

Serum and salivary enzymes – possible indicator of the incidence of tooth decay in patients with chronic alcoholic hepatitis

Lecturer Daniela G. BALAN¹, MD, PhD, Univ. Assist. Iulia I. STANESCU¹, MD, PhD, Univ. Assist. Andra E. BALCANGIU-STROESCU¹, MD, PhD, Drd. Dr. Adela M. CEAU², MD, Lecturer Alexandru G. CROITORU³, MD, PhD, Univ. Assist. Dan PIPEREA-SIANU¹, MD, PhD candidate

¹Physiology Department, Faculty of Dental Medicine, University of Medicine and Pharmacy “Carol Davila”, Bucharest

²Politehnica University, Bucharest

³Physiopathology and Immunology Department, Faculty of Dental Medicine, University of Medicine and Pharmacy “Carol Davila”, Bucharest

ABSTRACT

Objectives. Determination of correlations between the cariogenic index, as quantifying element for the frequency of tooth decay, and some salivary and serum enzymes in patients who had been diagnosed with chronic alcoholic hepatitis.

Materials and methods. The study group consisted of 25 patients diagnosed with chronic alcoholic hepatitis. The following salivary enzymes were determined: AST, ALT and the AST/ALT ratio. Also, the following plasma enzymes were determined: AST, ALT, amylase, LDH, GGT, ALP, AST/ALT and GGT/ALP ratios.

Results. The determined average values were: cariogenic index $1,8 \pm 0,96$, salivary AST $72,52 \pm 46,21$ U/L, salivary ALT $80,28 \pm 40,34$ U/L, salivary AST/ALT ratio $1,03 \pm 0,63$, plasma AST $115,80 \pm 79,16$ U/L, plasma ALT $114,76 \pm 116,01$ U/L, plasma LDH $546,88 \pm 444,08$ U/L, plasma amylase $53,04 \pm 18,12$ U/L, plasma GGT $212,32 \pm 198,12$ U/L, plasma ALP $98,76 \pm 30,88$ U/L, plasma AST/ALT ratio $1,58 \pm 1,17$, plasma GGT/ALP ratio $2,15 \pm 1,76$.

Conclusions. Statistically significant correlations were determined between the cariogenic index and the salivary AST/ALT ratio, plasma AST, plasma ALT, plasma AST/ALT ratio.

Keywords: chronic alcoholic hepatitis, cariogenic index, salivary enzymes, plasma enzymes

INTRODUCTION

Ethyl alcohol is an organic compound that affects the specific and non-specific defense mechanisms of the oral cavity as well as the integrity of oral structures. For this reason, people with high-level alcohol consumption have a modified oral status characterized by an increased incidence of dental caries, compared to non-alcoholic individuals. The increased inci-

dence of tooth decay is due, on the one hand, to the denaturing action of ethyl alcohol, and, on the other hand, to the poor oral hygiene and general malnourishment in these individuals (1).

Alcoholic hepatitis is a liver inflammatory syndrome that occurs in people who consume alcohol in excess for many years, but the relationship between alcohol consumption, the amount, the duration of consumption, the type

Corresponding author:

Univ. Assist. Dan Piperea-Sianu, PhD candidate, Physiology Department, Faculty of Dental Medicine, „Carol Davila” University of Medicine and Pharmacy, 8th Eroii Sanitari Blvd, Bucharest, Romania
E-mail: sianu.dan@gmail.com

of alcohol consumed and the occurrence of liver disease is complex. Not all the individuals who consume large quantities of alcohol develop hepatopathy, but alcoholic hepatitis may occur in people who consume alcohol moderately (2).

According to the World Health Organization, around 3.3 million deaths are reported globally as a consequence of excessive alcohol consumption. It also mentions an average alcohol consumption of 6.2 liters of alcohol per person, aged at least 15. Alcoholism is therefore considered a major health problem, which must be rapidly diagnosed in order to prevent side effects and in order to limit the socio-economic impact (3).

OBJECTIVES

Through the present study we aimed to determine the correlations between the frequency of tooth decay, objectified through the cariogenic index (CI), and a series of salivary and plasma enzymes in individuals diagnosed with chronic alcoholic hepatitis.

It is common knowledge that some serum parameters are useful for screening, diagnosing and following the evolution of the aforementioned patients. Some of these parameters are gamma-glutamyltransferase (GGT), alanine aminotransferase (ALT), aspartate aminotransferase (AST), AST/ALT ratio.

Saliva is a fluid that is increasingly used to dose constituents whose variation may be useful for the diagnosis of various oral and systemic conditions. Among the advantages of saliva samples vs. blood samples, we can mention: lower costs, taking saliva samples is easier than taking plasma samples, patients are much more likely to accept getting saliva samples repeatedly.

MATERIALS AND METHODS

The study was conducted on 25 patients (23 males and 2 females), averagely aged 41.16 ± 7.93 , investigated both clinically and paraclinically, diagnosed with chronic alcoholic hepatitis.

In order to confirm the diagnosis and also to exclude the viral etiology of the hepatic impairment, the following seric determinations were made: anti-VHA IgM, anti-HBc IgM, AgHBs, AgHBe, anti-HBe, anti-HBc, anti-VHC antibodies. The patients with chronic alcoholic hepatitis had a common history of chronic alcohol consumption, negative viral markers, symptoms and results of paraclinical investigations suggesting hepatic impairment.

Blood and saliva samples were taken in the morning (8:30-9:30), *à jeun*, the patients having not eaten at least 12 hours before. The blood samples were taken through venous puncture, and were processed in the hospital laboratory, using standard techniques for preparing the samples for the investigation.

Regarding saliva, at least 120 minutes before the sampling, the patients had to brush their teeth, being known that even in the case of minor lesions, like the ones that can occur during brushing, the plasma exsudate may modify the salivary composition. No other oral hygiene manouvers were allowed. Patients were not allowed to drink, eat, smoke or make any physical effort after brushing their teeth, before the sampling. 60 minutes before sampling, the patients rinsed their oral cavities with distilled water. 15-20 minutes after the venous puncture, mixed saliva samples were taken – the secretion of saliva should not have been stimulated. The samples were taken in sterile calibrated test tubes, held in ice-cold environment. The sampling was conducted for 10 minutes, at 1 minute intervals (the first saliva sample was not used). The patients were sitted in a relaxed position and were asked not to swallow during the sampling.

The status of the oral cavity was objectified by examination of teeth and soft tissues. The absent teeth as well and the teeth affected by tooth decay (treated or not) were identified and counted. The result was written down as cariogenic index. “+” signifies 4 carious lesions or less, “++” signifies between 4 and 10 carious lesions and “+++” signifies more than 10 carious lesions.

From the saliva samples the following parameters were determined: aspartate aminotransferase (AST), alanine aminotransferase (ALT), AST/ALT ratio.

From the blood samples the following parameters were determined: aspartate aminotransferase (AST), alanine aminotransferase (ALT), AST/ALT ratio, lactate dehydrogenase (LDH), amylase, gamma-glutamyltransferase (GGT), alkaline phosphatase (ALP), GGT/ALP ratio.

RESULTS AND DISCUSSIONS

Table 1 presents the salivary concentrations of AST, ALT and salivary AST/ALT ratio in the patients from the study group, together with their average values and standard deviations. The av-

average values that were determined are: salivary AST 72.52 ± 46.21 U/L, salivary ALT 80.28 ± 40.34 U/L, salivary AST/ALT ratio 1.03 ± 0.63 .

TABLE 1. Cariogenic index values and salivary enzymes concentrations

Patient	Cariogenic index	Salivary AST U/L	Salivary ALT U/L	Salivary AST/ALT ratio
1F	3	150	126	1.19
2M	0	39	82	0.48
3M	2	31	44	0.70
4M	3	136	150	0.91
5M	1	76	38	2.00
6M	2	45	47	0.96
7M	3	69	53	1.30
8M	3	32	134	0.24
9M	1	45	33	1.36
10F	1	86	49	1.76
11M	2	92	32	2.88
12M	3	213	110	1.94
13M	2	47	57	0.82
14M	1	22	74	0.30
15M	1	68	106	0.64
16M	2	92	54	1.70
17M	3	42	94	0.45
18M	1	37	86	0.43
19M	2	48	116	0.41
20M	2	79	70	1.13
21M	2	35	47	0.74
22M	0	46	65	0.71
23M	3	98	142	0.69
24M	1	43	34	1.26
25M	1	142	164	0.87
av.val.	1.80	72.52	80.28	1.03
st.dev.	0.96	46.21	40.34	0.63

Table 2 presents the p values, which represent the statistical correlation between the cariogenic index and the analysed salivary parameters. No statistically significant correlations were determined between the cariogenic index and salivary AST ($p = 0.406$) or salivary ALT ($p = 0.401$).

TABLE 2. The statistical signification (p) of the correlation between the cariogenic index and the salivary concentrations of AST, ALT and salivary AST/ALT ratio

	Salivary AST	Salivary ALT	AST/ALT Ratio
Correlation with CI	0.406	0.401	0.045

Statistically significant correlations ($p < 0.05$) were determined between the cariogenic index and the AST/ALT ratio ($p = 0.045$) (Fig. 1). The literature mentions the correlation between salivary AST and ALT and plasmatic AST and ALT values in patients with chronic hepatopathy, including in patients with alcoholic hepatitis (4-6). Moreover, Dalai C *et al* mention the increase in salivary AST and ALT in pregnant women with tooth decay and gingival impairment. (7).

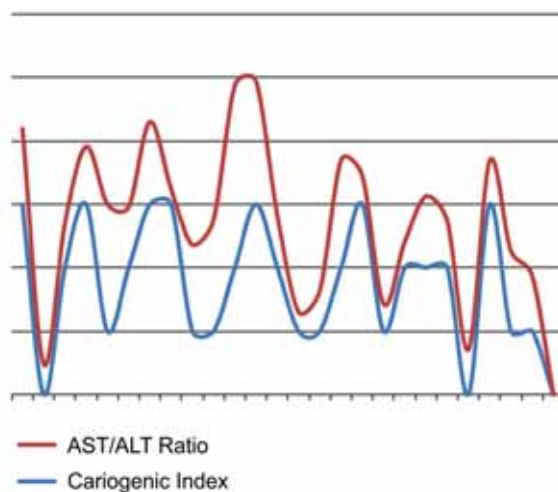


FIGURE 1. Graphic representation of the statistically significant correlation between CI and salivary AST/ALT ratio

Table 3 presents the values of the seric concentrations of aspartate aminotransferase (AST), alanine aminotransferase (ALT), AST/ALT ratio, lactate dehydrogenase (LDH), seric amylase, gamma-glutamyltransferase (GGT), alkaline phosphatase (ALP), GGT/ALP ratio in the patients from the study group, together with their average values and standard deviations.

The determined average values are: plasma aspartate aminotransferase 115.8 ± 79.16 U/L, plasma alanine aminotransferase 114.76 ± 116.01 U/L, AST/ALT ratio 1.58 ± 1.17 , LDH 546.88 ± 444.08 U/L, amylase 53.04 ± 18.12 U/L, GGT 212.32 ± 198.85 U/L, ALP 93.76 ± 30.88 U/L, GGT/ALP ratio 2.15 ± 1.76 .

Table 4 presents the p values, which represent the statistical significance of the correlation between the cariogenic index and the plasma concentrations of AST, ALT, AST/ALT ratio, LDH, amylase, GGT, ALP and GGT/ALP ratio. Statistically significant correlations were not determined between the cariogenic index and LDH ($p = 0.386$), plasma amylase ($p = 0.387$), GGT ($p = 0.411$), alkaline phosphatase ($p = 0.216$) and GGT/ALP ratio ($p = 0.375$).

Regarding aspartate aminotransferase ($p = 0.046$), alanine aminotransferase ($p = 0.027$) and

TABLE 3. Plasma enzymes concentrations

Patient	AST U/L	ALT U/L	AST/ALT Ratio	LDH U/L	Amylase U/L	GGT U/L	ALP U/L	GGT/ALP Ratio
1F	52	132	0.39	1989	84	516	131	3.939
2M	74	90	0.82	215	57	137	91	1.505
3M	69	278	0.25	336	42	161	61	2.639
4M	294	250	1.18	282	84	100	100	1.000
5M	109	48	2.27	206	52	55	77	0.714
6M	126	24	5.25	158	61	53	101	0.525
7M	134	45	2.98	1128	69	517	139	3.719
8M	121	209	0.58	874	69	519	98	5.296
9M	29	31	0.94	263	36	60	124	0.484
10F	73	20	3.65	148	39	15	47	0.319
11M	82	44	1.86	226	45	31	63	0.492
12M	124	54	2.30	1213	33	654	183	3.574
13M	39	22	1.77	227	32	47	76	0.618
14M	194	224	0.76	997	30	603	88	6.852
15M	95	112	0.85	573	56	111	103	1.078
16M	147	123	1.20	342	42	51	72	0.708
17M	52	94	0.55	486	66	217	49	4.429
18M	179	173	1.03	442	31	154	83	1.855
19M	77	33	2.33	239	30	41	97	0.423
20M	46	29	1.59	264	78	205	70	2.929
21M	154	63	2.44	422	80	241	96	2.510
22M	78	36	2.17	553	51	117	74	1.581
23M	140	119	1.18	970	-	374	99	3.778
24M	31	40	0.78	245	53	67	85	0.788
25M	366	536	0.68	874	-	262	137	1.912
av.val.	115.80	114.76	1.58	546.88	53.04	212.32	93.76	2.15
st.dev.	79.16	116.01	1.17	444.08	18.12	198.85	30.88	1.76

AST/ALT ratio ($p = -0.042$), we observed statistically significant correlations with the cariogenic index in patients with alcoholic hepatitis (Fig. 2).

Shivashankara AR et al., in a study conducted on 50 chronic alcoholics with history over the previous 5 years, analyzed the correlation between AST, ALT and serum and saliva GGT before and after alcohol withdrawal. The serum enzyme activity was significantly higher com-

pared to the control group. Serum concentrations for GGT, ALT and AST were 4.4, 2, and 1.8 times higher, respectively, compared to the control group. Enzyme concentration decreased significantly one month after alcohol withdrawal. They concluded that there is a statistically significant correlation between alcohol consumption and the seric but also salivary concentration of these enzymes (6).

TABLE 4. The statistical significance (p) of the correlation between the cariogenic index and the plasma concentrations of AST, ALT, AST/ALT ratio, LDH, amylase, GGT, ALP, and GGT/ALP ratio

	AST	ALT	AST/ALT Ratio	LDH	Amylase	GGT	ALP	GGT/ALP Ratio
Correlation with CI	0.049	0.027	-0.042	0.386	0.387	0.411	0.216	0.375

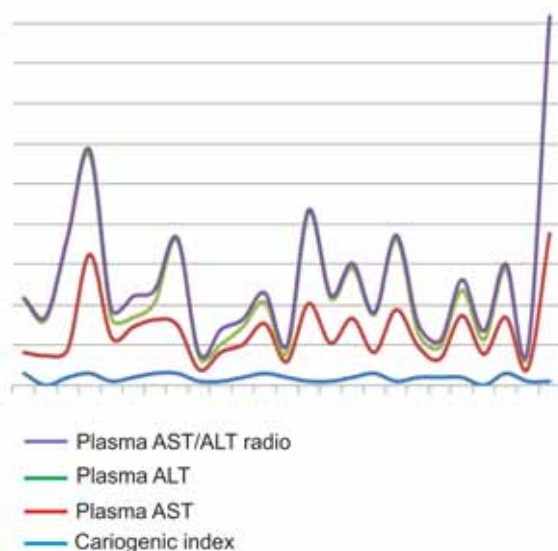


FIGURE 2. Graphic representation of the statistically significant correlations between CI and plasma AST/ALT ratio and plasma ALT and AST

CONCLUSIONS

Following the determinations performed on salivary and plasma enzymes in patients from the chronic alcoholic hepatitis group, we were

able to establish statistically significant correlations between the cariogenic index and the following parameters: salivary AST/ALT, plasma AST, plasma ALT and plasma AST/ALT ratio.

The correlations that were determined are in line with the literature studies, conducted on the general population.

In order to perform a correct and complete oral rehabilitation, the clinician, particularly the dental practitioner, needs to take into account both the systemic context and local elements such as caries risk or prognosis of carious disease. Although not being parameters that are commonly found in blood or saliva, AST and ALT dosing can provide information regarding the risk of tooth decay and its prognosis in patients with chronic alcoholic hepatitis, these being useful for the dentist.

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