Assessing the relation between some biochemical variables and vitamin D in patients with recurrent chronic arthritis

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Abstract

There are numerous biochemical markers that are either directly or indirectly related to the pathogenesis of rheumatoid arthritis (RA), which is characterized by both local and systemic effects of inflammation. By assessing the level of vitamin D in the serum of patients with recurrent arthritis, we conclude from this study that vitamin D is one of the vitamins that contribute to the emergence of the process of recurrent arthritis. The markers of disease activity such as erythrocyte sedimentation rate (ESR) and rheumatoid factor (RF) were also measured. The study included (60) patients with rheumatoid arthritis of both sexes, with the number of females (22) ranging in age from (31-70) years and the number of males (18) ranging in age from (31-70) years. They were also compared to a control group of (20) healthy men and women, divided into ten (10) males and ten (10) females. For both sexes, their ages ranged from (31-70) years. According to the study's findings, there are significant differences ($p<0.05$) between the vitamin D3, RF, and ESR groups. The mean levels of ESR and RF were highest in patients(84.05±33.79 and 17.35±5.08) than healthy (38.62±15.53 and 10.55±3.22) respectively. In contrast, the mean levels of vitamin D3 was lowest in patients (21.00±9.68) than healthy (32.40±13.45). The conducted study showed there is no significant difference ($p>0.05$) between ESR and RF among age groups of patients, but we found there is significant different between vitamin D3 among groups, where >70 and 41-50 years scored highest mean (31.37±9.80 and 23.96±8.82), while 31-40 and 61-70 years scored lowest mean (14.25±6.22 and 13.20±5.39) respectively. We conclude all these The majority of people with rheumatoid arthritis have a vitamin D deficiency, which is one of the factors that contributes to the severity of the disease, according to the research and current study's findings. Vitamin D deficiency in rheumatoid arthritis patients is caused by a lack of vitamin D intake from food sources, insufficient sun exposure, a disorder that impairs vitamin D absorption, and other factors.

Keywords: vitamin D, chronic arthritis, ESR, RF

Introduction

Vitamin D is classified as a fat-soluble hormone. Furthermore, Vitamin D is a hormone that promotes the metabolism of calcium and phosphate in the bones15. According to research, vitamin D is one of the hormones that affects other physiological functions and conditions associated with the disease. Vitamin D has also been shown in studies to have a wide-ranging effect on the immune system38. A lack of vitamin D has been linked to a number of autoimmune diseases, including rheumatoid arthritis, and it is thought to have immunomodulatory and anti-inflammatory properties (RA)39,40 .T-cell activity is increased and regulated by vitamin D. Whereas65. discovered that vitamin D controls fungi and adaptive immune system systems primarily through Toll-like receptors, Th17

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cells, and T-cell differentiation, it was discovered that Th17 cells play a significant role in the emergence of rheumatoid arthritis. Vitamin D encourages the conversion of monocytes to phagocytes during infection and increases the release of chemotaxis and cytokines. In turn, this facilitates in the emergence of chronic arthritis45 Whereas destructive arthritis is a form of chronic arthritis that is classified as a systemic autoimmune disease. Whereas it is known that this immune system inflammation affects 1% to 2% of the world's population and damages joints by attacking them directly21. This inflammation can develop for a number of reasons, such as those related to oxidative stress, genetics, an unbalanced immune system, or environmental factors like bacterial infections. Smoking may also play a role in the emergence of recurrent chronic arthritis1,50,20. According to 53, chronic arthritis is one of the yearly injuries that affects people all over the world, occurring with an estimated frequency of 5 to 10 percent in emerging and industrialized nations and at a lower rate in Asian nations. For the right person, chronic arthritis can shorten their lifespan by 3 to 7 years 16. Female sex hormones are thought to be responsible for the higher occurrence of rheumatoid arthritis in women than in men. Whereas the incidence of chronic arthritis was found to be four times higher in women than in men until the age of 50, but less than two times after that. The disease reaches its peak around the age of 50 8. The estimated annual incidence of this infection is between 0.5 and 1% in both developing and developed nations, with Asia having a lower incidence than other continents. As it was discovered, the people of Africa experience a rate of chronic recurrent arthritis at a low rate in rural areas compared to the people of cities, there are differences at the level of peoples in the rate of infection with this inflammation. The infection rate among Indians is predicted to be 5%. Additionally, there was a rise in the infection rate among Alaska Natives and patients of American Indian descent. In Kenya, the ratio was 2.8:1 17, whereas the infection rate for men to women was estimated to be 2.1-0.3 in European countries. According to the findings of the current study, the prevalence rate of adults is estimated to be 1%, and this percentage is consistent with what is found in other parts of the world. He also mentioned that the rate of infection from men to women is estimated to be between 3.4 and 1 in Iraq, where it was previously rare. This is in line with the findings of the researcher 3 who found that, as in other nations, women make up the majority of those who suffer from rheumatoid arthritis. Anti-citrullinated protein antibodies, however, have recently been connected to rheumatoid arthritis. The New European Association for Rheumatology and Arthritis (ACR/EULAR) Diagnostic Criteria for Rheumatoid Arthritis (RF and ACCPA) have approved these autoantibodies as serological markers. These autoantibodies are targeted at joints during inflammation for the subsequent modification of proteins in inflamed joints 23. The erythrocyte sedimentation rate (ESR) is a measurement of how quickly red blood cells settle or drop at the bottom of the blood sample test tube.

A higher sedimentation rate indicates the presence of infections in the body. It should be noted that inflammation is a component of the immune response system, and it can be a reaction to a specific infection that affects the body or the result of an injury to the body, as well as a sign of a chronic disease such as infections. rheumatoid arthritis, an immune disorder, or another medical condition in which the erythrocyte sedimentation rate (ESR) is important for diagnosis 7.

Patients And Methods

patients

The investigation was conducted in collaboration with Dr. Adeeb Al-laboratories Azbaji's for advanced medical examinations in Nasiriyah Governorate - Shatrah DistrictIn advance, as well as from healthy individuals between the dates of 2/2/2022 and 24/6/2022 as sample collection centers. It was approved by the Department of Health and Medical Technologies - National College of Science and Technology. The study included (60) patients of both sexes with rheumatoid arthritis, with females (22) ranging in age from (31-70) years and males (18) ranging in age from (31-70) years. They were also compared to a control group of (20) healthy men and women, ten (10) of whom were males and ten (10) of whom were females. Their ages ranged from (31-70) years for both sexes. as shown in Figure (1.2. 1).

Methods

To compare venous blood samples from patients and healthy individuals, 10 ml of venous blood samples were collected from each group under sterile conditions after locating the vein and drawing venous blood as recommended by 46. It included sex, age, disease duration, genetic factor, and 3 ml of blood was placed in a tube containing an anticoagulant substance EDTA for the purpose of testing Vitamin D and checking the erythrocyte sedimentation rate, and then the remaining volume of blood with Capacity (6 ml) in normal tubes containing gel at (3000RPM) the separated serum for 10 minutes in a centrifuge to separate the serum from the rest of the blood components, and32used deep freeze preservation at (-40 °C) to perform immunofluorescence (RF) assays.

Statistical analysis

First, the parameters of RF, ESR, and vitamin D3 were evaluated for normality (Kolmogorov-Smirnov and Shapiro-Wilk test). The mean and standard deviation (SD) of all parameters that fit both tests (no significant difference) were given and compared using the student t test and the ANOVA test. The percentage frequencies for the other parameters were provided. To comprehend the correlation between particular parameters, the pearson bivariate correlation was used. Each parameter was given its own receiver operating characteristic (ROC) curve, from which the area under the

curve (AUC), sensitivity, and specificity were inferred. For these analyses, the statistical software SPSS 25.0, GraphPad Prism 6, and MedCalc were used.

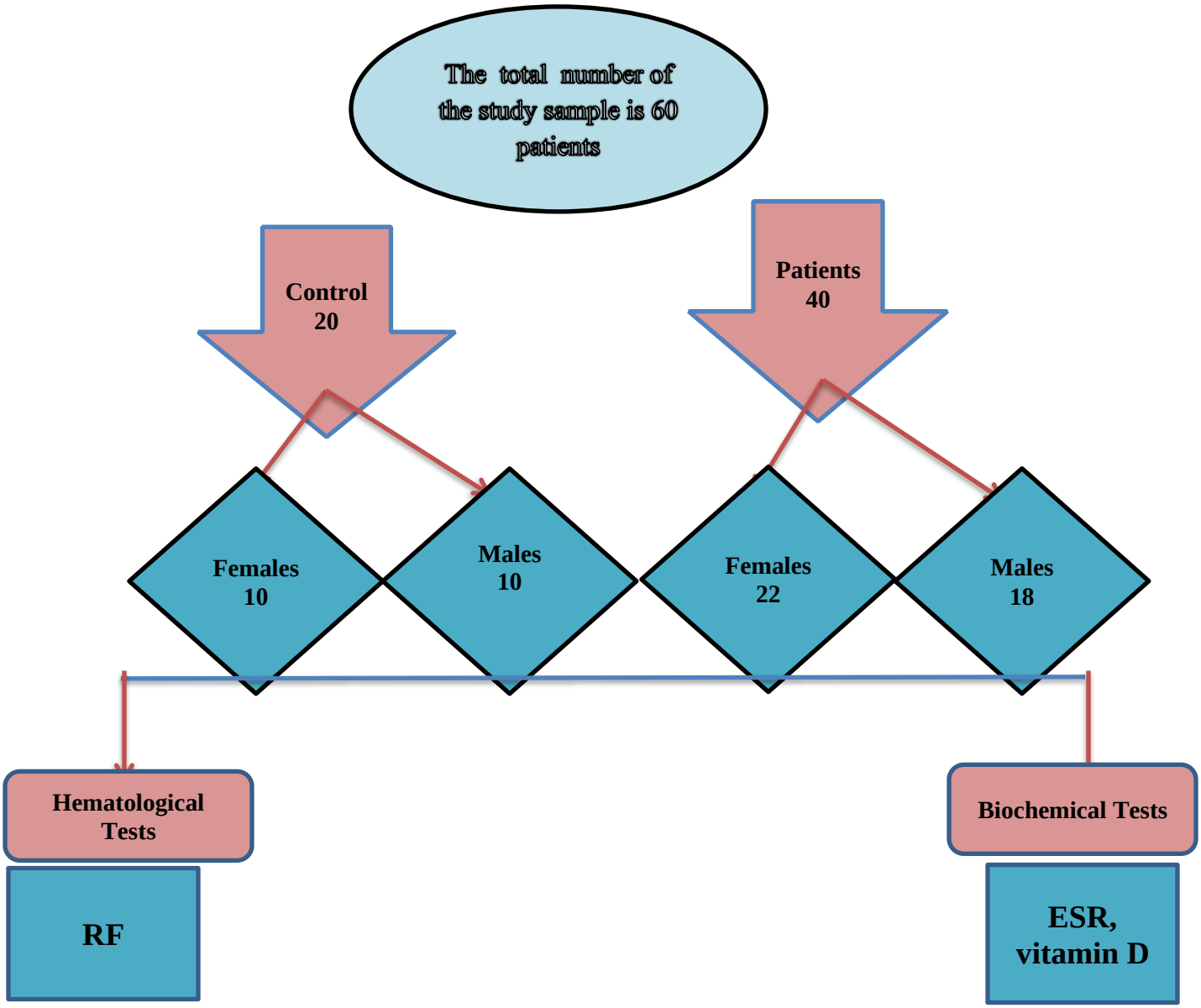

Figure (1.2.1) depicts the design of the study sample and the criteria that were measured.

3. Results And Discussion

1.Base line characters of participants

According to the current study, the age group 41-50 years had the highest percentage of patients (35%) and the age group >70 years had the highest percentage of healthy (30%). The age group 61-70 years old had the lowest percentage of patients and healthy people (10% and 15%, respectively).

According to the current findings, the percentage of males and females in patients (30% and 70%, respectively) was higher than in healthy (45% and 55%). (table 1).

Table 1: baseline characters of participants

			Groups		*Total*
			patients	*Healthy*	
Age groups (years)	31-40	n	11	3	14
		%	27.5%	15.0%	23.3%
	41-50	n	14	3	17
		%	35.0%	15.0%	28.3%
	51-60	n	5	5	10
		%	12.5%	25.0%	16.7%
	61-70	n	4	3	7
		%	10.0%	15.0%	11.7%
	>70	n	6	6	12
		%	15.0%	30.0%	20.0%
Gender	Males	n	12	9	21
		%	30.0%	45.0%	35.0%
	Females	n	28	11	39
		%	70.0%	55.0%	65.0%

The current study demonstrates a higher incidence of RA in females compared to males, which can be attributed to a variety of factors, including hormonal factors, including estrogen hormone. The female to male ratio in the current study is more than 3:1 in favor of females. This result agrees with the majority of studies8,5,35.

Although androgens appear to protect against autoimmunity and estrogens tend to promote it, the hormonal explanation for female-biased autoimmunity continues to be the most compelling one. However, there is also enough evidence to suggest that genetic factors and sex differences play a role in the hormonal explanation. Another study found that women with RA had worse outcomes than men. Male patients are able to prevent functional losses because they have more muscle mass and stamina9.

The current findings were in agreement with31, who showed that RA infection was most prevalent in people between the ages of 41 and 50. From the 50–59 age group in 2002–2003 to the 60–69 age group in 2012–2013, the peak age changed. 66 demonstrated that disease onset can happen at any age, but the fourth and fifth decades of life are when it tends to peak in incidence 29Previous study showed relationship between RA and aging, and stated that the most age group affected by rheumatoid disease are 39-50 years4.

In their explanation of the epidemiologic data, 24 noted a three-fold age-dependent increase in disease frequency in women compared to men and a strong association between RA and sex. For men, the incidence rises after the third through fifth decades but remains stable for women, whose incidence rises steadily with age. Particularly, from late adolescence to the forties, RA is three times more common in females, drops to a 2:1 ratio between the ages of 55 and 65, and finally shifts to a male predominance after the age of 65. Genetic and hormonal factors are just two examples of potential causes for this sexual disparity in RA.

Relation of ESR, RF, and vitamin D3 with study groups

According to the study's findings, there are significant differences ($p<0.05$) between the vitamin D3, RF, and ESR groups. Patients had the highest average levels of ESR and RF (84.0533.79 and 17.355.08, respectively) compared to healthy people (38.6215.53 and 10.553.22) In contrast, patients had the lowest mean levels of vitamin D3 (21.009.68) compared to healthy people (32.4013.45). (table 2 and figure 1).

Table 2: comparative of ESR, RF, and vitamin D3 with study groups

Groups		*N*	*Mean*	*SD*	*P value*
ESR	Patients	40	84.05	33.79	P<0.001***
	Healthy	20	38.62	15.53	
RF	Patients	40	17.35	5.08	P<0.001***
	Healthy	20	10.55	3.22	
Vitamin D3	Patients	40	21.00	9.68	P<0.001***
	Healthy	20	32.40	13.45	

The current study found that patients with RA had higher levels of ESR than healthy people, and these findings matched those of 34. Furthermore, the current findings are consistent with previous research that concluded that ESR levels can be elevated in RA and can be used as a screening test to assess disease severity, but with much lower specificity than CRP and RF 12

Because of their dependability, reproducibility, and cost-effectiveness, ESR is the most widely used marker for measuring acute phase response. Both of these markers are highly correlated with RA clinical disease activity 41.

Previous research demonstrates a significant relationship between serum ferritin levels and the markers of disease activation CRP, ESR, and platelet count in RA patients 51. Another study found that RA patients have elevated levels of the inflammatory markers CRP and ESR, and that the disease activity is correlated with these levels. These findings suggested that these markers may play a role in the pathogenesis, and they can be used as indicators of disease activity in the diagnosis and management of RA 54. According to 49, linear mixed model analysis verified that ESR significantly increased with RA, was higher in RA patients prior to anti-TNF treatment, and significantly decreased after 3 and 6 months of treatment.

The rate at which erythrocytes pass through plasma while suspended in a vertical tube is known as the ESR, and it serves as an indirect indicator of the concentrations of acute-phase reactants (mainly fibrinogen). Red blood cell size, shape, and number, as well as other components of plasma like immunoglobulins, all have an impact on ESR levels. Increased ESR levels can be brought on by tissue damage, end-stage renal disease, nephrotic syndrome, infection, malignancy, local or systemic inflammation, infection, or obesity. Age-related increases in ESR values are slightly greater in women than in men. Additionally, a variety of factors, such as abnormal erythrocyte shape, severe leukocytosis, heart failure, and cachexia, may result in falsely low ESR values 52. The ESR is not a specific indicator of inflammation, which is not surprising.

Both ESR measurements—despite their flaws—remain important for the diagnosis and treatment of RA. The 2010 ACR/EULAR Classification Criteria for RA include high ESR levels6 .The Disease Activity Score 28-ESR or CRP (DAS28-ESR or DAS28-CRP) and the Simplified Disease Activity Index (SDAI) are two of the six RA disease activity measures that the ACR has approved for use in clinical practice 11. Although it does not specifically state a preference for measures that include laboratory values over those that do not, the 2015 ACR Guideline for the Treatment of RA, which is widely used in clinical practice, encourages the use of these disease activity measures. Additionally, the guidelines do not expressly advise all RA patients to regularly monitor their ESR and CRP 56. These treatment recommendations are currently being updated, with a fall 2021 release date anticipated.

ESR and CRP elevation and radiographic and functional outcomes in RA patients have been linked in numerous studies 52. Early RA is thought to have elevated ESR as a better predictor of these outcomes, whereas later stages of the disease may have superior CRP due to less susceptibility to other factors like immunoglobulin levels and anemia47. This said, about 40% of RA patients have normal ESR and CRP levels 26. Furthermore, despite clinical improvement with treatment, values may stay stable even in patients with baseline elevation. ESR values may also differ, which is interesting. Discordant ESR and CRP values were found in 26% of patients in a large observational study that included over 9,000 patients from a practice-based registry despite active RA as determined by joint counts and global assessments 52.

Autoantibodies that are directed against the Fc region of IgG are known as rheumatoid factors (RF). A reliable diagnostic and prognostic test for rheumatoid arthritis is the rheumatoid factor. For decades, the only serologic criterion widely used in the diagnosis of RA was high titer IgM RF, which is relatively specific for the diagnosis of RA in the context of a chronic polyarthritis 33.

Due to the fact that these antibodies are pentameric IgM antibodies that bind to the Fc portion of human immunoglobulin G, which causes it to be elevated in autoimmune disease or inflammation, as well as other factors, there are more RF-positive patients than RF-negative patients. Rheumatoid arthritis is an inflammatory condition in healthy individuals, so this will result in an increase in this protein 37.

In addition to rheumatoid arthritis, rheumatoid factors (RF) are present in a number of autoimmune and non-autoimmune diseases (RA). It has been established that up to 4% of young, healthy, and elderly people have 60.

The two biomarkers have the potential to encourage early, aggressive intervention with newer RA treatment options and track disease activity, according to the studies looked at. Anti-CCP antibody titers are higher in the blood of patients with erosive RA, and several studies have found a direct correlation between anti-CCP antibodies in the serum and joint damage. According to a previous study 2, all RA patients tested positive for ACCP antibodies, while 52.9% of RA patients tested positive for RF.

The main way vitamin D affects bone and mineral metabolism is by changing the expression of several genes in the kidneys, parathyroid glands, small intestine, and bone 59. By encouraging intestinal calcium and phosphate absorption and renal tubular calcium reabsorption, 1,25(OH)2D-induced activation of VDR contributes to the maintenance of an adequate calcium-phosphate product that crystallizes in the collagen matrix of the bone. By inducing the expression of osteocalcin, the main non-collagenous protein in the skeleton, and stimulating the receptor activator of nuclear factor kappa-B-dependent bone resorption, 1,25(OH)2D also has direct effects on the bone 19. Additionally, 1,25(OH)2D induces osteocytes to produce FGF-23, which increases urinary phosphate excretion, and directly inhibits PTH production, which reduces bone resorption 19.

The current study revealed lower levels of vitamin D3 in RA than in healthy individuals, and these findings were consistent with those of 58. According to the findings of our study, RA patients had significantly higher rates of vitamin D deficiency than non-RA patients, according to a cross-sectional study by 13. Another retrospective study by 28. found that vitamin D deficiency affected 61% of RA patients 29. The relationship between vitamin D and RA activity was investigated in a prospective cohort study involving 29,368 healthy female participants. Vitamin D was added to their diet as a supplement. Over the course of the 11-year follow-up, the cohort reported only 152 cases of RA in these women, indicating a marked reduction in the risk of RA with increased intake of vitamin D supplements 42.

RA and other autoimmune disorders, including rickets, have been linked to vitamin D in the literature numerous times 30. The balance between autoimmunity and endurance is thought to be disturbed by RA, which is thought to be brought on by the interaction of environmental factors in individuals who have a genetic susceptibility 61.Vitamin D is a potential risk factor for RA, even though smoking is one of the major environmental risk factors. However, because RA limits mobility, patients who have it limit their outdoor activities 58 .As a result, they receive less sun exposure, which is the main source of vitamin D, in turn. A further vitamin deficiency might make the condition worse.

Patients with RA are more likely to have vitamin D deficiencies, which could be one of the factors contributing to the onset or progression of RA. The serum levels of vitamin D tend to drop in RA as the disease activity rises. To ensure that they are consuming the recommended amount of Vitamin D, all RA patients need to have their Vitamin D status properly evaluated. Further investigation is necessary to take advantage of Vitamin D's antiproliferative, immunomodulatory, and anti-inflammatory properties to treat a range of autoimmune rheumatic diseases40.

The goal of RA treatment is to reduce disease activity, improve joint function, and, consequently, maintain stable serum 25-OHD3 levels. Early diagnosis and treatment could mitigate the effects of vitamin D deficiency and reduce the amount of disease activity 58.

In a recent study, omega 3 fatty acid supplementation with or without vitamin D for five years reduced the rate of autoimmune disease by 15% (not statistically significant), while vitamin D supplementation alone reduced the rate of autoimmune disease by 22%. 27.

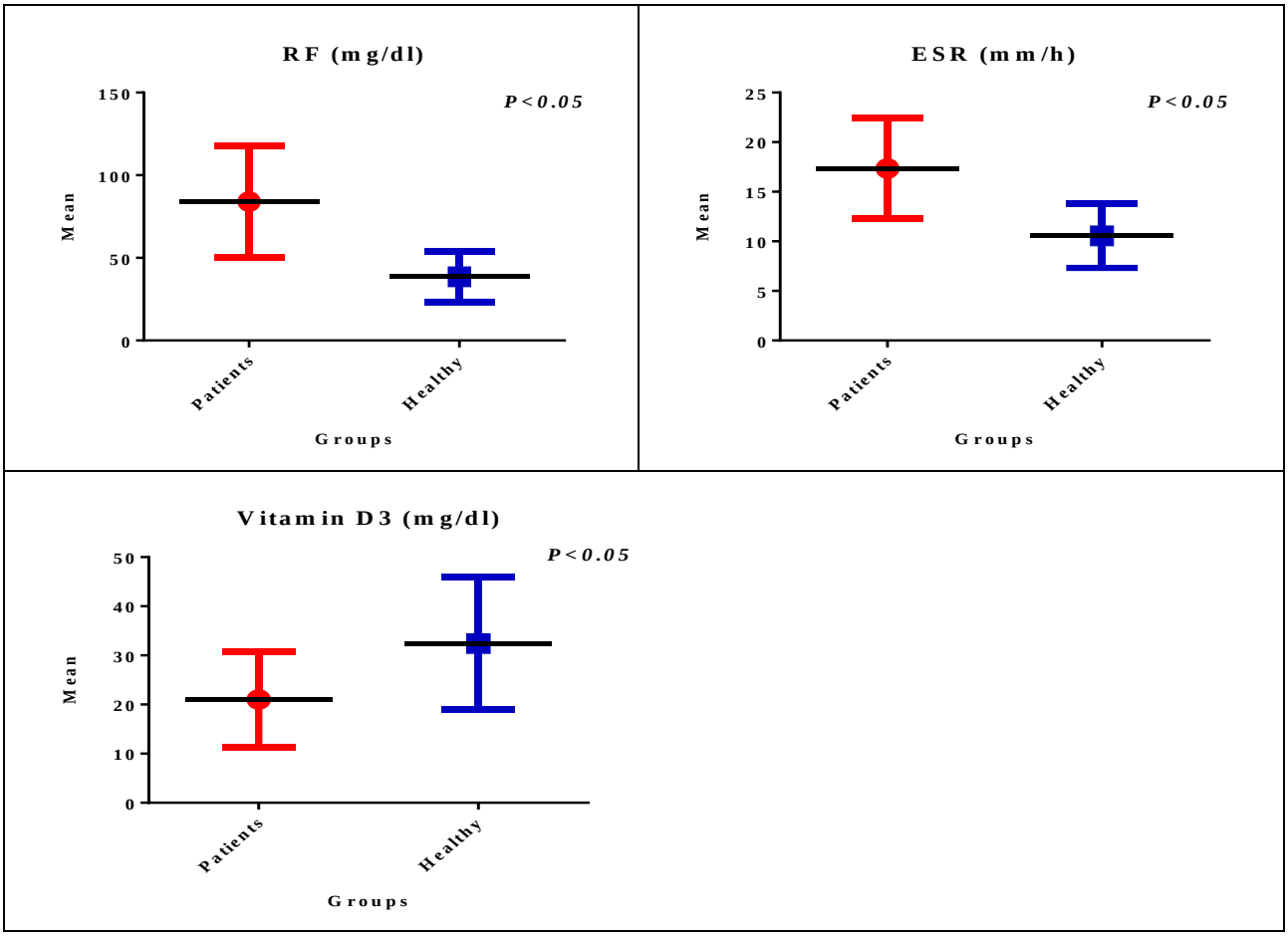

Figure 1; comparative of ESR, RF, and vitamin D3 with study groups

3. correlation relationship among ESR, RF, and vitamin D3 parameters

The current study demonstrated a strong relationship between vitamin D3, ESR, and RF. ESR and RF significantly negatively correlate with vitamin D3 (r=-0.418 and r=-0.336, respectively). The RF and ESR have a strong positive correlation (r=0.791**). (table 3).

Table 3: correlation relationship among ESR, RF, and vitamin D3 parameters

		ESR	*RF*	*D3*
ESR	Pearson coefficient	1	.791**	-.418**
	Probability		.000	.007
RF	Pearson coefficient	.791**	1	-.336*
	Probability	.000		.034
D3	Pearson coefficient	-.418**	-.336*	1
	Probability	.007	.034	

According to 36 the increased level of fibrinogen, which makes red blood cells sticky and accelerates erythrocyte sedimentation, is what causes the relationship between an elevated level of the ESR and RA.

ESR and RF are significant adjuvant markers for the diagnosis of rheumatoid arthritis even though they are not specific for the condition. 10 .found that simultaneous radiofrequency and ESR detection is helpful for confirming the diagnosis of rheumatoid arthritis.

According to 58, patients with RF positivity had lower mean vitamin D levels than RA participants without RF. Similar to this, RA patients with RF positivity were reported to experience hypovitaminosis more frequently than RA patients with RF negativity..

4. Relation of ESR, RF, and vitamin D3 with age groups of patients

The conducted study showed there is no significant difference (p>0.05) between ESR and RF among age groups of patients, but we found there is significant different between vitamin D3 among groups, where >70 and 41-50 years scored highest mean (31.37±9.80 and 23.96±8.82), while 31-40 and 61-70 years scored lowest mean (14.25±6.22 and 13.20±5.39) respectively (table 4).

Table 4; comparative of ESR, RF, and vitamin D3 with age groups of patients

Age groups		*N*	*Mean*	*SD*	*P value*
ESR	31-40	11	68.18	23.16	p>0.05
	41-50	14	92.50	34.85	
	51-60	5	87.40	13.65	
	61-70	4	87.50	49.07	
	>70	6	88.33	47.82	
RF	31-40	11	20.08	2.25	p>0.05
	41-50	14	16.35	5.85	
	51-60	5	14.02	4.22	
	61-70	4	18.43	5.50	
	>70	6	16.71	6.15	
D3	31-40	11	14.25	6.22	p<0.05*
	41-50	14	23.96	8.82	
	51-60	5	21.32	9.52	
	61-70	4	13.20	5.39	
	>70	6	31.37	9.80	

Age and sex were independently correlated with the levels of both acute phase reactants in early RA, according to a previous study, though the effects on the ESR seemed to be the strongest. These findings highlight the importance of considering these outside variables when interpreting disease activity in patients with early RA. The disease activity of older patients may be overestimated because the acute phase

reactants have a tendency to rise with age, independent of other key measures of disease activity 64 .Similar to sex differences, certain immunological or hematological changes, such as hormonal changes in menopausal women, may be responsible for the aging-related increase in ESR levels 55.

Contrary to what the name implies, rheumatoid factors (RF) are found not only in rheumatoid arthritis (RA), but also in a variety of other autoimmune and non-autoimmune diseases. They have been found in up to 4% of young, healthy people as well as the elderly 62.48 found evidence of an association between serology status of RF and age-at-onset , and these results contrast to present study that showed no association of RF with age 57 illustrated a significant relationship between positive RF and age.

The current study found that vitamin D3 levels decreased with age due to malnutrition and chronic diseases. Skin vitamin D production decreases with age. When comparing old and young people, the concentration of 7-dehydrocholesterol in the epidermis decreases, as does the response to UV light, resulting in a 50% decrease in the formation of previtamin D3 25.

5. Relation of ESR, RF, and vitamin D3 with gender of patients

The study found a significant difference ($p<0.05$) between ESR and RF and patient gender, but we found no significant difference ($p>0.05$) between vitamin D3 and gender. Males had higher mean ESR levels (106.6736.64) than females, while females had higher RF levels (18.404.71) than males. (table 5).

Table 5; comparative of ESR, RF, and vitamin D3 with gender of patients

Gender		*N*	*Mean*	*SD*	*P value*
ESR	Males	12	106.67	36.64	P<0.05*
	Females	28	74.36	27.89	
RF	Males	12	14.90	5.24	P<0.05*
	Females	28	18.40	4.71	
D3	Males	12	24.12	11.24	p>0.05
	Females	28	19.66	8.81	

According to 55, women are more likely than men to have elevated ESR values, and these findings corroborated those of the current study. It is well known that pathological ESR elevation may result from increased fibrinogen levels and higher rates of disorders in women than in men.

43 found that there were more male patients with RA, RF, and ACCP than female patients, but this difference was not statistically significant. In contrast, the current study found that there were significantly higher levels of RF in female patients than in male patients. However, a different study conducted by Alwan and Ghali in 2021 revealed a significant correlation between the level of anti-CCP and female gender. Considered discriminative biomarkers for the diagnosis of RA are RF and ACCP.

There is a strong correlation between the severity of the disease and the high prevalence of vitamin D deficiency in RA patients. Therefore, when assessing at-risk patients, particularly women with complaints of vitamin D deficiency, a high index of suspicion is necessary 58.

6.Receiver operator characteristic curve (ROC) of RF, ESR, and vitamin D3

Results of present study showed the ESR and RF scored highest sensitivity (95% and 100%) than vitamin D3 (67.5%). Additionally, the specificity of ESR, RF, and vitamin D3 was 100% for each other (figure 2).

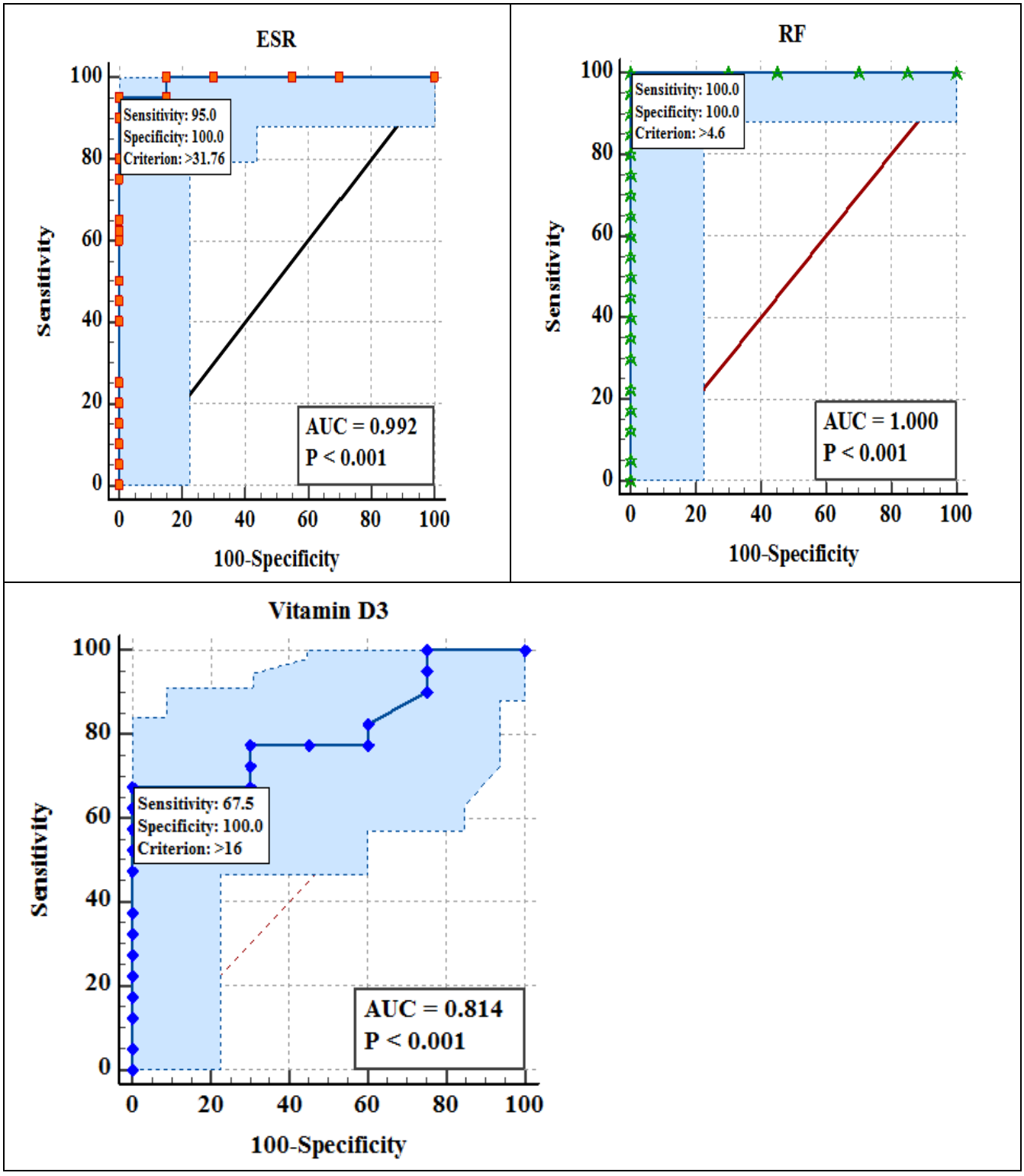

Figure 2; Receiver operator characteristic curve (ROC) of ESR, RF, and vitamin D3.

43 used the ROC test to demonstrate high sensitivity and specificity; RF had (94% sensitivity and 98% specificity), while ACCP had (98% sensitivity and 99% specificity). These findings were consistent with the current study, which demonstrated high sensitivity and specificity of RF (100% sensitivity and 100% specificity).

Our findings show that the rheumatoid factor IgM test is 100% sensitive. When compared to a prior study, the findings of this one show the highest levels of sensitivity to rheumatoid factor IgM (60–80%)22.

Both the serum C-reactive protein (CRP) and the erythrocyte sedimentation rate (ESR) are typically elevated in RA. The results of the present study were consistent with those of 63, who noted that ESR in RA patients had a high sensitivity of

100% when used repeatedly after the initial evaluation and diagnosis for monitoring and assessing systemic inflammation (RA). 14 came to the conclusion that vitamin D is a good indicator of RA disease activity in patients, with a sensitivity of 71%. These findings are nearly identical to those of the current study, which found that vitamin D3 had a 67.5% sensitivity for RA disease screening.

Conclusions

Patients with RA are more likely to have vitamin D deficiencies, which could be one of the factors contributing to the onset or progression of RA. The serum levels of vitamin D tend to drop in RA as the disease activity rises. According to the research and results of the current study, the majority of people with rheumatoid arthritis have a vitamin D deficiency, which is one of the factors that contributes to the severity of the disease. Patients with rheumatoid arthritis who have vitamin D deficiency do so for a variety of reasons, including inadequate dietary intake, inadequate sun exposure, a condition that interferes with vitamin D absorption, and others.

Compliance with Ethical Standards statements

Ethical approval :Iaqi Ministry of Health, Immam Hussein teaching hospital ,Thi-Qar, Iraqi certifies the ethical approval, Funding details (In case of Funding) :I am responsible for paying the financing, Conflict of interest : There is no conflict of interest, Informed Consent: Iaqi Ministry of Health, Immam Hussein teaching hospital ,Thi-Qar, Iraqi Agreed

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