

Alanine Amino Transferase (ALT) Among Blood Donors Visiting King Abdulaziz Medical City Blood Donor Center

Salem Alshimemeri¹, Mohammed Alshareef¹, Mohammed Sambas¹,
Abdulrahman Alshareef¹, Waleed Tamimi²

¹College of medicine, king Saud bin Abdulaziz university for health sciences, Saudi Arabia

²Department of Pathology and Laboratory Medicine, King Abdulaziz Medical City, Saudi Arabia

ABSTRACT:

Purpose: to determine Alanine Amino Transferase (ALT) level among blood donors visiting King Abdulaziz Medical City blood donor center. **Patients and methods:** This is a cross-sectional study where 434 blood samples that were serologically negative of Hepatitis B, Hepatitis C, HIV, HTLV, and Syphilis were taken from 434 seemingly healthy blood donors and were tested for ALT level. **Results:** The mean age of the donors was 30.1 + 8.6 years. The mean weight was 84.1 + 16.6 kg. The mean Hb level was 15.54 + 1.24 g/dl. The mean ALT level was 32.76 + 23.24 U/L. The median ALT level was 26.00 and the 95th percentile was 69.25 while the 5th percentile was 12.00. Out of the 434 donors, 51 (11.8%) had an ALT level higher than 55 U/L which is normal upper limit at our hospital's lab. The mean weight for donors with normal ALT was significantly lower than those with ALT >55 U/L (83.4 + 16.8 vs 89.7 + 14.2 U/L respectively, and p-value = 0.01). **Conclusion:** The study has found an association between weight and ALT level. We recommend reviewing the normal range of ALT. Also, we recommend screening overweight people for subclinical liver disease specifically non-alcoholic fatty liver disease NAFLD.

Keywords: ALT, Saudi Arabia, Weight, Blood Donor, liver disease

1. Introduction

Alanine aminotransferase is an enzyme found in the liver and is a sensitive indicator of liver injury; therefore, it is used clinically as a screening test for numerous liver conditions, such as non-alcoholic steatohepatitis, viral hepatitis, and hepatotoxicity, along with other liver enzymes as part of liver function test (LFT). [1- 3] The upper limit for ALT was established in the 1950s at 40 U/L and has changed little since then; however, the normal range is different for each lab depending on their protocols and is around 7 – 56 U/L as mentioned by Davis CP in his article titled “Normally, where are AST and ALT (Aminotransferase enzymes)?”. [3, 4] Also several studies are trying to challenge the upper limit and normal values of ALT. [3, 5]

The controversy surrounding the normal range of ALT and the normal upper limit and the scarcity of local data on this topic provide enough incentive to study it. The aim of the study is to determine ALT level among blood donors visiting King Abdulaziz Medical City blood donor center.

2. Methods

The study design is cross-sectional. The sample size was calculated using Raosoft sample size calculator. Based on the blood donor center's estimation of 26,000 blood donors per year, an expected NAFLD prevalence of 15%, a +5% margin of error, and a 95% confidence interval, the recommended sample size was 379 but a sample of 434 was taken. 434 blood samples that were serologically negative of Hepatitis B, Hepatitis C, HIV, HTLV, and Syphilis were taken from 434 seemingly healthy blood donors visiting King Abdulaziz Medical City's blood donor center. Then, the samples were sent to the clinical laboratory and tested for ALT level. The ALT levels were later entered onto an excel file. Donors' age, weight and HB level were later retrieved by an employee of the blood donor center using the sample ID and entered into the same excel file. Data was analyzed using SPSS where ANOVA test, T-student test, as well as Pearson correlation test were performed. Frequency tables (n and %) were used for categorical data (such as gender, ALT status) while mean \pm standard deviation was used for numerical data (such as age, ALT level, weight). A p-value of > 0.05 was considered statistically significant.

3. Results

The mean values for age, weight, Hemoglobin (Hb) level, and ALT level are shown in Table 1. Out of 434 donors, only three donors were female. The mean age of the donors is 30.1 ± 8.6 years. The mean weight is 84.1 ± 16.6 kg. The mean Hb level is 15.54 ± 1.24 g/dl. The mean ALT level is 32.76 ± 23.24 U/L. The median ALT level is 26.00 and the 95th percentile is 69.25 while the 5th percentile is 12.00 (Fig 1). Out of the 434 donors, 51 (11.8%) had an ALT level higher than 55 U/L which is the normal upper limit at our hospital's lab (Table 2). The mean weight for donors with normal ALT was significantly lower than those with ALT >55 U/L (83.4 ± 16.8 vs 89.7 ± 14.2 U/L respectively, and p-value = 0.01) (Table 3). Using Pearson correlation test, ALT had a very weak linear correlation with weight (Linear correlation = 0.178) (Table 4). The 434 donors were separated into four age groups. Those aged ≤ 25 years had a statistically significant median than those aged 26 to 29, 30 to 34, and ≥ 35 (21.0 (16.75, 31.25), 32.5 (21, 48.25), 27.5 (20, 49.75), and 29.0 (21.75, 41.0) U/L respectively, p-value = <0.001) (Table 5) (Fig 2).

4. Figures and Tables

Table 1. characteristics of the 434 donors

Characteristics of the 434 donors		
Factor	Mean	Standard Deviation
Age (yr)	30.1	± 8.6
Weight (kg)	84.1	± 16.6
Hb (g/dl)	15.54	± 1.24
ALT level (u/l)	32.76	± 23.24

Table 2. ALT Status

ALT Status		
	Frequency	Percent
Positive*	51	11.8
Negative	383	88.2
Total	434	100

*Positive = >55 u/l

Table 3. ALT (Mean ± SD)

ALT (Mean ± SD)			
	Positive (n= 51)	Negative (n= 383)	p-value
HB (g/dl)	15.74 ± 1.02	15.52 ± 1.26	0.23
Weight (kg)	89.7 ± 14.2	83.4 ± 16.8	0.01
Age (years)	30.4 ± 7.2	30.0 ± 8.8	0.79

Table 4. Correlation of ALT level with quantitative factors

Correlation of ALT level with quantitative factors		
Factor	Correlation	P value
Age (yr)	.083	0.08
Weight (kg)	.178	<0.001
Hb (g/dl)	.096	0.046

Table 5. ALT*

ALT*			
Age group	n	Median (IQR)	p-value
≤ 25	150	21.0 (16.75, 31.25)	<0.001
26 - < 30	94	32.5 (21, 48.25)	
30 - < 35	80	27.5 (20, 49.75)	
+35	110	29.0 (21.75, 41.0)	

*Kruskal-Wallis Test

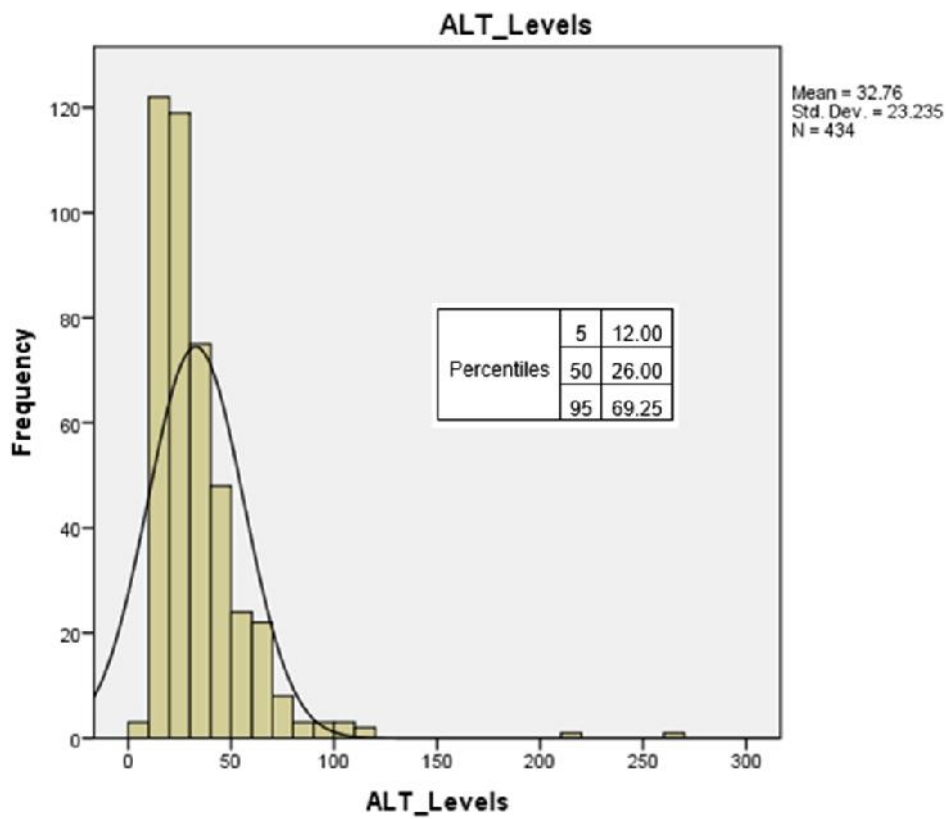


Figure 1. median ALT level and percentile

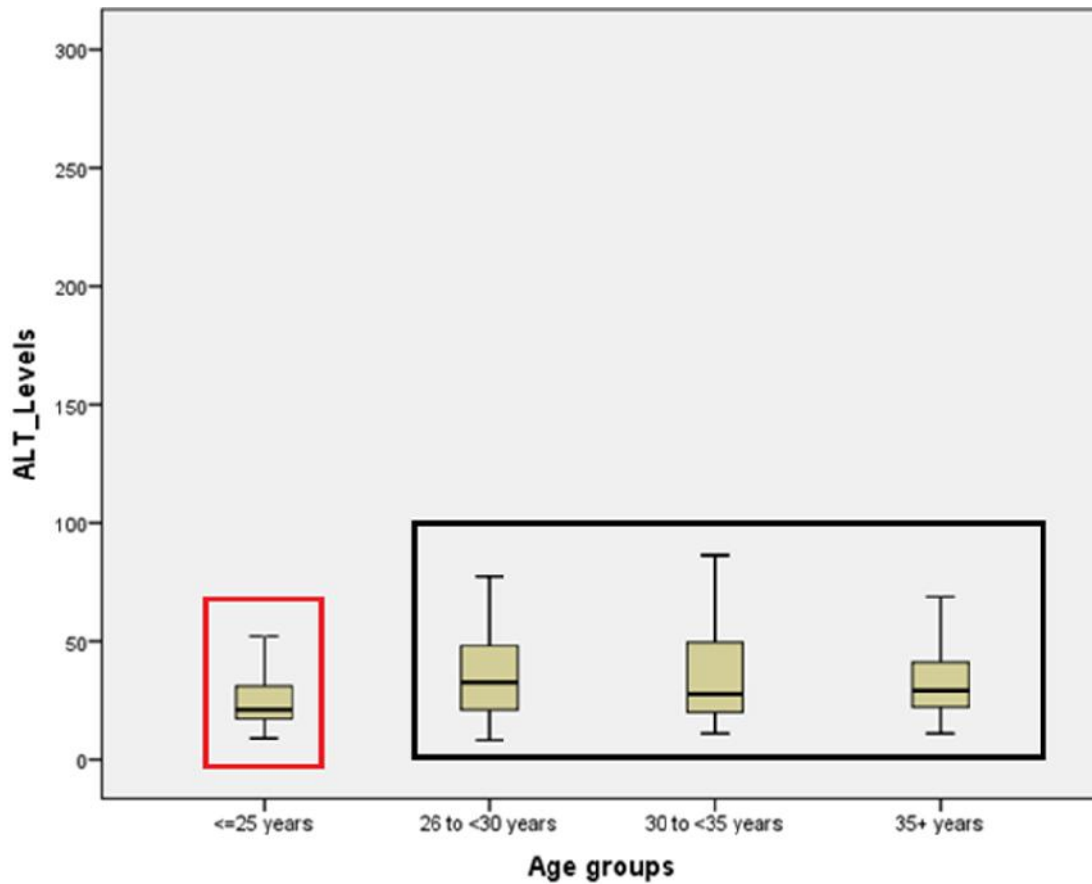


Figure 2

5. Conclusion

The study has found a statistically significant difference in mean weight when comparing blood donors with ALT ≤ 55 and those with ALT > 55 . When comparing the mean ALT value of our study with a study done by Dr. Waleed Al-Hamoudi at King Faisal Specialist Hospital in Riyadh, Saudi Arabia in 2013 on a population potential liver donors and a study done by Dr. Mohamadnejad at Tehran blood donation center in 2003 the mean ALT levels were $32.76 + 23.24$ U/L, $23.6 + 11.3$ U/L, and 19.87 U/L standard error = 0.27 respectively. [3, 5] When comparing each study's upper normal limits, the results were 69.25 U/L, 22 U/L for women and 33 U/L for men, and 40 U/L for each study respectively. Our study's high ALT level is most likely attributed to sub clinical liver disease such as non-alcoholic fatty liver disease (NAFLD). [3, 5]

Our study faced multiple limitations including not being able to calculate BMI for the donors as donor height is not regularly taken by the blood donor center although it is part of their policy. Our study also couldn't compare genders since only three of the blood donors were female.

In conclusion, our study has found an association between weight and ALT level. We recommend reviewing the normal range of ALT. Also, we recommend screening overweight people for subclinical liver disease specifically NAFLD.

References

- [1] Galvin Z, McDonough A, Ryan J, Stewart S. Blood alanine aminotransferase levels >1,000 IU/l - causes and outcomes. *Clin Med (Lond)*. 2015 Jun;15(3):244-7. doi: 10.7861/clinmedicine.15-3-244.
- [2] Kaplan MM. Alanine Aminotransferase Levels: What's Normal? *Ann Intern Med*. 2002;137(1):49-51. doi:10.7326/0003-4819-137-1-200207020-00012
- [3] Mohamadnejad M, Pourshams A, Malekzadeh R, Mohamadkhani A, Rajabiani A, Asgari AA, Alimohamadi SM, Razjooyan H, Mamar-Abadi M. Healthy ranges of serum alanine aminotransferase levels in Iranian blood donors. *World J Gastroenterol*. 2003 Oct;9(10):2322-4.
- [4] Davis CP. Normally, where are AST and ALT (Aminotransferase enzymes)? [Internet]. [Place unknown]: MedicineNet [reviewed 2016 April 20, Cited 2016 May 10] Available from: http://www.medicinenet.com/liver_blood_tests/page3.htm
- [5] Al-hamoudi W, Ali S, Hegab B, Elsiey H, Hashim A, Al-Sofayan M, Khalaf H, Al-Bahili H, Al-Masri N, Al-Sebayel M, Broering D, Abdo A, Alqahtani S, Abaalkhail F. Revising the upper limit of normal for levels of serum alanine aminotransferase in a Middle Eastern population with normal liver histology. *Dig Dis Sci*. 2013 Aug;58(8):2369-75. doi: 10.1007/s10620-013-2659-0. Epub 2013 Mar 30.