Study of bacteriological diagnosis and some biochemical parameters in PTB patients who receiving Anti-tuberculosis drugs

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Abstract

Background: Anti-tuberculosis drugs can cause harmful effects on the health of a PTB patient and thus cause harmful interference with various vital body functions.

Methods: In this study, 80 PTB patients (43 men and 37 female) were randomly assigned, and 40 healthy people (21 men and 19 female) were used as the control group. The findings indicated that males (53.75%) were more likely than females (46.25%) to be infected with pulmonary tuberculosis.

Results: The result of statistical analysis showed a significantly increased serum level of urea, TSB, and sodium in the PTB patients group compared to the control. The mean ±SD of serum urea, TSB, and sodium for the patient respectively were 34.14±4.19, 0.669±0.21 and 142.98±14.837. There was a significant positive correlation between serum GOT and serum GPT ($r=0.573$, $p<0.0001$) as well as serum ALP ($r=0.258$, $p<0.0001$) in PTB patients (N=80). Similarly, the correlation between serum sodium and serum potassium was positive and significant ($r=0.200$, $p=0.021$).

Conclusions: Anti-tuberculosis drug-treated tuberculosis was linked with a significant increase in serum urea, TSB, and sodium and a significant decrease in serum potassium in this study. Therefore, in patients who receive anti-tuberculosis drugs, there is a chance that the increase and decrease in serum biochemical parameter levels will have an adverse influence on body functions. ***Objectives:*** In considering this, the current study's goal was to investigate the side effects of anti-tuberculosis drugs on liver and kidney functions and some electrolytes for PTB patients who take these drugs.

Key Words: Tuberculosis, PTB, Biochemical Parameters, Anti-tuberculosis drug, GeneXpert System MTB/RMP.

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Introduction

Tuberculosis (TB) is still the most common infectious bacterial agent-related cause of death worldwide. Thus, limiting the spread of the tuberculosis epidemic is a top concern for worldwide public health.[1] Caused by *Mycobacterium tuberculosis* (M.tb) which affects around one-third of the global population. Many individuals acquire latent tuberculosis infection (LTBI), however, only 10% of those who have LTBI go on to develop active TB.[2] This disease often affects the lungs and is usually curable with prompt diagnosis and appropriate treatment.[3] A progressive granulomatous disease that spreads by airborne droplets, pulmonary tuberculosis (TB) can be lethal. As a result, a pulmonary tuberculosis patient becomes the primary source for the disease's spread across the community.[4] Additionally, it can affect any organ in the body, but it usually appears as pulmonary tuberculosis (PTB) in the lungs.[5] The risk factors such as age, gender, smoking, unemployment, poverty, overcrowding, alcoholism and human immunodeficiency virus (HIV) are connected to pulmonary tuberculosis separately. These elements might be involved in how TB infection develops into disease.[6] Interrupting TB treatment is still a major problem that has a negative impact on treatment results. Asian countries account for the majority of the world's new

tuberculosis cases, which has led to a systematic investigation of treatment interruption predictors due to the variable results.[7] The global burden of tuberculosis (TB) is increasing, especially in cases where there is multidrug resistance (MDR) and become a major health challenge. The diagnosis of drug-resistant tuberculosis (DR-TB) depends on early TB diagnosis and rapid drug resistance detection.[8] Many studies revealed that genetic variants are associated with anti-TB drug toxicity, and these variations might also affect reaching the highest possible dosage of the drug. Thus, inter-individual differences play a typical role by influencing the genes involved in drug metabolism pathways.[9] Several drugs used to treat tuberculosis have been linked to a higher frequency of side effects. These adverse consequences range from mild to fatal. As a result, the drug regimen is stopped.[10] Studies have shown that TB was associated with biochemical changes such as liver and renal function tests and serum electrolytes.[11,12,13,14,15]

Methodology

A total of 120 individuals were selected for this study; Eighty TB patients with pulmonary tuberculosis who were receiving anti-TB medication were chosen and enrolled for this study, were referred to the National Reference Laboratory of Tuberculosis Respiratory/Baghdad for diagnosis and treatment during the June 2023–October 2023 time frame. RIPE regimens for treating TB disease have an intensive phase of 2 months consist of Rifampin (RIF), Isoniazid (INH), Pyrazinamide (PZA), and Ethambutol (EMB) , followed by a continuation phase of 4 months consist of Rifampin (RIF), Isoniazid (INH) (total of 6 months for treatment). patients consists of 43 males and 37 females with age ranged 17-68 years Tuberculosis cases were diagnosed by specialized doctors, which were based on clinical symptoms and signs, chest x-ray examination, sputum smear tests or sputum culture. While the others 40 apparently healthy individuals (control group) were included (21 males and 19 females) with age ranged 20-67 years. According to a manufacturer's directives, Laboratory investigations including serum urea, serum creatinine, TSB, GOT, GPT, ALP, sodium and potassium were performed in all patients using standard laboratory procedures. Five milliliters of blood were collected from each patient or control. These samples were allowed to coagulate for one to two hours at room temperature. They were then centrifuged for ten minutes at 3000 rpm, and the blood serum was stored at -20°C until further processing. Sputum with mucosa and festering components was collected using sterile, transparent, unbreakable plastic containers or infusion containers with a tight-fitting lid. For every PTB patient, three sputum samples were collected in accordance with the national tuberculosis control program in Iraq, one each before breakfast, one when he first arrived at the clinic, and one at any other time of the day.[16] Two sputum samples are used in Ziehl-Nelseen staining (ZN) and culture, with the third sample being used in GeneXpert MTB/RIF assay.

Statistical Analysis

To input and analyze the data, the statistical program for social sciences, version 26 (SPSS 26), was utilized. All results were presented as mean ± standard deviation (M±SD). T-test for two independent samples. P- Values ($P < 0.05$) were measured statistically significant. Findings with P value equal or less than 0.05 were considered significant. Correlation statistics were used to determine association between numerical parameters employing pearson´s correlation test.

Results

Study groups' demographic features

The age distribution of the patients was divided into two age groups (<40 years and ≥40 years). The results revealed that the disease is more frequent in < 40 years (57.50%) than ≥ 40 years (42.50%) as shown in (fig-1). In addition, tuberculosis disease is more frequent in male (52.50%) than female (47.50%) as shown in (fig-2).

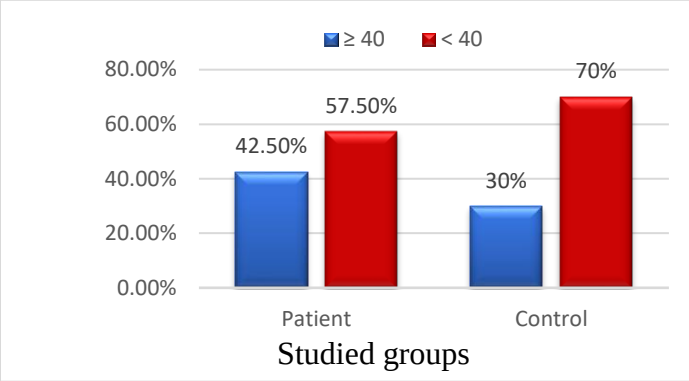

Fig 1. Distribution of TB patients and controls according to age.

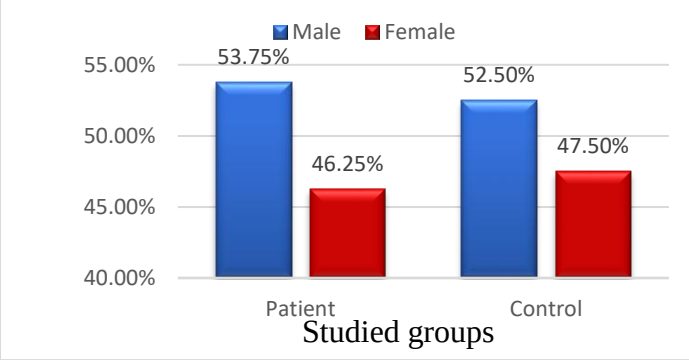

Fig 2. Distribution of TB patients and control based on gender.

Comparison between different groups based on Biochemical parameters

In present study we have analyzed various biochemical parameters, including serum urea, serum creatinine, serum TSB, SGOT, SGPT, serum ALP, serum sodium and serum potassium in the serum of tuberculosis positive cases and healthy controls. Data of various biochemical parameters are expressed as mean ± SD in (Table-1).

The results of serum urea level were significantly increased in PTB patients when compared to the control group, the serum levels mean ±SD of patient and controls were 34.14±4.19 and 25.48±10.12, (mg/dl) respectively. The level mean ±SD of serum creatinine in PTB patient and control group were 0.628±0.314 and 0.612±0.09, (mg/dl) respectively, and this difference was not statistically significant.

The results of TSB serum level were significantly decreased in patient group than control, the serum levels mean ±SD of patient and controls were 0.669±0.21 and 0.58±0.289 (mg/dl) respectively. While the result of GOT, GPT and ALP levels, it is found that there is non-significant difference among different groups compared with control. The GOT, GPT and ALP serum levels mean ±SD for patient and controls were (39.38± 17.405 vs. 24.93±14.244, 33.6±20.703 vs. 27.13±23.183 and 176.25±47.123 vs. 93.23± 48.793) iu/l respectively.

Serum levels of Sodium and Potassium showed significant differences between patients and control groups. The mean ±SD of sodium and potassium serum levels for patient and controls were (142.98 ± 14.837 vs. 140.68 ± 5.289 and 3.786 ± 0.691 vs. 3.823 ± 0.4135 mmol/l, respectively).

There was significant positive correlation between serum GOT and serum GPT ($r=0.573$, $p<0.0001$) as well as serum ALP ($r=0.258$, $p<0.0001$) in PTB patient (N=80). Similarly, the correlation between serum sodium and serum potassium was positive and significant ($r=0.200$, $p=0.021$). In contrast, the correlation between serum urea and other biochemical parameters and that between serum creatinine and other biochemical parameters and that serum TSB and other biochemical parameters was not significant (Table -3).

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Table 1. Biochemical parameter comparison between tuberculosis patients and control.

Parameters	PTB Patient(N=80)	Control(N=40)	p-value (p<0.05)
	Mean ±SD	Mean ±SD	
Serum Urea (mg/dl)	34.14±4.19	25.48±10.12	<0.004*
Serum Creatinine (mg/dl)	0.628±0.314	0.612±0.09	0.055
Serum TSB (mg/dl)	0.669±0.21	0.58±0.289	<0.046*
Serum GOT (iu/l)	39.38± 17.405	24.93±14.244	0.258
Serum GPT (iu/l)	33.6±20.703	27.13±23.183	0.587
Serum ALP (iu/l)	176.25±47.123	93.23± 48.793	0.336
Serum Sodium (mmol/l)	142.98 ± 14.837	140.68 ± 5.289	<0.0001**
Serum potassium (mmol/l)	3.786 ± 0.691	3.823 ± 0.4135	<0.045*

* Significant, **highly significant

Table 3. Correlation between biochemical parameters in PTB patient who receiving Anti-tuberculosis drugs.

Correlations									
biochemical parameters		Urea	Creatinine	TSB	GOT	GPT	ALP	Na	K
Urea	Pearson Correlation	1	-0.185	0.081	0.189	0.115	0.129	0.084	0.019
	Sig. (2-tailed)		0.101	0.473	0.093	0.309	0.255	0.457	0.867
	N	80	80	80	80	80	80	80	80
Creatinine	Pearson Correlation	-0.185	1	-0.078	-0.191	-0.074	-0.214	-0.088	-0.085
	Sig. (2-tailed)	0.101		0.489	0.089	0.513	0.056	0.440	0.453
	N	80	80	80	80	80	80	80	80
TSB	Pearson Correlation	0.081	-0.078	1	0.024	0.039	0.140	-0.050	0.101
	Sig. (2-tailed)	0.473	0.489		0.829	0.730	0.216	0.663	0.373
	N	80	80	80	80	80	80	80	80
GOT	Pearson Correlation	0.189	-0.191	0.024	1	0.573**	0.386**	0.202	0.137
	Sig. (2-tailed)	0.093	0.089	0.829		0.0001	0.0001	0.073	0.227
	N	80	80	80	80	80	80	80	80
GPT	Pearson Correlation	0.115	-0.074	0.039	0.573**	1	0.089	0.134	0.119
	Sig. (2-tailed)	0.309	0.513	0.730	0.0001		0.432	0.237	0.295
	N	80	80	80	80	80	80	80	80
ALP	Pearson Correlation	0.129	-0.214	0.140	0.386**	0.089	1	0.032	0.019
	Sig. (2-tailed)	0.255	0.056	0.216	0.0001	0.432		0.780	0.864
	N	80	80	80	80	80	80	80	80
Na	Pearson Correlation	0.084	-0.088	-0.050	0.202	0.134	0.032	1	0.258*
	Sig. (2-tailed)	0.457	0.440	0.663	0.073	0.237	0.780		0.021
	N	80	80	80	80	80	80	80	80
K	Pearson Correlation	0.019	-0.085	0.101	0.137	0.119	0.019	0.258*	1
	Sig. (2-tailed)	0.867	0.453	0.373	0.227	0.295	0.864	0.021	
	N	80	80	80	80	80	80	80	80

*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).

Identifications of Mycobacterial Isolates

Ziehl-Neelsen stain (ZN) was used to evaluate all 80 positive sputum samples, and the samples were then inoculated onto culture medium LJ, and finally tested with the GeneXpert System MTB/RMP.

Discussion

The results of this study were in agreement with Ameen, (2019) and Kurup etal. (2016) where found that TB is more common in younger age groups.[17,18] May by this result from the disease's interplay with specific environmental factors or lifestyle choices, as well as from a genetic tendency to develop the illness. It's also likely that patients at these ages are more active in society and may be more susceptible to infections.[17] Under nutrition, poverty, diabetes, tobacco use, and indoor air pollution continue to be the main causes of tuberculosis (TB), and this need be addressed to achieve the WHO 2035 TB care and prevention targets.[19]

Additionally, the study is in line with Ameen, (2019) and AS and Bekheet, (2022) in Baghdad and Basra respectively, showed that high prevalence of infection was in males in TB cases.[17,20] According to WHO, (2017) research, men in Iraq were more affected than women.21 This finding may be explained by the fact that men in our society behavior in more extracurricular activities, travel, and work outside the home than do women.[20]

High rates of morbidity and mortality are associated with tuberculosis, especially in developing countries. It impacts several organs and may have an influence on biochemical changes.[12] The excessive drug levels of the four first-line anti-tuberculosis (TB) medications that are most frequently used, isoniazid (INH), rifampicin (RMP), ethambutol (EMB), and pyrazinamide (PZA), may cause unfavorable responses, insufficient drug exposure may result in drug resistance and treatment failure.[14]

The results of present study are in agreement with Rafiq etal., (2017) who documented that in TB patients the serum level of urea differ between cases and control.[11] Another study in India, Nakarani et al., (2019) found that there was not a significant difference in the serum urea between both groups.[12] However, the results of present study showed the high insignificant level of serum creatinine in patient compared to control. This result was in agreement with Emokpae etal., (2006) in which non-significant difference is found in concentrations of serum creatinine level for PTB patients compared with the control group.[22] And does not agree with Rafiq etal., (2017) who found that the patients with pulmonary tuberculosis triggered higher concentrations of creatinine.[11]

Anti-tuberculosis treatment causes acute renal failure in 10.3% in older patients. As a result, patients usually suffer mild kidney damage and recover without long-term consequences. However, the complications had no effect on the outcome of the TB treatment, and there was no chronic impairment of the kidneys.[23] Saito etal., (2019) suggested to modify the dosage of anti-tuberculosis (TB) drugs based on renal function for patients with chronic kidney disease.[24]

According to the study's findings, the patient's serum TSB level was significant increased than the controls. This study is in agreement with Nakarani etal.,(2019) who found significantly higher serum levels of TSB in patient compared to control groups, but do not agree with serum GOT, GPT and ALP levels.[12] In another study, Rafiq etal., (2017) found a significant decrease in the level of serum TSB and non-significant differences in Serum GOT, GPT and ALP levels.[11] When the anti-tuberculosis drugs isoniazid and rifampicin are used together, hepatotoxicity occurs more often than when the treatments are used separately, making the liver more susceptible to damage.[25] Since hepatotoxicity is one of the most frequent and serious side effects of anti-TB drugs.[26] We observed significantly high serum levels of sodium and potassium. Our findings correlate with the study of with Nakarani etal.,(2019) who found significantly higher serum levels of sodium (Na) in patient compared to control groups, but significantly decrease in serum level of potassium (K).[12] And agreement with Ufoaroh etal.,(2021) in which high significant difference is found in concentrations of serum sodium, while they found an insignificantly lower Potassium concentration.[13]

For treating a patient with drug-sensitive or drug-resistant tuberculosis, several drugs may have hepatotoxic side effects or drug-induced liver injury

(DILI).[27] In a Chinese study, Wang (2020) found that anti-tuberculosis medications were the cause of patients' acute liver failure, he found a significant increase in the serum levels of GOT, GPT, and creatinine, as well as a non-significant increase in the serum levels of ALP and TSB. So patients with signs of severe liver damage, such as increased AST and TSB, should stop taking the anti-tuberculosis drugs in order to lower their chance of acquiring acute liver failure.[15] In different study conducted by Muda etal., (2023) which aimed to determine the relationship between multidrug-resistant tuberculosis with liver and kidney functions, they found that age and gender do not affect these functions, and they indicated that there is no liver or kidney toxicity in treating patients with multidrug-resistant tuberculosis.[28] Nakarani etal ., (2019) suggested periodic evaluation of liver and kidney function parameters and minerals to prevent hepatotoxicity, nephrotoxicity and altered mineral metabolism in patients with tuberculosis.[12]

Ziehl-Neelsen staining (ZN) is a quick and simple procedure that can be used to give a physician preliminary diagnosis confirmation and a quantitative estimate of the number of bacilli. (Fig-3A) shows the rode shape bacilli with red or pink color under microscopic lens. Which is widely used in the third world, especially in Iraq.[29]

Sputum smears are an easy and safe technique that can identify 60% to 80% of adult cases of pulmonary tuberculosis. Considering that patients with a positive smear microscopy are mostly in responsible for maintaining the disease transmission chain, this is an important fact.[30] AFB (acid-fast bacilli) smears are commonly utilized, although Xpert MTB/RIF has been the recommended assay for detecting TB and rifampicin resistance due to its superior sensitivity and ability to quickly identify rifampicin resistance.[31]

Culture is still the gold standard for the diagnosis of pulmonary TB.[32] Culture, which is more sensitive than microscopically examination, can identify as few as 10 bacteria/ml of digested sample; accurate identification requires concentrated material and the growth of the organism. (Fig-3B) shows the Mycobacterium tuberculosis on Löwenstein–Jensen medium.

The GeneXpert MTB/RIF assay's diagnostic performance was nearly identical to that of culture, and can be trusted to identify MTB in smear-negative sputum samples.[33] The GeneXpert MTB/RIF (Xpert) assay is a test for amplification of nucleic acids that is automated. It can identify rifampin resistance-associated mutations and the M. tuberculosis complex in two hours.[34,35] as shown in (Fig-3C).

The World Health Organization (WHO) suggests using some quick molecular tests, such as Xpert MTB/RIF or Xpert Ultra, as preliminary tests for tuberculosis diagnosis and to identify rifampicin resistance in those exhibiting tuberculosis signs and symptoms.[35] The World Health Organization (WHO) has approved the method as a point-of-care test for the detection of extra pulmonary and pulmonary tuberculosis. However, it is difficult to fully utilize Xpert in low-resource environments since it necessitates a steady supply of electricity, a massive capital investment for devices and consumables, and persistent maintenance.[36] Therefore, the that GeneXpert MTB/RIF is better than AFB smear for identify tuberculosis.[31] And higher capacity to identify borderline rifampicin resistance.[37]

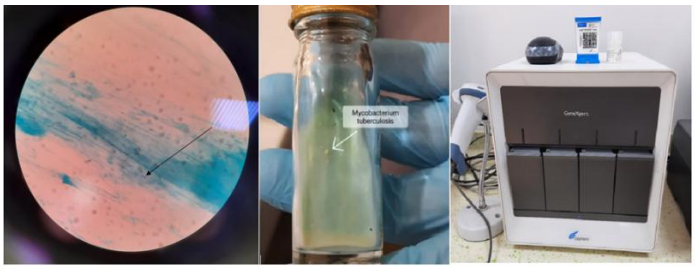

Fig 3. A: Ziehl – Neelsen stain (ZN) under the optical microscope (100x), B: *Mycobacterium tuberculosis* on Löwenstein–Jensen medium, C: GeneXpert System MTB/RMP.

Conclusions:

According to this study, TB patients receiving anti-TB drugs had significantly increased in serum urea, sodium, TSB, and potassium levels and significantly decreased in serum potassium level. As a result, it is possible that these changes in serum biochemical parameter levels will have an adverse effect on a patient's body function. In this study, tuberculosis with anti-tuberculosis drugs was related with significant positive serum GOT and serum

GPT, serum GOT and serum ALP, and serum sodium and serum potassium levels.

References

1- Romano M, Squeglia F, Kramarska E, Barra G, Choi HG, Kim H J, Ruggiero A, Berisio R. 2023. A structural view at vaccine development against M. tuberculosis. Cells, 12(2), 317.

2- Rapolu BL, Pullagurla A, Ganta S, Komaravalli PL, Gaddam SL. 2021. Immuno-genetic importance of Th17 in susceptibility to TB. Scandinavian Journal of Immunology. 94(2): e13085.

3- Carvalho TF, Santos VL, Silva JC, de Assis Figueredo LJ, de Miranda SS, de Oliveira Duarte R, Guimarães FG. 2023. A systematic review and repeatability study on the use of deep learning for classifying and detecting tuberculosis bacilli in microscopic images. Progress in Biophysics and Molecular Biology. 180:1-18.

4- Anggraini D, Nasrul E, Susanti R, Suharti N. 2023. Polymorphysm of tumor necrosis factor-A interleukin-10 gene with pulmonary tuberculosis susceptibility. Journal of Population Therapeutics and Clinical Pharmacology,30 (2):50-8.

5- Kadhim BJ.2022. Estimation of miR-16 Gene Expression in Iraqi Tuberculosis Patients and Its Association with Response to Therapy. Iraqi journal of biotechnology. 21(2): 522-528

6- Yonge SA, Otieno MF, Sharma RR. Omedo RCA. 2016. Risk Factors in Transmission of Tuberculosis Infection in Mombasa Kenya: An Epidemiological Descriptive Study. International Journal of Tropical Disease & Health. 13(4): 1-10.

7- Oh AL, Makmor-Bakry M, Islahudin F, Wong IC. 2023. Prevalence and predictive factors of tuberculosis treatment interruption in the Asia region: a systematic review and meta-analysis. BMJ global health, 8(1), e010592.

8- Lama C, Adhikari S, Sapkota S, Regmi RS, Ghimire GR, Banjara MR, Ghimire P, Rijal KR. 2022.Evaluation of Xpert MTB/RIF Assay, MTB Culture and Line Probe Assay for the Detection of MDR Tuberculosis in AFB Smear Negative Specimens. Diseases. 6;10(4):82.

9- Khan A, Abbas M, Verma S, Verma S, Rizvi AA, Haider F, Raza ST, Mahdi F.2022. Genetic variants and drug efficacy in tuberculosis: a step toward personalized therapy. Global Medical Genetics. 25;9(02):090-6.

10- Gulbay BE, Gurkan OU, Yildiz OA, Onen ZP, Erkekol FO, Baccioglu A, Acican T. 2006.Side effects due to primary antituberculosis during the initial phase of therapy in 1149 hospitalized patients for tuberculosis. Respiratory Medicine. 100: 1834–42.

11- Rafiq S, Rafiq N, Iqbal T, Shafiq N, Javaid I.2017. Association of pulmonary infections of mycobacterium tuberculosis with biochemical and demographic parameters. 3(1):69-77.

12- Nakarani KC, Rana BS, Chavan V.U. 2019. Study of various biochemical parameters in tuberculosis patients: A hospital based cross-sectional study. MedPulse International Journal of Biochemistry. November 2019; 12(2): 66-71.

13- Ufoaroh CU, Onwurah CA, Mbanuzuru VA, Mmaju CI, Chukwurah SN, Umenzekwe CC, Aghanya IN, Ushie SN, Anyabolu AE, Enemuo EH, Anyabolu EN.2021. Biochemical changes in tuberculosis. PAMJ - 38(66):1-9.

14- Cheng L, Luo M, Guo Y, Fan Y, Wang P, Zhou G, Qin S, Weng B, Li P, Liu Z, Liu S.2023. Correlations among the plasma concentrations of first-line anti-tuberculosis drugs and the physiological parameters influencing concentrations. Frontiers in Pharmacology,14:(1-10).

15- Wang S, Shangguan Y, Ding C, Li P, Ji Z, Shao J, Fang H, Yang M, Shi P, Wu J, Ren J.2020. Risk factors for acute liver failure among inpatients with anti-tuberculosis drug-induced liver injury. Journal of International Medical Research. 48(1):0300060518811512.

16- Zhai W, Wu F, Zhang Y, Fu Y, Liu Z. 2019. The immune escape mechanisms of Mycobacterium tuberculosis. International Journal of Molecular Sciences, 20(2): 340.

17- Ameen NA, Utba MU, Abed MQ. 2019. Interleukin-17A rs3819024 gene polymorphism in Iraqi Arab pulmonary tuberculosis patients. Research Journal of Biotechnology. 14(1): 83-88.

18- Kurup R, Flemming K, Daniram S, Marks-James S, Roberts Martin R. 2016. Hematological and biochemistry profile and risk factors associated with pulmonary tuberculosis patients in Guyana. Tuberculosis Research and Treatment, 2016: 6983747.

19- Chakaya J, Khan M, Ntoumi F, Aklillu E, Fatima R, Mwaba P, Kapata N, Mfinanga S, Hasnain SE, Katoto PD, Bulabula AN.2021. Global Tuberculosis Report 2020–Reflections on the Global TB burden, treatment and prevention efforts. International journal of infectious diseases, 113: S7-12.

20- AS MK, Bekheet AR.2022. Prevalence and Drug Resistance Pattern of Mycobacterium tuberculosis Isolated from Tuberculosis Patients in Basra, Iraq. Polish Journal of Microbiology, 71, (2): 205-215.

21- World Health Organization (WHO). 2017. Report Tuberculosis country profiles Iraq.

22- Emokpae MA, Nwokedi EE, Dutse AI.2006. Biochemical changes in adult Nigerians with pulmonary tuberculosis in Kano-Nigeria. Highland Medical Research Journal,13;4(1):15-21.

23- Chang CH, Chang LY, Ko JC, Wen YF, Chang CJ, Keng LT, Tsou PH, Yu KL, Wang JY, Yu CJ.2023. Incidence of and risk factors for acute kidney injury during antituberculosis treatment: A prospective cohort study and literature review. Infectious Diseases and Therapy,12(3):919-31.

24- Saito N, Yoshii Y, Kaneko Y, Nakashima A, Horikiri T, Saito Z, Watanabe S, Kinoshita A, Saito K, Kuwano K. 2019. Impact of renal function-based anti-tuberculosis drug dosage adjustment on efficacy and safety outcomes in pulmonary tuberculosis complicated with chronic kidney disease. BMC Infectious Diseases,19(1):1-8.

25- Singla R, Sharma S, Alladi M, Govind Makharia, Sreenivas V, Jha B, Kumar S, Sarda P, Singh S. 2010. Evaluation of risk factors for antituberculosis treatment induced hepatotoxicity. Indian J Med Res, 81- 86.

26- Bai H, Wu T, Jiao L, Wu Q, Zhao Z, Song J, Liu T, Lv Y, Lu X, Ying B. 2020. Association of ABCC Gene Polymorphism with Susceptibility to Antituberculosis Drug–Induced Hepatotoxicity in Western Han Patients with Tuberculosis. The Journal of Clinical Pharmacology, Mar;60(3):361-368.

27- Tyagi H, Aggarwal J, Javith M, Midha U, Batra J.2023. Liver Fuction Test and Multi Drugs Resistant (MDR) Tuberculosis: A Review. Journal of Coastal Life Medicine, 11:1713-22.

28- Muda I, Adam MF, Saputra R, Muhyi A, Noprianto D, Aminuddin M. 2023. Association of Multidrug-Resistant Tuberculosis (MDR-TB) Patients on Profile of Liver and Kidney Function. Jurnal Kesehatan Pasak Bumi Kalimantan,5(2):139-43.

29- AL-Kaisse AA, AL-Thwani AN, Mankhi AA. Abood ZH, Ali R M. 2023. Epidemiological Study of Prevalence TB in Iraq. Revis Bionatura , 8 (2) 27.

30- Ogata T, Nagasu N, Uehara R, Ito K. 2019. Association of low sputum smear positivity among tuberculosis patients with interferon-gamma release assay outcomes of close contacts in Japan. International Journal of Environmental Research and Public Health,16(19):3713.

31- Karuniawati A, Burhan E, Koendhori EB, Sari D, Haryanto B, Nuryastuti T, Gayatri AY, Bahrun U, Kusumawati RL, Sugiyono RI, Susanto NH. 2023. Performance of Xpert MTB/RIF and sputum microscopy compared to sputum culture for diagnosis of tuberculosis in seven hospitals in Indonesia. Frontiers in Medicine, 9:909198.

32- Lumbessy RH, Mertaniasih NM, Alimsardjono L, Soedarsono S. 2023. Comparison of chlorhexidine 0.7% and modified Petroff's method on sputum decontamination for culture method to detect Mycobacterium tuberculosis. Bali Medical Journal, 12(1):222-7.

33- Rimal R, Shrestha D, Pyakurel S, Poudel R, Shrestha P, Rai KR, Ghimire GR, Rai G, Rai SK.

2022. Diagnostic performance of GeneXpert MTB/RIF in detecting MTB in smear-negative presumptive TB patients. BMC Infectious Diseases, 22(1):321.

34- Ghebrekristos YT, Beylis N, Centner CM, Venter R, Derendinger B, Tshivhula H, Naidoo S, Alberts R, Prins B, Tokota A, Dolby T. 2023. Xpert MTB/RIF Ultra on contaminated liquid cultures for tuberculosis and rifampicin-resistance detection: a diagnostic accuracy evaluation. The Lancet Microbe, 4(10): e822-e829.

35- Shapiro AE, Ross JM, Yao M, Schiller I, Kohli M, Dendukuri N, Steingart KR, Horne DJ. 2021. Xpert MTB/RIF and Xpert Ultra assays for screening for pulmonary tuberculosis and rifampicin resistance in adults, irrespective of signs or symptoms. Cochrane Database of Systematic Reviews, (3):CD0136

36- World Health Organization (WHO). 2014. Xpert MTB/RIF implementation manual: technical and operational 'how-to'; practical considerations (No. WHO/HTM/TB/2014.1). World Health Organization.

37- Xia H, Song Y, Zheng Y, Wang S, Zhao B, He W, Liu D, Ou X, Zhou Y, Zhao Y. 2022. Detection of Mycobacterium tuberculosis rifampicin resistance conferred by borderline rpoB mutations: Xpert MTB/RIF is superior to phenotypic drug susceptibility testing. Infection and Drug Resistance, (15):1345-52.

دراسة التشخيص البكتريولوجي وبعض المعايير البيوكيميائية لدى مرضى التدرن الذين يتلقون الأدوية المضادة للتدرن

الخلفية: يمكن أن تسبب الادوية المضادة للتدرن تأثيرات ضارة على صحة مريض التدرن وبالتالي تسبب تداخلات ضارة بمختلف وظائف الجسم الحيوية. في هذه الدراسة، تم اختيار ٨٠ مريض بالتدرن الرئوي (٤٣ ذكرا و٣٧ أنثى) بشكل عشوائي، واربعين شخصا من الأصحاء (٢١ ذكرا و١٩ أنثى) كمجموعة سيطرة. أشارت النتائج إلى أن الذكور (٥٣,٧٥٪) كانوا أكثر عرضة للإصابة بالتدرن الرئوي من الإناث (٤٦,٢٥٪)، وأن المرضى الذين تقل أعمارهم عن ٤٠ عامًا (٥٧,٥٠٪) كانوا أكثر انتشارًا من أولئك الذين تزيد أعمارهم عن ٤٠ عامًا (٤٢,٥٠٪). أظهرت نتيجة التحليل الإحصائي الى وجود زيادة معنوية في مستوى اليوريا و TSBوالصوديوم في مجموعة مرضى التدرن مقارنة بمجموعة السيطرة. وكان متوسط ± SDلليوريا و TSBوالصوديوم لمجموعة المرضى ٣٤,١٤ ± ٤,١٩ و٠,٦٦٩ ± ٠,٢١ و١٤٢,٩٨ ± ١٤,٨٣٧ على التوالي. وحدث انخفاض معنوي في مستوى البوتاسيوم في مصل الدم لدى مجموعة مرضى التدرن مقارنة بمجموعة السيطرة، حيث كان متوسط SD± للبوتاسيوم ٣,٧٨٦ ± ٠,٦٩١. ومع ذلك، لم يكن هناك وجود فروق معنوية في مستويات الكرياتينين و GOTو GPTو ALPفي مصل كلا المجموعتين. كان هنالك ارتباط طردي معنوي بين مستوى مصل GOT ومصل GPT (r=0.573, p=<0.0001) وكذلك بين مصل GOT مصل ALP (r=0.258, p=<0.0001) في مرضى التدرن الرئوي. ايضا كان الارتباط طردي معنوي بين الصوديوم والبوتاسيوم (r= 0.200, p= 0.021).

الاستنتاجات: ارتبط علاج مرض التدرن بالأدوية المضادة للتدرن مع زيادة معنوية في مستوى كل من اليوريا و TSBوالصوديوم وانخفاض معنوي في مستوى البوتاسيوم في الدم في هذه الدراسة. لذلك في المرضى الذين يتلقون الأدوية المضادة للتدرن هناك احتمال أن يكون للزيادة والنقصان في مستويات المعلمات البيوكيميائية في الدم تأثير سلبي على وظائف الجسم.

الهدف: دراسة الآثار الجانبية للأدوية المضادة للتدرن على وظائف الكبد والكلى وبعض الأملاح لدى مرضى التدرن الذين يتناولون هذه الأدوية.