly recognized, which can include visual changes, anxiety, and other autonomic disturbances (Postuma et al., 2012). The prodromal phase of PD offers a rare opportunity to recognize those at high risk of developing PD and prior to the onset of severe neurodegeneration, offering valuable insight into the mechanisms of the disease and its development, and a potential therapeutic window for neuroprotective treatments; hence efforts have been made to increase the identification of this period.

Wide population studies such as PRIPS (Prospective Assessment of Risk Factors for Idiopathic Parkinson 's Syndrome), PARS (Parkinson At-Risk Syndrome Study), TREND (Tubinger Assessment of Risk Factors for Early Detection of Neurodegeneration) and Rotterdam Studies have helped to classify prodromal markers of PD. (Postuma et al., 2019 ). Online-based screening studies, such as the general population PRE- DICT-PD and the GBA mutation carriers RAP- SODI, are currently under way. The diagnostic criteria for the prodromal phase of PD have recently been revised, and a web-based prodromal PD risk calculator that enables individuals to measure the probability of prodromal PD is now available, but should be used with caution and only in clinical settings (Heinzel et al., 2019).

## Diagnosis and Differential diagnosis

PD is basically a clinical diagnosis. Recently the Movement Disorders Society revised the diagnostic criteria for PD (Postuma et al., 2015) (Table 1). Table 2 & 3 summarizes the principal differential diagnoses.

**Secondary Parkinsonism**
Parkinsonism can be due to basal ganglia lesions with different etiologies – such as ischemic, neoplastic, or infective. A sudden onset and the co-occurrence of other symptoms in those cases should suggest a diagnosis other than PD. Exposure to toxins (carbon monoxide, manganese) or drugs such as dopamine-blocking agents (anti-psychotics but also metoclopramide), tetrabenazine, calcium channel blockers, amiodarone and lithium may cause parkinsonism; the second most common cause of parkinsonism after PD is drug-induced parkinsonism (DIP). Accurate diagnosis is necessary for better management and appropriate prognosis. Motor characteristics that can help distinguish it from PD are symmetric symptoms, oromandibular dyskinesias, and no or limited response to levodopa; however, DIP motor characteristics may be similar to PD. Hyposmia appears to be the most effective NMS to differentiate between DIP and PD, although the founding factors (age, smoking, and cognitive impairment) may complicate its assessment. Withdrawal of the causative medication for 6 months could lead to symptom improvement, but this is not always feasible or successful (Brigo et al 2014).

**Essential Tremor (ET)**
ET's key clinical characteristic is a 5–12 Hz frequency postural and/or action tremor with symmetric presentation

that includes the hands, head ('yes–yes' or 'no–no') and/or voice more frequently. Rest tremor can be present but it increases during movement as compared to PD. Patients display tremulous handwriting rather than micrography as in PD. In addition to tremor, mild signs of the cerebellar, cognitive dysfunction, psychological symptoms and sensory problems were often identified. The disease is usually slowly progressive; its symptoms may be mitigated by alcohol, propranolol and primidone, while they are ineffective in PD. ET shows an autosomal dominant inheritance and patients often report a positive family experience (Bhatia et al . , 2018). Some overlapping features were described between PD and ET, and misdiagnosis is relatively common (Shahed & Jankovic 2007).

### Atypical Parkinsonism

Multiple system atrophy (MSA) is a neurodegenerative disease portrayed by autonomic dysfunction and cerebellar signs and/or parkinsonism. Motor symptoms of MSA include an akinetic-rigid parkinsonism with, in contrast to PD, a symmetric distribution and no or limited response to levodopa; pyramidal symptoms (extensor plantar responses and hyperreflexia), cerebellar signs (dysarthria, dysmetria, nystagmus, ataxia) and oculomotor dysfunction (impaired smooth pursuit movement, dysmetric saccades, repression of vestibulo-ocular reflex) may happen. Classic resting tremor is rare; a jerky poly-mini myoclonus can be seen in patients instead. Neck (anterocollis or laterocollis) or orofacial dystonia may happen, particularly when levodopa is prescribed. Dysautonomic features are common from early stages of the disease; they include urogenital, cardiovascular (orthostatic hypotension and its effects such as syncope and postural dizziness), respiratory (stridor, sleep-related breathing disturbances, respiratory failure), gastrointestinal and sudomotor symptoms. Dementia may ensue at the later stages of the illness. MSA is pathologically a synucleinopathy; neurodegeneration affects the striatonigral and/or olivopontocerebellar structures more commonly (Stamelou & Bhatia, 2015, Deutschlander, et al., 2017).

Various forms of progressive supranuclear palsy (PSP) were identified. The classic PSP phenotype is known as Richardson syndrome; it typically has an axial akinetic-rigid parkinsonism with no or moderate reaction to levodopa, postural anomalies (head and trunk hyperextension / retrocollis, not camptocormia as in PD), gait abnormalities (broad-based gait and freezing), postural instability, and falls from the initial stage of the disease (rather than in a later stage as in PD). The typical symptom of PSP is the supranuclear palsy of the vertical gaze, which is absent in PD; other indications of oculomotor dysfunction include slowing down (especially downward) vertical saccadic movements and eyelid opening apraxia (which cause a compensatory overactivity of the frontal muscle and lead to a typical 'surprised' expression). Despite the supranuclear aspect of gaze palsy, the vestibulo-ocular reflex is retained. Certain characteristics include pseudobulbar palsy, dementia of the sub-cortical form, symptoms of frontal release and perseveration of the motor that are absent in PD. A characteristic of PSP patients is 'motor recklessness,' described as no caution in walking / standing / moving despite loss of balance and frequent falling. Pathologically, PSP is a tauopathy disease linked with irregular tau protein aggregates and its hallmark characteristic is 'tufted astrocytes;' neurodegeneration affects subcortical structures such as the SN, the sub-thalamic nucleus (STN) and the midbrain (Stamelou & Bhatia, 2015, Deutschlander, et al. 2017).

The most common motor characteristics of corticobasal degeneration (CBD) are asymmetric rigidity and bradykinesia, which can occur in conjunction with dystonia and myoclonus (typically distal and sensitive to stimulation) differently from PD. A distinguishing sign of CBD is the 'alien limb phenomenon,' reported by about 50 % of patients: the limb may involuntarily assume positions, grab objects or interfere with the actions of the non-affected limbs. Tremor is rare, and an action / postural tremor is present, rather than a resting tremor as in PD. CBD also has cortical symptoms such as dementia (usually affecting frontal and parietal functions), apraxia, and cortical sensory impairment, usually absent in PD. However CBD presentation is highly variable and can overlap with other diseases, and it is estimated that its clinical diagnostic accuracy is particularly low (< 50 percent). Pathologically, CBD is a tauopathy; its signature characteristic is the development of 'astrocytic plaques;' the neurodegeneration primarily affects the SN and the front-parietal cortex (Stamelou & Bhatia, 2015, Deutschlander, et al. 2017).

### Other Parkinsonisms

Dementia of Lewy Body -DLB's main clinical characteristics include cognitive impairment, with alertness and concentration disturbances, parkinsonism, visual hallucinations and Rem Sleep Behavioral Disorder (RBD ). Parkinsonism occurs in nearly 85 per cent of patients; it is typically milder than in other atypical parkinsonisms and PD; axial symptoms such as postural disturbances, gait disorder and postural dysfunction are prevalent; tremor is rare. Essentially, cognitive dysfunction occurs at or within 1 year of parkinsonism. Cognitive impairment is characterized by attention deficits, executive function and visuospatial ability, while memory and language are spared relatively. Many clinical characteristics include dysautonomy, repeated dropping, prolonged daytime sleepiness, susceptibility to the neuroleptics, hyposmia and mood disorders. Hallucinations are typically extremely vivid and informative. Alertness and attention variations are rather common, and help eliminate PD. DLB is a synucleinopathy; its pathological features are neuronal inclusions of a-synuclein (LBs and Lewy neurites), and neuronal failure. DLB comprises three types of a-synuclein pathology: predominant brainstem, limbic (or transitional), and neocortical. Alzheimer's disease pathology is overlapping (Walker et al., 2015).

The second most frequent cause of neurodegenerative dementia before age 65 (after Alzheimer's disease) is Fronto-Temporal Dementia (FTD ). There are specific variants with FTD and they are graded based on clinical characteristics. In the behavioral type (bvFTD), parkinsonism is more pronounced; the most pronounced

motor symptoms are bradykinesia, parkinsonian gait, rigidity, postural stiffness, and resting tremor. For FTD cases with C9orf72 mutations, a cause of FTD-amyotrophic lateral sclerosis (FTD-ALS), parkinsonism is often common; it is usually symmetrical and rigid-akinetic. The presence of early behavioral or cognitive symptoms may assist in the diagnosis of differentials. FTD pathology is complex and classified in pathological inclusions according to the predominant protein: tau (4R and/or 3R tau), TDP-43 or FET (Baizabal-Carvallo & Jankovic, 2016).

Other degenerative diseases such as Wilson disease (WD) and Huntington disease (HD) can cause parkinsonism. Wilson disease is a recessive, autosomal, monogenic disorder. The causative gene, ATP7B, encodes a P-type ATPase that carries copper. Hepatic and/or neurological symptoms are characteristic of WD. Usually, neurological symptoms in WD begin in the second or third decade of life; however, both late onset (> 70 years of age) and infancy onset have been identified. The combination of wing-beating tremor or flapping tremor and dysarthria strongly indicates WD diagnosis; other neurological signs include parkinsonism, other types of tremor (an abnormal, jerky, dystonic tremor; rest, motion, or intention tremor), dystonia, and orofacial dyskinesias. Often reported were pyramidal features, hallucinations, psychotic symptoms and irregular vertical smooth pursuit. WD may present with acute liver failure or chronic liver disease, but WD is not exempt from the absence of liver disease. The presence of Kayser – Fleischer rings and the low concentrations of serum ceruloplasmine are sufficient to establish the diagnosis. Precise diagnosis of WD is critical, since it is a treatable disorder and pre-symptomatic treatment is also mandatory in relatives with pre-clinical WD biochemical or genetic evidence. Treatment options include copper chelators, zinc salts, or both; life-long medical therapy is required. Introduction of WD therapy can be associated with an initial deterioration of clinical characteristics and requires close monitoring (Poujois & Woimant, 2019).

Huntington disease is a neurodegenerative disorder with autosomal dominant inheritance, instigated by an extended repeat of the CAG trinucleotide in the gene encoding the huntingtin protein (HTT). The disorder features a mixture of motor, cognitive, and behavioral characteristics. Motor features in HD include repetitive gestures, such as chorea, and voluntary movement disorder, such as incoordination and bradykinesia. Cognitive deficiency in HD is portrayed by problems in mental flexibility, concentration, preparation, cognitive slowing, and awareness of emotion problems. Psychiatric symptoms include depression, apathy, irritability, paranoia and obsessive – compulsive behaviors. Juvenile HD, also known as Westphal type, can resemble PD: behavioral and cognitive abnormalities are often the first sign and the motor picture is characterized by dystonic hypokinesia and bradykinesia; chorea is uncommon in the first decade and occurs only in the second decade; epileptic fits are frequent (Bates et al., 2015). Current HD management focuses on the management of symptoms, but disease-modifying therapies such as antisense oligonucleotides designed to inhibit HTT messenger RNA give promising results in trials (Tabrizi et al., 2019).

Parkinsonism can also occur in neurodegenerative diseases with brain iron accumulation –such as Hallervorden-Spatz disease – and some forms of spinocerebellar ataxias: in these cases, a positive family history, young age at onset, concurrent clinical features and instrumental findings should lead the neurologist to consider other causes than PD.

Parkinsonism can also occur in neurodegenerative diseases with accumulation of brain iron, such as Haller-vorden-Spatz disease, and certain forms of spinocerebellar ataxia: in these cases, a positive family history, early age, concurrent clinical characteristics and instrumental findings should lead the neurologist to consider causes other than PD.

## Conclusion

The assessment of the suspected Parkinson patient is a delicate process. It entails good knowledge of the differential of the disease, good listening and observation skills. In addition to cooperative patient and caregiver.

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**Table 1. New diagnostic criteria for Parkinson disease from Movement Disorder Society**

The essential criterion is parkinsonism defined as: bradykinesia in combination with at least 1 of rest tremor or rigidity

**Diagnosis of clinically established PD**
1. Absence of absolute exclusion criteria
2. At least two supportive criteria, and
3. No red flags

**Diagnosis of clinically probable PD**
1. Absence of absolute exclusion criteria
2. Presence of red flags counterbalanced by supportive criteria
- If one red flag is present, there must also be at least 1 supportive criterion
- If two red flags, at least 2 supportive criteria are needed
- No more than two red flags are allowed for this category

**Supportive Criteria**
1) Clear and dramatic beneficial response to dopaminergic therapy. During initial treatment, patient returned to normal or near-normal level of function. In the absence of clear documentation of initial response, a dramatic response can be classified as:
a) Marked improvement with dose increases or marked worsening with dose decreases. Mild changes do not qualify. Document this either objectively (>30% in UPDRS III with change in treatment) or subjectively (clearly documented history of marked changes from a reliable patient or caregiver).
b) Unequivocal and marked on/off fluctuations, which must have at some point included predictable end-of-dose wearing-off.
2) Presence of levodopa-induced dyskinesia
3) Rest tremor of a limb, documented on clinical examination (in past, or on current examination)
4) The presence of either olfactory loss or cardiac sympathetic denervation on MIBG scintigraphy

**Absolute exclusion criteria**
1. cerebellar abnormalities, such as cerebellar gait, limb ataxia or cerebellar oculomotor abnormalities
2. Downward vertical supranuclear gaze palsy, or selective slowing of downward vertical saccades
3. Diagnosis of probable behavioural variant fronto-temporal dementia or primary progressive aphasia, defined according to consensus criteria within the first 5 years of disease
4. Parkinsonian features restricted to the lower limbs for more than 3 years
5. Treatment with a dopamine receptor blocker or a dopamine-depleting agent in a dose and time-course consistent with drug-induced parkinsonism
6. Absence of observable response to high-dose levodopa despite at least moderate severity of disease
7. Unequivocal cortical sensory loss, clear limb ideomotor apraxia, or progressive aphasia
8. Normal functional neuroimaging of the presynaptic dopaminergic system
9. Documentation of an alternative condition known to produce parkinsonism and plausibly connected to the patient's symptoms, or the expert evaluating physician, based on the full diagnostic assessment, feels that an alternative syndrome is more likely than PD

**Red Flags**
1) Rapid progression of gait impairment requiring regular use of wheelchair within 5 years of onset
2) A complete absence of progression of motor symptoms or signs over 5 or more years unless stability is related to treatment
3) Early bulbar dysfunction: severe dysphonia or dysarthria (speech unintelligible most of the time) or severe dysphagia (requiring soft

food, nasogastric tube or gastrostomy feeding) within first 5 years
4) Inspiratory respiratory dysfunction: either diurnal or nocturnal inspiratory stridor or frequent inspiratory sighs
5) Severe autonomic failure in the first 5 years of disease. This can include orthostatic hypotension or severe urinary retention or urinary incontinence in the first 5 years of disease (excluding long-standing or small amount stress incontinence in women) that is not simply functional incontinence. In men, urinary retention must not be attributable to prostate disease, and must be associated with erectile dysfunction
6) Recurrent (>1/year) falls because of impaired balance within 3 years of onset
7) Disproportionate anterocollis (dystonic) or contractures of hand or feet within the first 10 years
8) Absence of any of the common non-motor features of disease despite 5 years' disease duration. These include sleep dysfunction (sleep-maintenance insomnia, excessive daytime somnolence, symptoms of REM sleep behaviour disorder), autonomic dysfunction (constipation, daytime urinary urgency, symptomatic orthostasis), hyposmia or psychiatric dysfunction (depression, anxiety or hallucinations)
9) Otherwise unexplained pyramidal tract signs, defined as pyramidal weakness or clear pathological hyperreflexia (excluding mild reflex asymmetry and isolated extensor plantar response)
10) Bilateral symmetric parkinsonism. The patient or caregiver reports bilateral symptom onset with no side predominance, and no side predominance is observed on objective examination

**Table 2. Differential diagnosis in parkinsonism**

| Parkinson disease | Secondary parkinsonism | Atypical parkinsonism | Neurodegenerative disease | Other diseases |
|---|---|---|---|---|
| Sporadic | Drug induced | Multi-systemic atrophy | Dementia with Lewy bodies | Wilson disease |
| Familial/genetic | vascular | Progressive supranuclear palsy | Alzheimer disease with | Huntington disease |
| | Toxic | Corticobasal syndrome | Prion disease | Kufor Rakeb syndrome |
| | Neoplastic | | Frontotemporal Dementia | SCA3 |
| | Infective | | | Dopa-responsive dystonia |
| | Normal pressure hydrocephalus | | | X-linked parkinsonism dystonia |
| | Trauma | | | Neurodegeneration with brain iron accumulation |
| | Liver failure | | | Fragile X-associated ataxia-tremor-parkinsonism |

**Table 3: Differential diagnosis of Parkinson's disease**

| Diagnosis | Differentiating clinical features |
|---|---|
| Progressive supranuclear palsy | Oculomotor dysfunction with vertical gaze abnormalities, axial rigidity, falls during the early stages of disease, pseudobulbar palsy, swallowing dysfunction, cognitive impairment, apraxia of eyelid opening, parkinsonism with lack of or transient response to L-dopa, rapid progression, dysarthria |
| Multiple system atrophy | Postural hypotension and autonomic dysfunction (Shy-Drager variant), cerebellar dysfunction (olivopontocerebellar atrophy variant), parkinsonism with lack of or transient response to L-dopa (striatonigral degeneration variant), falls during the early stages of disease, swallowing dysfunction, rapid progression, neck flexion, myoclonus, dysarthria |
| Vascular parkinsonism | Lower body presentation with freezing gait during the early stages of disease, pyramidal tract signs, cognitive dysfunction, relative lack of response to L-dopa |
| Diffuse Lewy body disease | Early dementia, hallucinations with L-dopa therapy, fluctuating level of alertness, sensitivity to extrapyramidal side effects of neuroleptics |
| Corticobasal degeneration | Apraxia, cortical sensory signs, myoclonus, unilateral presentation, dystonia, cognitive impairment, lack of response to L-dopa |

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# Bloodstream infection with *Kocuria rhizophila*: A case report and review of literature

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## Abstract

**Background:** *Kocuria rhizophila* is a Gram-positive microorganism, which has recently been known as an organism that can cause infection in humans. However, the reports regarding this organism and its possibility to cause severe infections in children are relatively limited.

**Case Presentation:** On October 28th, 2018, a 30-day old boy presented to the Maternity & Children's Hospital, Abha City, Saudi Arabia, with a history of cough and shortness of breath for two days, followed by apnea and cyanosis. On clinical examination, he was in moderate respiratory distress with compensated shock. He developed supraventricular tachycardia, which was controlled by adenosine. He was admitted to the Pediatric Intensive Care Unit (PICU). Blood culture showed positive growth with *Kocuria rhizophila*, sensitive to Gentamicin, Erythromycin, and Moxifloxacin. The patient developed respiratory distress and needed non-invasive respiratory support. At that time, antibiotics were upgraded with no significant improvement of clinical condition till Gentamycin was added on the second day, which led to a dramatic response and the patient was shifted from PICU to the pediatric medical ward.

**Conclusion:** *K. rhizophila* can cause severe infections in pediatric patients that necessitate PICU admission. Therefore, it should be considered as a true pathogen and proper treatment should be provided to all susceptible pediatric patients.

Key words: *Kocuria rhizophila*, pediatrics, Gentamycin; respiratory distress.

## Introduction

*Kocuria rhizophila* is a Gram-positive coccus that relates to the family Micrococcaceae in the order Actinomycetales (1). It was found in the rhizosphere of a narrow leaf cattail (*Typha angustifolia*) and chicken meat treated with oxalic acid; also, in contaminated dust, fresh water and food (2). It lives on healthy skin and mucous membranes of humans and animals (3). Moreover, it can cause infection in immunocompromised patients with severe underlying diseases. Infection by *K. rhizophila* is underestimated and its clinical pathogenic potency is still doubtful (4).

Here, we present a case of bloodstream infection caused by *Kocuria rhizophila*. Because of its ability to cause severe infection and increased antibiotics resistance in hospitalized patients it should not be ignored as a contaminant.

## Case Report

On October 28th, 2018, a 30-day old boy presented to the Maternity & Children's Hospital, Abha City, Saudi Arabia. The baby boy, who had been previously medically free, presented to our hospital with cough, shortness of breathing for two days followed by one episode of cessation of breathing associated with cyanosis on the day of presentation. He had a history of diarrhea and vomiting one day before admission associated with decreased oral intake and activity.

The patient was a product of a late preterm pregnancy through normal spontaneous vaginal delivery with no neonatal intensive care unit admission. He received his birth vaccines and was fed by breast and bottle. Parents are non-consanguineous, with four healthy siblings.

Initially, the patient was conscious, sick-looking, with moderate respiratory distress and severe dehydration. Vital signs assessment revealed temperature: 37.3°C, heart rate: 240 beats/min, blood pressure: 83/47 mmHg, respiratory rate: 50 breaths/ minute, oxygen saturation: 82-86% in room air, with delayed capillary refill time.

The patient was connected to oxygen through nasal prongs and maintained with 2L oxygen, normal saline bolus was given, and adenosine was received. Infection workup was performed including blood culture. Antibiotics (Ampicillin and Cefotaxime) were started. The patient was admitted to PICU as a case of controlled supraventricular tachycardia (SVT) with compensated septic shock.

Regarding investigations: Complete blood count (CBC): White blood counts: 14.19×109/L mainly neutrophils (59.5%), hemoglobin: 18.5 gm/dL, hematocrit: 52.6%, platelets: 184,000 platelets per microliter), renal function tests: (urea: 23 mg/dL, creatinine: 0.34 mg/dL, calcium: 8.4 mg/dL, phosphorus: 3.1 mg/dL, magnesium: 1.8 mg/dL, sodium: 137 mEq/dL, potassium: 4.5 mEq/dL), C-reactive protein: 1.6 mg/dl.

Blood culture revealed *Kocuria rhizophila,* sensitive to Gentamicin, Moxifloxacin and Erythromycin. The VITEK 2 system (BioMérieux, Inc, Hazelwood, Mo.) was used to confirm the identity of the bacteria. Chest x-ray and electrocardiogram were normal. Cerebrospinal fluid study was refused by the family.

Four days after admission, the patient developed respiratory distress and was connected to BiPAP and antibiotics were upgraded to Meropenem and Linezolid, with no significant improvement in his clinical condition.

On the next day, Gentamicin was added, based on results of previous blood culture. On the second day of starting gentamicin, the patient showed dramatic response with normalization of respiratory rate and discontinuation of BiPAP. Repeated blood cultures showed no growth. Then the patient was shifted to the pediatric medical ward. A Holter monitor was connected, with no more episodes of SVT. Our patient completed the course of antibiotics for seven days then was discharged in a good condition.

## Discussion

To the best of our knowledge, the current case is the first bloodstream infection with *Kocuria rhizophila* to be reported in Saudi Arabia. *K. rhizophila* bacteria were considered as contaminants, and were rarely associated with infection. Nevertheless, recently, the incidence of infections caused by *Kocuria* spp. has increased, with subsequent consumption of patient's health and medical resources (1, 2, 4-6).

*Kocuria rhizoplila* is one of several species of *Kocuria*. It is a Gram-positive coccus in the phylum Actinobacteria, class *Actinobacteria*, order *Actinomycetales*, suborder *Micrococcinae* and family *Micrococcaceae* (1). Interestingly, chicken meat treated with oxalic acid can be used as a medium for growing the organism (3, 4). Contact with contaminated meat and dust is considered as a source of infection (4). The possibility of invasive devices used in hospitalized patients, especially the central venous catheter line, as a portal of entry, was also considered (4). Meningitis, brain abscess, bacteremia, urinary tract infection, cholecystitis, peritonitis, and endocarditis are infections that can be caused by *Kocuria rhizophila* (6-9).

The risk factors predisposing to infection by *Kocuria* spp. include gastrointestinal abnormalities (e.g., short bowel syndrome), chronic catheterization (in cases of total parenteral nutrition), malignancies (e.g., acute myelogenous leukemia, non-Hodgkin's disease) and patients on peritoneal dialysis secondary to end-stage renal disease (6-9).

There are few reported cases of *K. rhizophila.* The first case of *K. rhizophila* infection was reported in an eight-year-old boy with methylmalonic aciduria with subcutaneous implantable vascular access port. He suffered from multiple sepsis episodes for more than two years and port-A-cath was represented as a source of infection (4). They used

16s rRNA gene sequence analysis to confirm the presence of *K. rhizophila* (4). Also, they covered the patient with antibiotics in each time of sepsis, but he showed response and recovery from sepsis after they changed the port-A-cath (4).

Moissenet et al. reported a case of *K. rhizophila*, who presented as persistent bloodstream infection associated with a damaged central catheter in a 3-year-old girl with Hirschsprung's disease (5).

Our 30-day old case presented with apnea, supraventricular tachycardia, and sepsis. Blood culture showed *Kocuria rhizophila* identified by using the VITEK 2 system. It was sensitive to Gentamicin, Moxifloxacin, and Erythromycin. After starting treatment with Gentamicin, the patient showed dramatic improvement.

The identification of *Kocuria* is still difficult due to the high cost and unavailability of molecular typing with the need for specialized laboratory services. Moreover, the misidentification of coagulase-negative staphylococcus as *Kocuria* species mandates use of molecular methodology (10).

Nonhoff et al. (11) reported that the Vitek 2 system identified 95% of isolates correctly, detected oxacillin resistance with a sensitivity of 99% and a specificity of 96%, with acceptable accuracy for antimicrobial susceptibility testing. The median time for reporting results was less than 3 hours for identification and seven hours for susceptibility tests.

Pathogenic *Kocuria* species are highly susceptible to broad-spectrum antibiotics, like: amoxicillin/clavulanate, ceftriaxone, cefuroxime, doxycycline, and amikacin as a first-line therapy against micrococcal pathologies (12). Duration of treatment should be correlated with the type of infection (12, 13). Catheter removal in patients with central line-related infection is the mainstay of treatment (12, 13).

In our case, we used only the VITEK 2 system to confirm the identity of bacteria and the lack of molecular typing of this pathogen represented as one of the limitations in our report.

In conclusion, not all *Kocuria rihzophila* are contaminants. We should try to correlate the clinical condition of the patient with positive blood culture for this organism, especially in pediatric immunocompromised patients, with intravenous catheters. Further studies regarding the organism, its virulence, pathogenic potency, risk factors, and antimicrobial susceptibility patterns of *Kocuria* spp. are needed.

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# Knowledge, attitudes and awareness of women about the long and short-term effects of a caesarean section for mothers and children in Taif, KSA, 2020

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## Abstract

**Background:** Cesarean section (CS) delivery reduces the risk of complications associated with vaginal delivery, but it is associated with short term and long-term complications.

**Objectives:** The aim of this study was to explore the prevalence of CS, and to assess the extent of Saudi women's awareness and attitude towards the long-term and short-term complications of caesarean sections.

**Methods:** A cross sectional study using an electronic questionnaire was distributed to 384 women in the reproductive age at Taif City with an age ranging from 18 to 56 years. The questionnaire included items about participants' demographic data, previous delivery, presence of chronic diseases or complications after CS, and items related to the knowledge and attitude towards CS.

**Results:** Of the participants, 68.8% prefer normal delivery, 77.6% saw that cesarean section is more harmful than normal delivery, and 39.8% saw that cesarean section is safer for the mother and the baby. For the participants who had previous CS (38% of the sample), and 16.9% had CS for health causes and complications for the fetus. About 18% of them said that constant pain was the common complication of CS, 47.9% saw that uterine adhesion is the most common complication of a CS in the long-term, while 44.1% saw that delay and lack of breastfeeding is the most common complications of the CS on the child.

**Conclusions:** This study calls for health education of all women about advantages and disadvantages of CS to enable mothers to take the proper decision.

**Key words:** Knowledge, attitudes, caesarean, mothers, children, Taif

## Introduction

Cesarean section delivery (CS) is defined as the surgical removal of a neonate through the maternal abdominal and uterine walls. It is a surgical procedure done when the normal delivery is impossible or is dangerous to mother or baby. The World Health Organization recommends to keep the rate of CS below 10–15%, but rates rise worldwide (1).

There are many factors that have increased the rate of caesarean sections, such as maternal obesity, gestational diabetes or hypertension, multiple gestation, preterm labor and physicians malpractice (2). CS is a common operative procedure among the United States hospital patients. The rate from 1996 to 2011 rose from 20.7% to 32.8%. Reported rates of CS in America in 2016 show 24.5% in Western Europe, 32% in North America, and 41% in South America (3).

CS reduces the risk of complications associated with vaginal delivery, like pelvic organ prolapse and urinary incontinence, but it is associated with short term and long-term complications (4).

Cesarean delivery is one of the major abdominal surgery routines that is associated with complications more than vaginal delivery such as infection, emergency hysterectomy, persistent pain, haemorrhage, visceral injury, and venous thromboembolism (5). CS affects not only the mother, it is also carries risks to the infant such as, respiratory distress, asphyxia and other pulmonary disorders. CS only affects the current pregnancy, but it has a major role in future pregnancy complications like adhesions of uterus, bowel and bladder injury, uterine rupture, abnormal placentation (placenta previa, accrete, increta, percreta) and risks of infertility (5,6). First birth CS was reported to increase the risk of placental abruption and placenta previa 30% and 40% compared to vaginal delivery (7).

In the Kingdom of Saudi Arabia, the rate of CS increased 80% from 1997 to 2006 and absence of antenatal care has resulted in 70% increase in CS deliveries (8). A study was done in 2015 in the Eastern Province of KSA to explore women's views and beliefs towards elective caesarean section to discover the role of these factors in increasing the CS rates. The study found that about half of the women (49.7%) indicated that they would agree to undergo CS in the future. It was found that the percentage of those who agree to undergo CS in the future was significantly increasing with increased age of the women (9).

In the same time, another study was done in the same year in Makkah city to determine the popularity of cesarean sections (CS) on demand among women in Saudi Arabia and to assess the factors affecting the choice of the delivery. The study found that (80.9%) of the study population preferred vaginal delivery (10).

A recent study was done in 2019 to determine the outcome of pregnancy in Saudi women with previous one cesarean section. The study found that successful vaginal delivery was (73.9%). There were no reported cases of maternal mortality or morbidity. However, there was a tender scar with no dehiscence or ruptured uterus (4 %). There was no neonatal mortality, however, 6% of the CS were indicated by fetal distress (11).

The aim of the present study was to explore the prevalence of CS, and to assess the extent of Saudi women's awareness and attitude towards the long-term and short-term complications of caesarean sections.

## Subjects and Methods

**Study design and time frame:** This study was a cross sectional study done from 1 May to 31 August 2020
Study setting: Taif city, KSA

**Sampling methodology:** The sample included 384 females and was calculated by sample size calculation formulas program and use of proportional allocation method. The inclusion criteria were all women in the reproductive age at Taif City with an age ranging from 18 to 56 years. The exclusion criteria were all females under 18 years and those above 56 years.

**Study instrument:** Data were collected by an electronic questionnaire. The questionnaire included items about socio-demographic data, previous delivery (type of delivery, the causes of CS, number of CS), presence of any chronic disease in the mother (DM, HTN), presence of any complication after CS. It also included items that asked the participants if they thought that the CS is more harmful than normal delivery, CS is safer for the mother and the baby, anesthesia during CS leads to complications for the mother and the baby, CS leads to consecutive CS delivery and reduces the chance of a normal delivery after that, and if the CS increases the chance of placenta previa or abruption in the future.

**Pilot testing:** Pilot testing of the questionnaire was done on 20 females to ensure correction of confusing and inconsistent questions, before it was administered for the actual data collection.

**Ethical consideration:** The Research Ethics Committee of Taif University approved the study.

**Statistical analysis:** Data were analyzed using (SPSS) version 23. Qualitative data was expressed as numbers and percentages, quantitative data was expressed as mean and standard deviation (Mean ± SD).

## Results

Table 1 shows that 48.4% of the participants were in an age ranging from 18-30 years, 97.2% were of Saudi nationality, 66% had been pregnant before, and 63.7% had delivery, of them 46.9% had delivered in a governmental hospital.

Figure 1 shows that of the participants who had previous delivery, 42.3% had normal delivery and 38% has CS delivery.

Table 2 shows that only 9.8% of the participants had chronic diseases, 68.8% prefer normal delivery, 77.6% saw that cesarean section is more harmful than normal delivery, and 39.8% saw that cesarean section is safer for the mother and the baby. For the participants who had previous CS (38% of the sample), 16.9% had CS for health reasons and complications for the fetus, 12.1% had their CS as the fourth or fifth etc delivery, and their mean number of CS's was (1.18 ± 0.43).

According to the participants' opinion, 18.6% said that constant pain was the common complication of CS, while 51.4% of them gave more than one answer (Figure 2).

Figure 3 shows that 47.9% of the participants saw that uterine adhesion is the most common complication of a cesarean section in the long-term, while 44.1% saw that delay and lack of breastfeeding is the most common complications of the CS on the child (Figure 4).

**Table 1: Distribution of the studied participants according to their demographic characters and their past delivery**

| Variable | No. (%) |
|---|---|
| **Age:** | |
| 18-30 years | 192 (48.4) |
| 31-40 years | 90 (22.7) |
| 41-50 years | 100 (25.2) |
| 51-56 years | 14 (3.5) |
| Above 56 | 1 (0.3) |
| **Nationality:** | |
| Saudi | 386 (97.2) |
| Not Saudi | 11 (2.8) |
| **Marital status:** | |
| Married | 123 (31) |
| Single | 274 (69) |
| **Have you ever been pregnant?** | |
| Yes | 262 (66) |
| No | 134 (34) |
| If yes, have you ever had delivery? | |
| No previous pregnancy | 133 (33.5) |
| Yes | 253 (63.7) |
| No | 11 (2.8) |
| **Hospital type:** | |
| No previous delivery | 144 (36.3) |
| Government | 186 (46.9) |
| Private | 67 (16.9) |

**Figure 1: Distribution of the studied participants according to the type of their past delivery**



| | Have you ever had a normal delivery ? | Yes | No | Have you ever had CS delivery ? | Yes | No |
|---|---|---|---|---|---|---|
| ■ Series 1 | | 42.3 | 57.7 | | 38 | 62 |
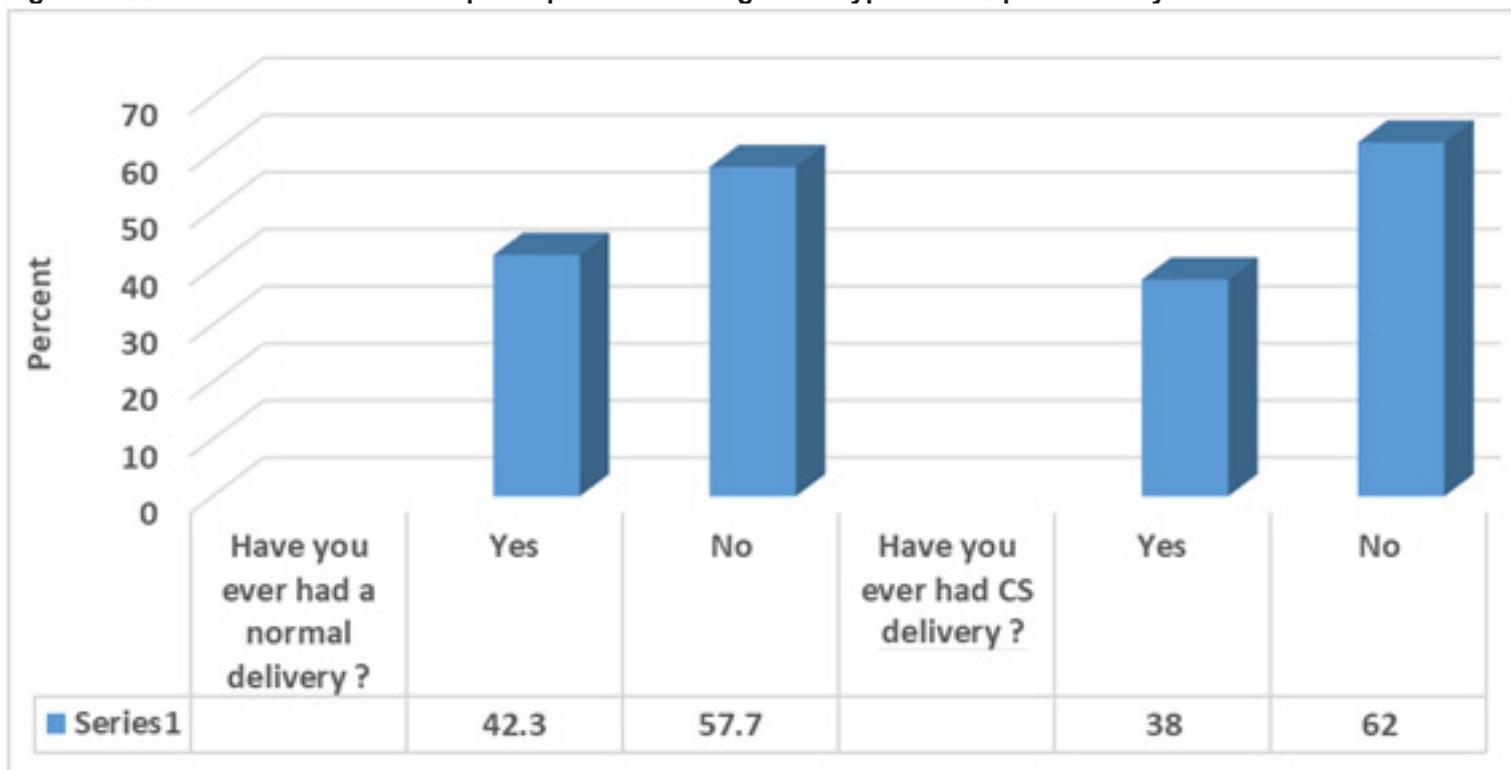
**Figure 2: Opinion of the participants regarding complications of a cesarean section in the short-term**



| | Bleeding after CS | Difficulty healing the wound | Inflammation | Constant pain | Injury of internal organs | DVT | more than one answer |
|---|---|---|---|---|---|---|---|
| ■ Series 1 | 4.3 | 7.3 | 5 | 18.6 | 4.5 | 8.8 | 51.4 |
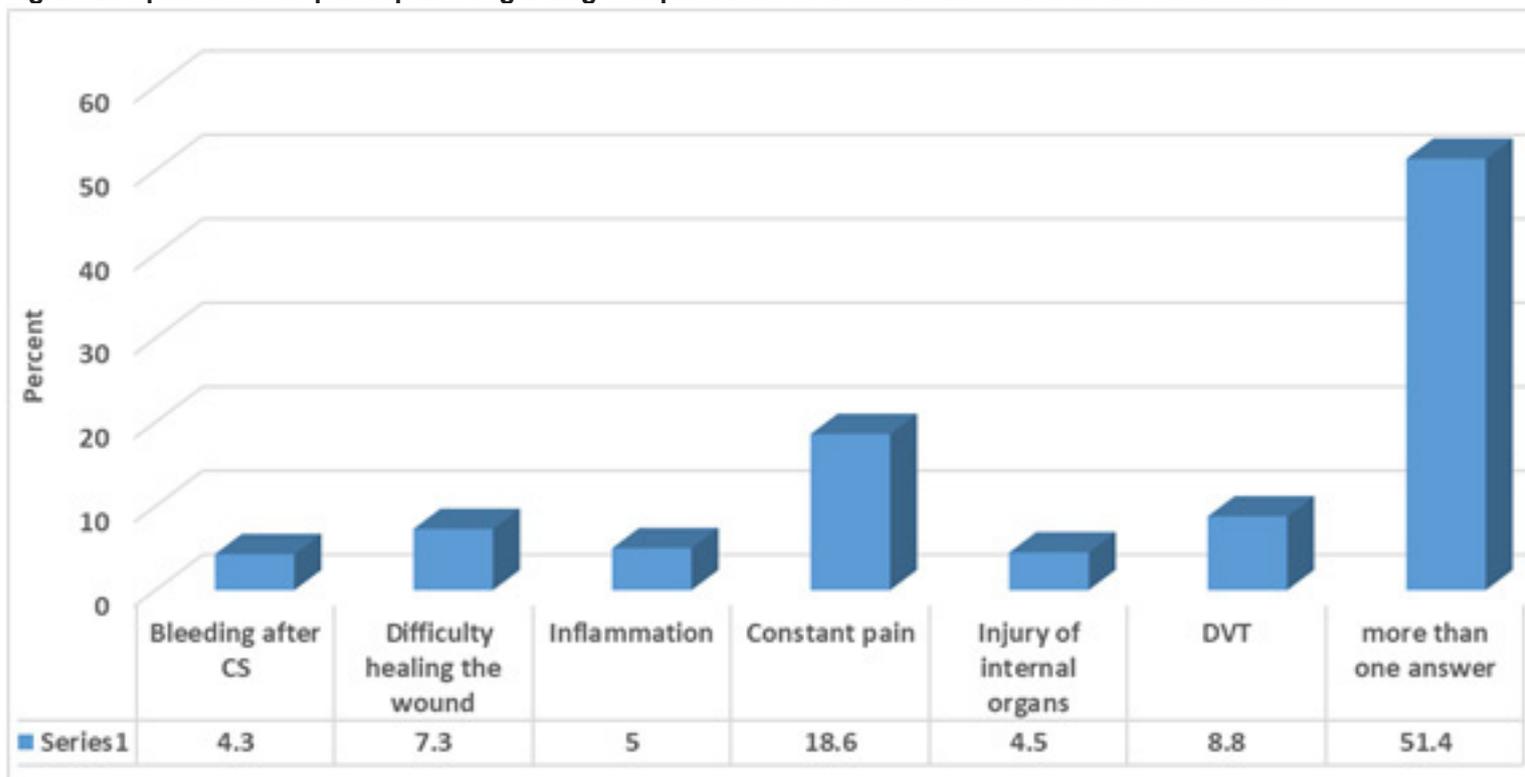
**Table 2: Distribution of the studied participants according to having chronic diseases, type of delivery they prefer, opinion about CS, mean number of CS, and order of their CS**

| Variable | No. (%) |
|---|---|
| Do you have any chronic disease (DM-HTN-Asthma):<br>Yes<br>No | 39 (9.8)<br>358 (90.2) |
| Which do you prefer?<br>Normal delivery<br>CS | 273 (68.8)<br>124 (31.2) |
| Do you think that the cesarean section is more harmful than normal delivery?<br>Yes<br>No | 308 (77.6)<br>89 (22.4) |
| Do you think that the cesarean section is safer for the mother and the baby?<br>Yes<br>No | 158 (39.8)<br>239 (60.2) |
| Do you think that the cesarean section increases the chance of a repeat in the future and reduces the chance of a normal delivery?<br>Yes<br>No | 325 (81.9)<br>72 (18.8) |
| What is the reason for your CS delivery? (No.=151)<br>1-Health causes and complications for the mother (pelvic narrowness-preeclampsia- pregnancy sugar)<br>2-Health causes and complications for the fetus<br>3-Psychological reasons such as fear, anxiety and stress<br>4-I have never had a C-section | 57 (14.4)<br><br>67 (16.9)<br>27 (6.8)<br>246 (62) |
| Number of your CS delivery: (Mean ±SD) (No. =151) | 1.18 ±0.43 |
| Arrangement of your cesarean section (No.=151)<br>    1-    First delivery is CS<br>    2-    Second delivery is CS<br>    3-    Third delivery is CS<br>    4-    Fourth or fifth... etc delivery is CS<br>    5-    Both (1 & 4)<br>    6-    Both (2,3)<br>    7-    Both (1,3)<br>    8-    Both (2,4)<br>    9-    Both (3,4) | 39 (9.8)<br>30 (7.6)<br>9 (2.3)<br>48 (12.1)<br>2 (0.5)<br>15 (3.8)<br>1 (0.3)<br>2 (0.5)<br>2 (0.5) |

**Figure 3. Opinion of the participants regarding complications of a cesarean section in the long-term**



| | Uterine adhesion | Uterine rupture | Placenta problems as placenta previa, Abruptio | more than one answer |
|---|---|---|---|---|
| ■ Series 1 | 47.9 | 14.9 | 14.9 | 22.4 |
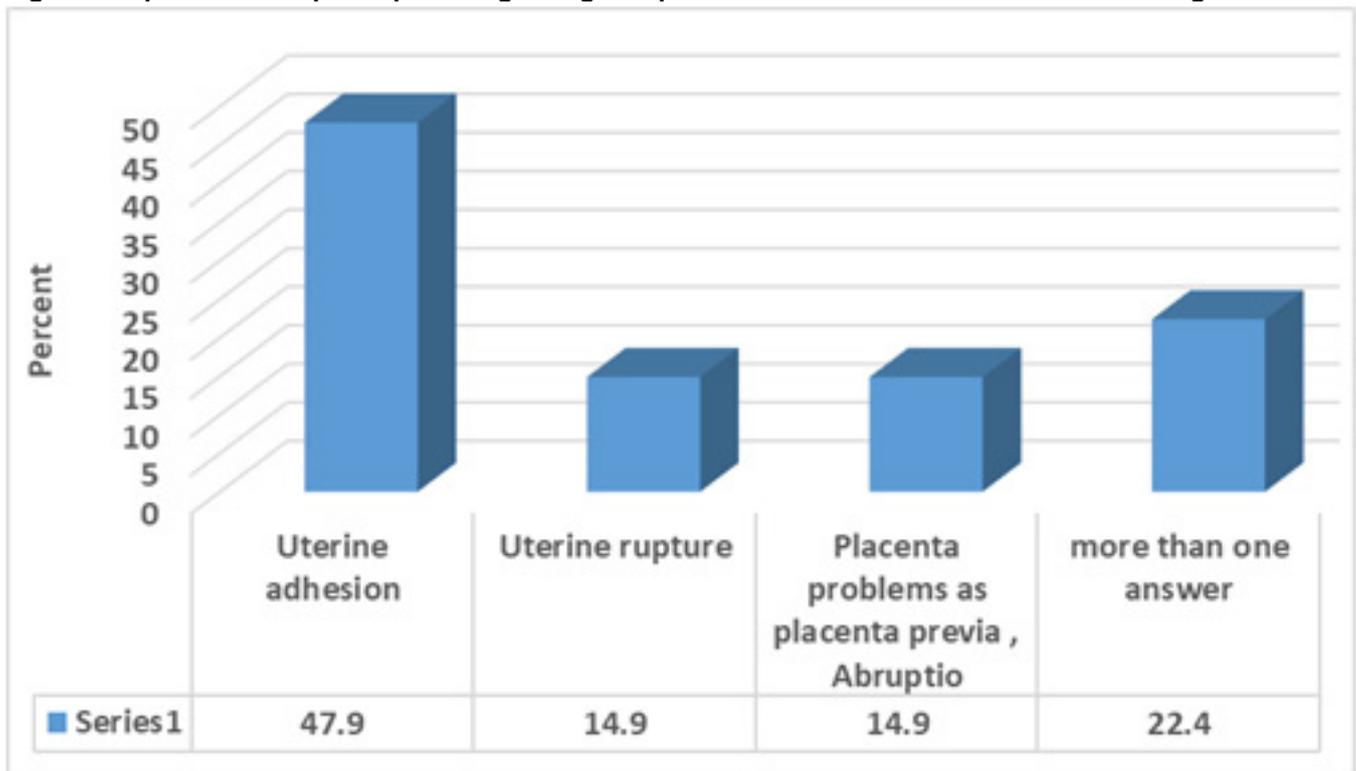
**Figure 4. Opinion of the participants regarding complications of the caesarean section on the child**



| | Respiratory infection of baby | Weakness of the child's immune system | Child asthma and obesity | Delayed and weak breastfeeding | More than one answer |
|---|---|---|---|---|---|
| ■ Series 1 | 15.6 | 18.1 | 4.8 | 44.1 | 17.4 |
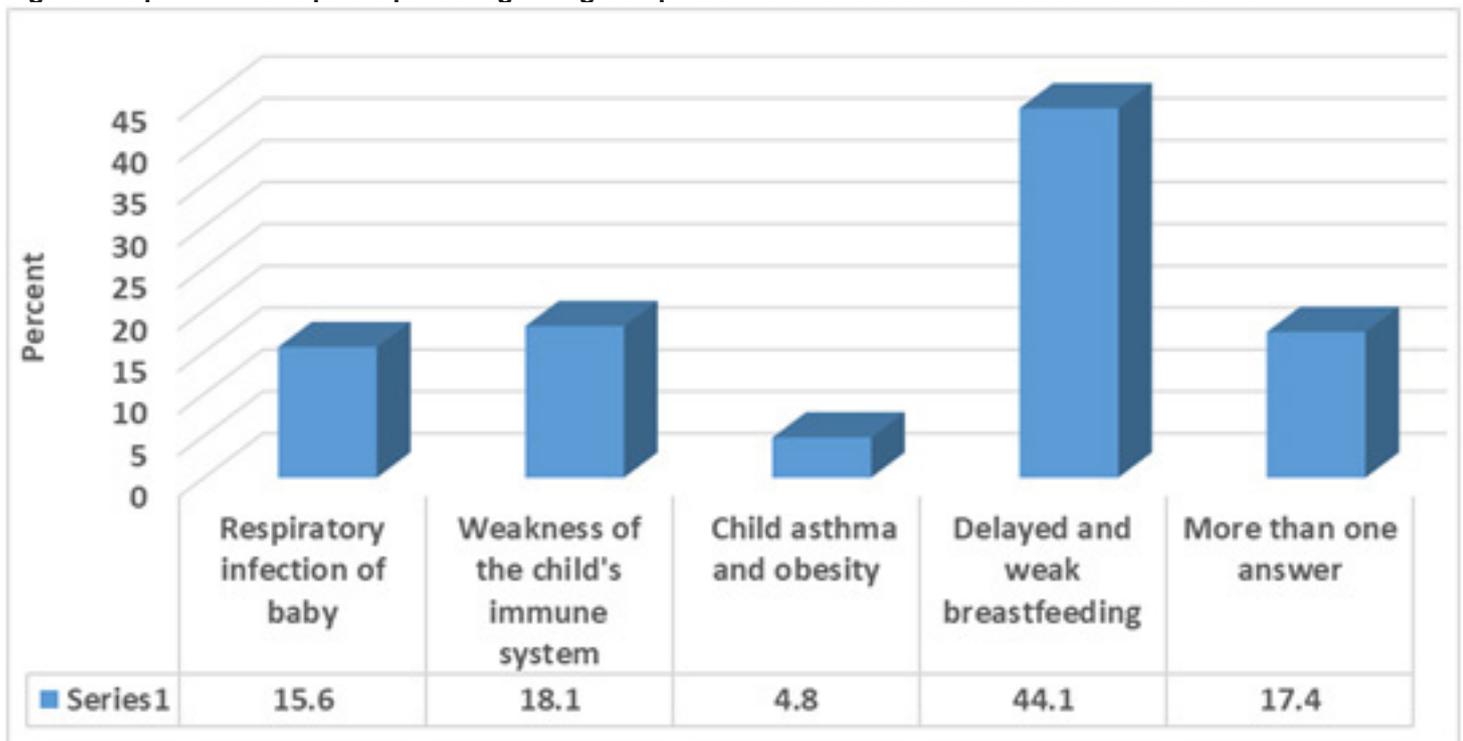
## Discussion

In the present study, there was 38% of the participant who had a previous CS, 16.9% of them had CS for medical indications and complications to the fetus.

This result goes along with the result revealed from a previous study done in a central region of KSA, where CS delivery rate significantly increased within the studied population. This increase was related to a change in physician's practice rather than a change in maternal characteristics (8). Over the last two decades, there has been a gradual increase in CS delivery rate observed at King Abdulaziz Medical City (KAMC), Riyadh, Saudi Arabia. This rate increased from 8% to 21% between 1993 and 2013 (8). This also goes along with a previous Saudi study, which revealed that CS delivery rate rose from 10.6% to 19.1% in KSA between 1997 and 2006 (12).

The same increase in CS rate was observed in other international studies (13,14,15). The observed CS prevalence among the studied participants is higher than that observed in a population- hospital-based study done on 18 Arab countries, where the CS rates ranged from 5–15%(16).

Previous studies have shown that morbidity and mortality associated CS should be taken into consideration (17). In the present study, 42.3% of the participants had normal delivery. Studies have found that both vaginal and CS delivery are acceptable modes of delivery, and cases need to be individualized. This individualization should be based on the women's medical history, preferences, incontinence risk factors, and the type of surgical repair done (7, 18, 19, 20, 21).

This work showed that 68.8% of the participants prefer normal delivery, and 77.6% saw that cesarean section is more harmful than normal delivery. In a previous Saudi study, 80.9 % of the study population favored vaginal delivery, imitating the reported global ratio (10). In another systematic review, 84.4% of women preferred vaginal delivery (22). Another study showed that 62.8% of women chose a vaginal delivery as vaginal delivery has less time to return to normal life (23).

In this work, 68.8% of women preferred normal delivery. In a previous national study, 19.1 % of the study participants preferred CS to avoid pain associated with vaginal delivery (10).

This work showed that 39.8% saw that CS is safer for the mother and the baby. The same was reported in a Saudi study done in Qassim where pregnancy within a year or in quick succession may compromise the mother will readily undergo caesarean section if need be in order to avoid complications during Birth whereas more than half of the participants agreed they will undergo CS if need to avoid complications during birth (24). The same cause was observed in a study done in Hong Kong by Pang et al. (25). In an Asian study done by Chong and Mongelli, (26)

the most common reasons to prefer CS by the participants were wishing a natural process (23.8%), fast recovery (22%), and safer mode of delivery (7.3%). This result disagrees with that observed in a previous study where 51.7% of studied women thought that CS is dangerous to the mother and baby (2). A much lower percentage of women who preferred vaginal delivery was observed in previous studies. Of these was a study done by Selo-ojeme et al. who reported that 55.3% of women preferred vaginal delivery (27). However, a higher percent was reported in a previous study where 93% (28) and 98.5% of women preferred a vaginal delivery (29). In an Asian study done by Chong and Mongelli, (27) 95.1% of women also preferred vaginal delivery (26).

In this study, for the participants who had previous CS, 16.9% had CS for health causes and complications for the fetus. In a previous study the most common reason for CS delivery was the fear of vaginal birth (30). On the other hand, participants in a USA study found that CS delivery was more painful than vaginal birth with regard to postpartum pain (31).

In the present study, 18.6% of the participants said that constant pain was the common complication of CS, and 51.4% of them gave more than one answer about CS complications. A previous Saudi study found that most women were aware of the complications of CS (57.6 %) (10). This result agrees with that present in a previous study where most of the participants thought that CS has a higher rate of complications such as prolonged bed rest and bleeding risks (32), a result that was also revealed from another study (33).

**Limitation**
The small sample size could be a limitation of this study. In addition being an online survey calls for future studies with larger sample is recommended.

## Conclusion

This study revealed that most of the participants (68.8%) prefer normal delivery, 77.6% of them saw that CS is more harmful than normal delivery, and only 39.8% saw that CS is safer for the mother and baby. Of the studied women, 47.9% saw that uterine adhesion is the most common complication of a CS in the long-term, while 44.1% saw that delay and lack of breastfeeding is the most common complications of the CS on the child. This study calls for health education of all women about advantages and disadvantages of CS for the mother and baby to enable them to take the proper decision to reduce the number of unnecessary CSs.

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