

## ARTIGO ORIGINAL

## FREQUENCY OF HEPATIC STEATOSIS IN A RADIOLOGY CLINIC IN PALMAS

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## ABSTRACT

Introduction: Recent studies suggest that hepatic steatosis is a worldwide distribution pathology that can progress to chronic liver disease with a highly unfavorable outcome resulting in the need for liver transplantation. That's why early diagnosis is important. The liver biopsy's considered a "gold standard" in its diagnosis, but the use of ultrasonography helps to detect steatosis in a non-invasive manner and is a very accessible method for the population. Objectives: To evaluate the frequency of steatosis in patients treated at a radiological clinic in Palmas using abdominal ultrasonography; observing its distribution in genders and age groups and its difference between 2010 and 2016. Methods: It was used ultrasound reports of abdomen of 3.222 patients made in 2010 and of 2.346 patients made in 2016. A longitudinal analysis was performed, between these two years, regarding the frequency of hepatic steatosis at the people and also between the genders and the age groups. Results: In 2010, 25,67% of people had hepatic steatosis in the ultrasound report, while in 2016 were 31,67%. In 2010, of the total number of people with steatosis, 52,48% were women and 47,52% were men; however in 2016, 51,94% were women and 48,06% were men. Regarding the age groups, in both periods, as in men and in women, steatosis was lower at the extremes of age and more frequent around the 5th to 7th decades of life. Discussion: The frequency of hepatic steatosis has increased in the period from 2010 to 2016. It was, as seen in the literature, quite high in the 5th and 6th decades of life, besides being more frequent in females. Unlike 2010, in 2016 begins to have children under 20 with signs of steatosis. Conclusion: In the year 2010 the frequency of hepatic steatosis was 25,67%, whereas in 2016 it was 31,84%.

**Keywords:** Steatosis; ultrasonography; liver.

 ACESSO LIVRE

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## INTRODUCTION

Hepatic steatosis is a pathological condition which causes lipid metabolism abnormalities<sup>1</sup>, which leads to its significant accumulation, mainly of triglycerides, in the cytoplasm of hepatocytes exceeding 5% of liver weight<sup>2-12</sup>. This accumulation in the hepatic parenchyma may occur in a diffuse or focal form causing alterations of the liver function and damages to the hepatic tissues<sup>13,14</sup>. It can have several etiologies, mainly alcoholism, hepatitis C virus infection and non-alcoholic steatosis, which is related to genetic factors, life habits and mostly obesity<sup>3,7,12</sup>. Over time, it can present evolutionary patterns such as: steatohepatitis, advanced fibrosis, cirrhosis and hepatocellular carcinoma, which increases the likelihood of patients needing a liver transplant, therefore it is important an early diagnosis of hepatic steatosis<sup>2,6,15-18</sup>.

Steatosis is a worldwide distribution disease<sup>19</sup>, occurring in 10% to 24% of the population in several countries<sup>13</sup>, and its prevalence is higher in the 5<sup>th</sup> and 6<sup>th</sup> decade of life, female population, obese people, those with type 2 diabetes mellitus or with metabolic syndrome such as dyslipidemia, abdominal obesity, hyperinsulinemia and insulin resistance<sup>2,5,20</sup>. However, it may be present in male, non-diabetic or lean individuals<sup>12</sup>. In addition, their frequency has increased in children, thanks to the increase in childhood obesity<sup>12,13</sup>, and may progress to liver cirrhosis in some of these pediatric patients by the time they reach adulthood<sup>18</sup>.

It's important to do the anamnesis, physical examination, laboratory tests, imaging tests and histopathological evaluation in order to diagnose steatosis<sup>7</sup>. The "gold standard" for its diagnosis is the histopathological evaluation by liver biopsy, because it allows a better staging of the disease and also allows access to morphology of the lesion<sup>1,7,21-23</sup>. However, its use is limited and shouldn't be used as a screening tool<sup>8</sup>, because it has a sampling error, high cost and adverse events, and can't be used with the intention of performing a research<sup>7,22</sup>. Through the biopsy, the accumulation of fat in the liver parenchyma is observed. In this way, steatosis can be classified as: Grade 0, when the accumulation is less than 5% of the liver weight; Grade 1, when it is from 5% to 33% of its weight; Grade 2, with accumulation above 33%, but below 66%; and Grade 3, when the accumulation is greater than 66%<sup>18,21</sup>.

Imaging tests, such as magnetic resonance imaging (MRI), computed tomography (CT), and ultrasonography (USG), are also efficient for detecting liver fat and may aid in the need for a biopsy<sup>7,12,21</sup>. The CT scan is less sensitive than USG<sup>11</sup>, it has a higher cost and uses ionizing radiation to perform it<sup>3</sup>. Both CT and USG examinations are less sensitive than those of MRI<sup>12</sup>, but nuclear resonance, even though it's the most efficient noninvasive method to detect fatty infiltration in the liver, is a costly procedure<sup>3</sup>. Therefore, due to the cost of the examination and the modest increase in accuracy, USG of the abdomen has been the most widely used imaging method in the clinical practice for the diagnosis of hepatic steatosis<sup>12,24</sup>, it also provides early diagnosis in patients who are still asymptomatic<sup>3</sup>, and has a more affordable cost and the non-use radiation in its realization<sup>2,24,25</sup>.

Abdominal ultrasound can evaluate liver shape, border characteristics, intrahepatic vessel arrangement, contour, biometry, liver parenchyma characteristics (echogenicity, attenuation, echotexture)<sup>2,3,23</sup>. In cases of steatosis, attenuation of the sound beam, gradual increase of parenchyma echogenicity in a diffuse form, and echogenicity discrepancy between the liver and the kidney are observed<sup>22,23</sup>. The textual changes are discrete and of less relevance<sup>23</sup>. Thus, hepatic fatty infiltration can be classified according to the criterion of Saadeh et al. (2002) in Grade 1 (mild) in which the diaphragm and intrahepatic vessels are normally visualized, but there're fine echoes of the parenchyma; Grade 2 (moderate) in which visualization of the intrahepatic vessels and the diaphragm are impaired and there's a diffuse increase of fine echoes; Grade 3 (severe) in which the visualization of the intrahepatic vessels is diminished or absent, and the fine echoes are with a significant increase<sup>2,3,16</sup>. However, the ultrasound examination has limitations, mainly because it is a dependent operator<sup>6,22,25</sup>. In general, the patients who benefit most from the use of ultrasound are those who are thin and those who have low gut gas<sup>25</sup>.

If the accumulation of lipids exceeds 10% of liver weight and its distribution by the organ is uniform, the accuracy of abdominal ultrasonography in the diagnosis of hepatic steatosis is between 80% and 95%<sup>12</sup>. When compared to biopsy, the sensitivity and specificity of the lesions are 89% and 93%, respectively<sup>3,16,24</sup>, so the ultrasound is very efficient for the diagnosis of moderate steatosis when the fat accumulation is higher than 33% of hepatic weight<sup>24</sup>. However, with the increase in the Body Mass Index, these values tend to decrease<sup>12</sup>. In addition, the specificity and sensitivity of the ultrasound examination is low in cases of mild steatosis<sup>1</sup>, especially when the liver has less than 33% fat accumulated in its parenchyma<sup>24</sup>.

The aim of this study is to estimate the frequency of hepatic steatosis in a radiological clinic in Palmas-TO by means of a longitudinal analysis of the abdominal ultrasound examinations performed at the Arai Kaminishi & Costa imaging clinic located in Palmas in the years of 2010 and 2016. The benefit of this study is to provide epidemiological data on the prevalence of steatosis in the study population.

## METHODS

To carry out this study, the researchers went to the Arai Kaminishi & Costa clinic in Palmas where they had access to all reports of abdominal ultrasound examinations performed in 3.222 and 2.346 patients in the years of 2010 and 2016, respectively. These reports has: the name, genre and age of patients; the date of the examination; and the anatomical characteristics of the abdomen and any pathological alterations. Were excluded from the survey: individuals who didn't have the report digitized in the clinic database and those whose abdomen ultrasonography reports didn't contain the liver description or didn't disclose the age and gender of the patients. Throughout the work, the participants' identity and other private information haven't been disclosed while maintaining their confidentiality. This research also requested a dispensation of free and informed

consent to the Research Ethics Committee (REC) due the fact that the study had a high number of participants, some of them no longer lived in Palmas making contact with them difficult and part of the data are from individuals who have undergone the USG exam a long time ago. Such dispensation was accept by REC.

Once analyzed, pertinent data to the work were recorded on the researchers' laptop. This information was placed in four columns in the Microsoft Excel 2013 program; in the 1<sup>st</sup> column the patient's ages were recorded; in the 2<sup>nd</sup>, their genre; in the 3<sup>rd</sup>, the date of the exams; in the 4<sup>th</sup>, if there was any evidence leading to a suspicion of fatty filtration in the liver. The years 2010 and 2016 were annotated in separate tables for comparison and analysis of the evolution of the disease.

Then, for each year, three tables were prepared to compare the prevalence of steatosis between the decade of life; one for the general population, another for the male population and the last one for the female population. Graphs were also constructed to illustrate the data obtained.

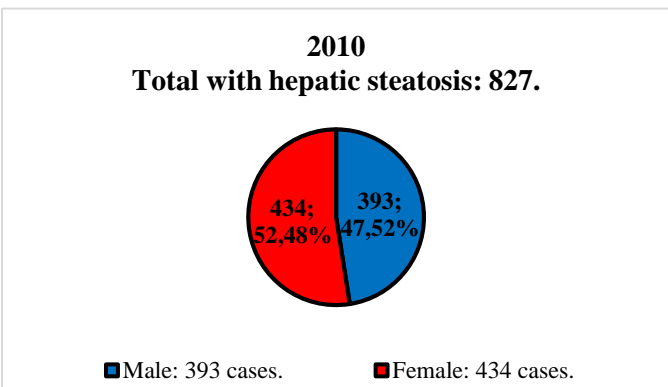
**RESULTS**

In the present study, abdominal ultrasound reports of 3.222 individuals in the year of 2010 were analyzed which 827 showed signs of fatty filtration in the liver and 2.395 without these findings giving a frequency of 25,67%. In the year of 2016, the reports of 2.346 patients were verified which 747 had signs of steatosis and 1.599 didn't have them, so in that year the frequency was 31,84%.

**Distribution of hepatic steatosis by gender in 2010.**

Of the 3.222 people in the study in 2010, 1.128 were males and of these 393 had signs of steatosis, while 735 did not. Thus, in the male population, the frequency of hepatic steatosis was 34,84%. Of the 2.094 female patients, 434 showed signs of fatty filtration in the liver and 1.660 did not, giving a frequency of 20,73%. Of the 827 individuals with hepatic steatosis, 53,48% (434 people) were female, while 47,52% (393 people) were male (Graph 1).

*Graph 1: Distribution of hepatic steatosis by gender in 2010.*

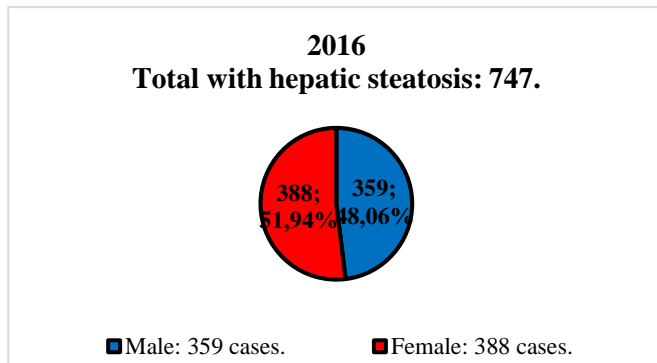


**Distribution of hepatic steatosis by gender in 2016.**

In the year 2016, there were 2.346 individuals in the study, 839 were males and 1.507 females. Among men, 359 showed signs of fatty infiltration in the liver, as 480 did not, giving a prevalence of 42,79% of steatosis in the male population. At the same time, in the female population, 388 showed signs of steatosis and 1.119 did not, resulting in a

prevalence of 24,75%. Of the 747 individuals with hepatic steatosis, 48,06% (359 people) were males, while 51,94% (388 people) were females (Graph 2).

*Graph 2: Distribution of hepatic steatosis by gender in 2016.*



**Distribution of hepatic steatosis by age group in 2010.**

In the year 2010, no individual from 0 to 19 years old was detected some finding that indicates as having steatosis, then the signs of infiltration began to appear from the 3<sup>rd</sup> decade of life (Table 1). In the male gender, signs of this pathology were observed only from 20 to 89 years old (Tabel 2). In females, such signs start to appear from the age of 20 years (Table 3). The study also showed that the number of individuals in 2010 with hepatic steatosis was lower at the extremes of age and higher at around 40-69 years old (Graph 3).

2010				
Age group	Number	With steatosis	Without steatosis	% with steatosis
1 <sup>st</sup> decade of life	68	0	68	0%
2 <sup>nd</sup> decade of life	141	0	141	0%
3 <sup>rd</sup> decade of life	246	22	224	8,94%
4 <sup>th</sup> decade of life	560	96	464	17,14%
5 <sup>th</sup> decade of life	746	200	546	26,81%
6 <sup>th</sup> decade of life	723	230	493	31,81%
7 <sup>th</sup> decade of life	442	191	251	43,21%
8 <sup>th</sup> decade of life	197	63	134	31,98%
9 <sup>th</sup> decade of life	84	23	61	27,38%
10 <sup>th</sup> decade or more	15	2	13	13,33%
Total	3222	827	2395	25,67%

*Table 1: Distribution of hepatic steatosis by age group in 2010.*

2010				
Age group (male)	Number	With steatosis	Without steatosis	% with steatosis
1 <sup>st</sup> decade of life	27	0	27	0%
2 <sup>nd</sup> decade of life	68	0	68	0%
3 <sup>rd</sup> decade of life	78	12	66	15,38%
4 <sup>th</sup> decade of life	187	62	125	33,16%
5 <sup>th</sup> decade	257	121	136	47,08%

of life				
6 <sup>th</sup> decade of life	256	99	157	38,67%
7 <sup>th</sup> decade of life	153	72	81	47,06%
8 <sup>th</sup> decade of life	67	18	49	26,87%
9 <sup>th</sup> decade of life	25	9	16	36%
10 <sup>th</sup> decade or more	10	0	10	0%
Total	1128	393	735	34,84%

Table 2: Distribution of hepatic steatosis by age group in the male population in 2010.

2010				
Age group (female)	Number	With steatosis	Without steatosis	% with steatosis
1 <sup>st</sup> decade of life	41	0	41	0%
2 <sup>nd</sup> decade of life	73	0	73	0%
3 <sup>rd</sup> decade of life	168	10	158	5,95%
4 <sup>th</sup> decade of life	373	34	339	9,12%
5 <sup>th</sup> decade of life	489	79	410	16,16%
6 <sup>th</sup> decade of life	467	131	336	28,05%
7 <sup>th</sup> decade of life	289	119	170	41,18%
8 <sup>th</sup> decade of life	130	45	85	34,62%
9 <sup>th</sup> decade of life	59	14	45	23,73%
10 <sup>th</sup> decade or more	5	2	3	40%
Total	2094	434	1660	20,73%

Table 3: Distribution of hepatic steatosis by age group in the female population in 2010.

**Distribution of hepatic steatosis by age group in 2016.**

In 2016, ultrasound scans detected signs of steatosis in people aged from 0 to 89 years (Table 4). This was also observed in the the male population (Table 5). In the female population, sights of steatosis wasn't observed only in the 2<sup>nd</sup> and 10<sup>th</sup> decades (Table 6). The number of patients with hepatic steatosis was higher from 30 to 69 years in this population in 2016 (Graph 4).

2016				
Age group	Number	With steatosis	Without steatosis	% with steatosis
1 <sup>st</sup> decade of life	80	6	74	7,5%
2 <sup>nd</sup> decade of life	106	1	105	0,94%
3 <sup>rd</sup> decade of life	173	25	148	14,45%
4 <sup>th</sup> decade of life	377	108	269	28,65%
5 <sup>th</sup> decade of life	484	165	319	34,09%
6 <sup>th</sup> decade	568	228	340	40,14%

of life				
7 <sup>th</sup> decade of life	374	166	208	44,39%
8 <sup>th</sup> decade of life	132	35	97	26,52%
9 <sup>th</sup> decade of life	51	13	38	25,49%
10 <sup>th</sup> decade or more	1	0	1	0%
Total	2346	747	1599	31,84%

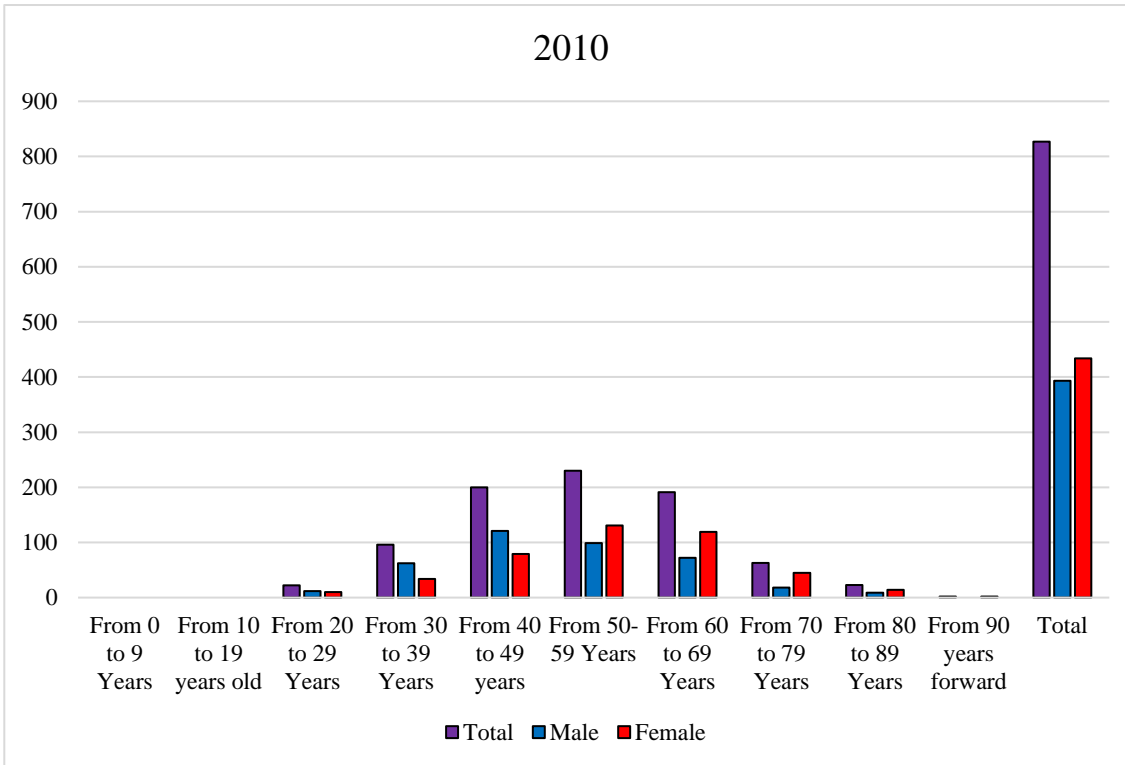
Table 4: Distribution of hepatic steatosis by age group in 2016.

2016				
Age group (male)	Number	With steatosis	Without steatosis	% with steatosis
1 <sup>st</sup> decade of life	39	1	38	2,56%
2 <sup>nd</sup> decade of life	40	1	39	2,50%
3 <sup>rd</sup> decade of life	65	18	47	27,69%
4 <sup>th</sup> decade of life	148	69	79	46,62%
5 <sup>th</sup> decade of life	178	97	81	54,49%
6 <sup>th</sup> decade of life	178	91	87	51,12%
7 <sup>th</sup> decade of life	120	61	59	50,83%
8 <sup>th</sup> decade of life	57	17	40	29,82%
9 <sup>th</sup> decade of life	13	4	9	30,77%
10 <sup>th</sup> decade or more	1	0	1	0%
Total	839	359	480	42,79%

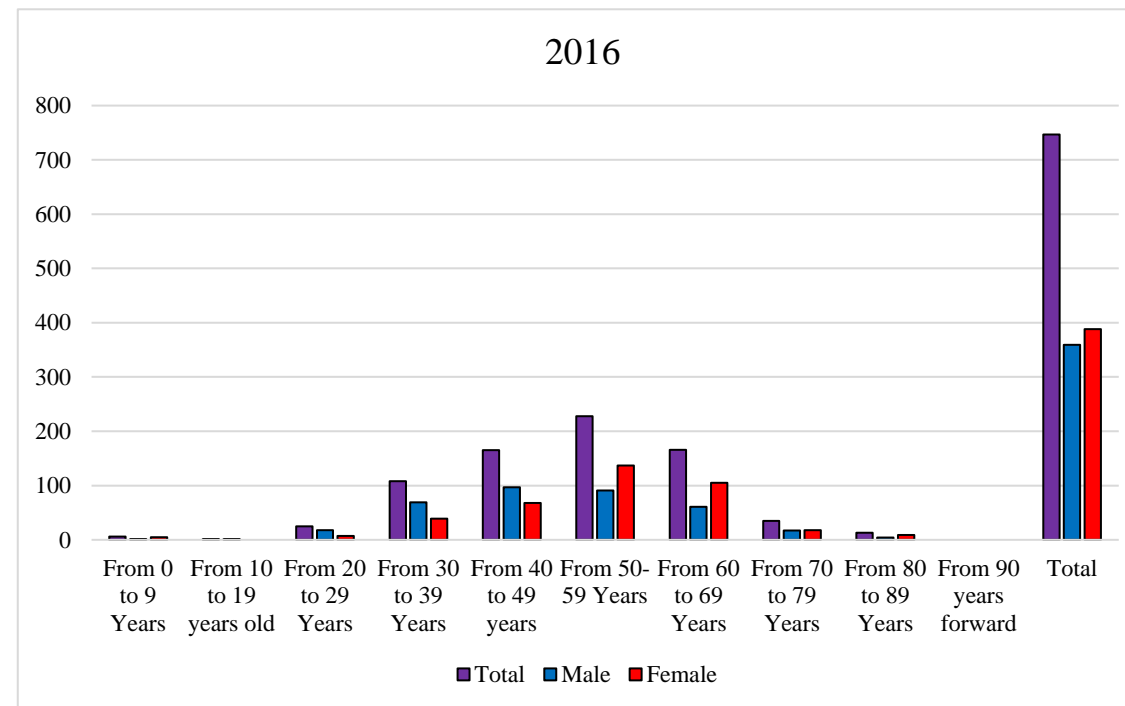
Table 5: Distribution of hepatic steatosis by age group in the male population in 2016.

2016				
Age group (female)	Number	With steatosis	Without steatosis	% with steatosis
1 <sup>st</sup> decade of life	41	5	36	12,20%
2 <sup>nd</sup> decade of life	66	0	66	0%
3 <sup>rd</sup> decade of life	108	7	101	6,48%
4 <sup>th</sup> decade of life	229	39	190	17,03%
5 <sup>th</sup> decade of life	306	68	238	22,22%
6 <sup>th</sup> decade of life	390	137	253	35,13%
7 <sup>th</sup> decade of life	254	105	149	41,34%
8 <sup>th</sup> decade of life	75	18	57	24%
9 <sup>th</sup> decade of life	38	9	29	23,68%
10 <sup>th</sup> decade or more	0	0	0	0%
Total	1507	388	1119	25,75%

**Table 6: Distribution of hepatic steatosis by age group in the female population in 2016.** infiltration in the liver compared to 2016. This shows that there is an increase in the cases of this pathology in this



**Graph 3: Number of people with hepatic steatosis by age group in the general population, in the male and the female in 2010.**



**Graph 4: Number of people with hepatic steatosis by age group in the general population, in the male and the female in 2016.**

When comparing the distribution of steatosis between the gender in these two years, the frequency of this disease increased in both males (from 34,84% to 42,79%) and females (from 20,73% to 25,75%).

The study also showed that when comparing the percentage of patients only in the male population, it was observed that it's higher in both years than the percentage of people with steatosis only in the female population. However, in both 2010 and 2016, there were more females with this disease than males. Thus, the hepatic steatosis was more frequent in women, this pattern was also evidenced in the literature<sup>2,5,20</sup>.

**DISCUSSION**

In the studied population, an increase in the frequency of hepatic steatosis from 25,67% in 2010 to 31,84% in 2016 was observed, although in 2010 there was a greater number of participants and more individuals with signs of fatty

Regarding the age group of the participants, as seen in the literature, the study showed that, in both periods, steatosis is present in a large number of patients in the 5<sup>th</sup> and 6<sup>th</sup> decade of life<sup>2,5,20</sup>, it was also observed that the number of individuals with this disease was high in the 4<sup>th</sup> and 7<sup>th</sup> decades of life, such pattern was similar in both men and

women in those age groups in the two years. Differently from what was seen in 2010, 2016 already has signs of fatty infiltration in individuals from 0 to 20 years, showing that steatosis is starting to be present in the youngest people due the increase in childhood obesity in recent years<sup>12,13</sup>, and also the ultrasonography had an increase of the accuracy allowing its diagnosis in a more efficient way in the young population<sup>24</sup>.

When comparing the total number of people with this pathology by the total number of individuals in the same age group, in 2010 the percentage is higher in the 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> decades; in the male population of that same year, the percentage was higher in the 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> decades; while in the female population it was higher from the 6<sup>th</sup> decade of life and forward. In 2016, the percentage was higher in the 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> decades; in men was higher in the 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> and 9<sup>th</sup> decades; in women was higher in the 6<sup>th</sup> and 7<sup>th</sup> decades. This fact shows that in the study population steatosis begins to be more present earlier in men than in women.

Therefore, hepatic steatosis is a pathology that is on the rise in the general population, regardless of gender, even being present even in the pediatric population<sup>12,13</sup>. If not diagnosed early and treated, it can progress to other chronic liver diseases, such as carcinoma and cirrhosis<sup>2,6,15-18</sup>. Although not the "gold standard" for diagnosis, the ultrasound examination has a considerable accuracy to diagnose moderate to severe cases of steatosis<sup>24</sup>, besides being a cheaper and accessible test for the population, and also a non-invasive method and doesn't need ionizing rays for its realization<sup>2,24,25</sup>, thus it doesn't offer risks to patients.

## CONCLUSION

In the present study, in 2010 the frequency of hepatic steatosis in Arai Kaminishi & Costa patients was 25,67% and, in 2016, it increased to 31,84%. Steatosis was more frequent in women and in the 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> decades of life. And, unlike 2010, in 2016 steatosis was also found in young people.

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