

OBESITY AND PEDIATRIC FATTY LIVER: THE SILENT EPIDEMIC AND SIGNIFICANT HEALTH PROBLEM

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SUMMARY

Introduction: Obesity and pediatric fatty liver related to modern lifestyle are getting epidemic characteristics and present the world public health problem. Fatty liver with obesity is especially important clinical entity which cautions on the possibility of chronic diseases development not only of the liver but the other organs as well. Fatty liver has the important influence on mental and physical development of children. Disease has asymptomatic clinical course so primary prevention and screening in early childhood are the best way to prevent the beginning and expansion of the disease. Primary prevention is focused on the entire population of children to enable them to adopt healthy lifestyles. To determine the frequency of obesity and fatty liver disease in children aged 6-14 years and the possibility of primary prevention.

Subjects and methods: Investigations were carried out in children ages between 6-14 years in two elementary schools in Gračanica, Bosnia and Herzegovina. Anthropometric measurements of 1499 children were performed as well as the ultrasonic scan of the abdomen in 300 children.

Results: BMI with percentile distribution indicates that 17% of children are overweight and 10% are obesity. 7% of children have fatty liver. 90% of children do not apply healthy diet. There are no school kitchens that apply the standard for a healthy diet of children of this school age. Only 20% of children are moderately physically active.

Conclusion: Fatty liver or steatosis occurs in a significant percentage of school age children. The implementation of the primary prevention program could largely prevent this trend and enable healthy growth and quality of life.

Key words: obesity - fatty liver – children - primary prevention - mental status

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INTRODUCTION

Fatty liver (FL), steatosis or non-alcoholic fatty liver disease (NAFLD) is a metabolic disorder characterized primarily by the accumulation of fat droplets in the hepatocytes (with no data on alcohol consumption, infections or autoimmune disorders). Disease occurs in a wide range of hepatic stages of activity (simple steatosis FL, non-alcoholic steatohepatitis -NASH, fibrosis and cirrhosis of the liver with possible progression to hepatocellular carcinoma) (Manti et al. 2014). NAFLD is associated with the obesity but also with a series of clinical extra-hepatic events including cardiovascular disease, type 2 diabetes mellitus with insulin resistance, locomotor illness, endocrine and mental disorders (Bush et al. 2017). Fatty liver occurs in all age groups. With regard to the emergence of a worldwide epidemic, especially in children, obesity-related fatty liver becomes a worldwide health problem. High body mass index (BMI), abdominal fat and viscerally hypertrophied fatty tissue are predictive important factors for the development of fatty liver with all hepatic and extra hepatic manifestations (Firmeisz 2014). Visceral fatty tissue as an endocrine organ actively participates in fatty liver pathogenesis through cytokines and adipokines. Adipocytokines (such as Adiponectin and Leptin) play an important role in the pathogenesis of liver steatosis and its progression to active hepatitis, fibrosis and cirrhosis of the liver as

well as the emergence of extrahepatic manifestations, primarily insulin resistance, baseline metabolic disorders, followed by the occurrence of almost all chronic non-contagious diseases (Tilg 2010).

The prevalence of pathologic obesity and fatty liver in the general population is high and takes epidemic characteristics ("pandemic of the new millennium") (Ng et al. 2014).

NAFLD is the most common liver disease in the period of childhood. According to epidemiological studies, 5-10% of children have some form of fatty liver, while in obese children the percentage of this disease is almost 40% (Vajro et al. 2012).

The natural course of this disease in children is different in adults. In childhood, insulin resistance and pathological obesity are important predictors for the development of disease progression to the most severe forms of cirrhosis, so NAFLD is one of the leading causes for liver transplantation.

Extra hepatic manifestations and the impact on quality of life and mental status is an important clinical feature of NAFLD childhood. A large number of pediatric patients have no symptoms directly related to the liver but have a wide range of non-specific symptoms such as general fatigue, daily drowsiness, dizziness and syncope, and cognitive dysfunction. (Kistler et al. 2010) These symptoms and possible falls are related to the autonomic nervous system dysfunction (Newton 2010).

Describing a greater incidence of depression and negative self-esteem, which leads to children in isolation, reduces physical activity and increases activity in the virtual world of mobile phones and social networks, further diverting these children from everyday school activities, so that they feel neglected and isolated (Kerker et al. 2013).

The basic diagnostic procedures for NAFLD are laboratory tests, ultrasound abdominal examination and tests that will exclude other liver diseases (Vajo et al. 2013, Schwimmer 2016).

Current treatment needs to be based on the principles of personal medicine, and focuses on healthy lifestyles including physical activity, nutrition and psychosocial activity to maintain a healthy mental status (Kerker et al. 2013).

The aim of the study is to determine the incidence of obesity and fatty liver in children aged 6-14 in elementary schools in Bosnia and Herzegovina, while assessing the possibility of implementing healthy lifestyles such as adequate and healthy nutrition and sufficient physical activity.

SUBJECTS AND METHODS

Subjects

Studies were conducted in children aged 6-14 years in two primary schools in Gračanica, Bosnia and Herzegovina.

Methods

Anthropometric measurements of 1499 children were performed. BMI in children was calculated using CDC BMI percentile chart. An ultrasound examination of the abdomen for the presence of liver steatosis and appropriate laboratory treatment were performed on a random sample of 300 children.

RESULTS

Tables 1-3 shows the results of research conducted in the Primary School "Hasan Kikić" and Second Elementary School in Gračanica.

Table 1. Primary school "Hasan Kikić" Gračanica

Total number of pupils	1101	100%
No data	6	1%
Undernourished (<5)	70	6%
Normal weight (5-85)	727	66%
Overweight (86-95)	168	15%
Obese (>95)	130	12%

BMI with centile distribution show that every fourth child is overweight or obese and there is no difference in the distribution of the child's nutritional status between the two schools.

Table 2. Second Elementary School in Gračanica

Total number of pupils	398	100%
No data	24	6%
Undernourished (<5)	0	0%
Normal weight (5-85)	260	65%
Overweight (86-95)	87	22%
Obese (>95)	27	7%

Table 3. Data collection for both elementary schools in Gračanica

Total number of pupils	1499	100%
No data	30	2%
Undernourished (<5)	70	5%
Normal weight (5-85)	987	66%
Overweight (86-95)	255	17%
Obese (>95)	157	10%

The analysis of the presence of fat in a sample of 300 children from both schools can be seen in Table 4. Table 4 shows the incidence of fatty liver in a sample of 300 children from both schools.

According to the basic diagnostic criteria fatty liver is found in 7% of children. Fatty liver is twice as common in boys (Figure 1).



Figure 1. Ultrasound of the abdominal examination: fatty liver

The Healthy Lifestyle Survey shows that 90% of children do not know or apply healthy eating habits. There are no school kitchens that apply standards for a healthy diet of children of this school age. Only 20% of children are moderately physically active.

Table 4. Results of the ultrasonic finding in 300 examined pupils

Total number of examined pupils - liver ultrasound	300	100%
Fatty liver US - total	22	7%
Others - normal livers US	278	93%

Relation regarding gender of fatty liver in US:
boys : girls ~ 15 (5%) : 7 (2%).

DISCUSSION

In the research study on the nourishment and obesity prevalence in the primary school children in Canton of Tuzla (Bosnia and Herzegovina) the assumption has been confirmed that there is a worrying trend in the increase in body weight of examined children (17% is overweight) and in the significant percentage of pathological obesity (10%). The results show that similar trends and obesity rate among 6-14 year olds are evident in neighboring countries. In the developed world, obesity has been tripled over the last few years and obesity has become a very important public health problem since this trend is accompanied by an increase in the rate of all chronic non-contagious diseases (Bralić et al. 2010).

The trend of increasing obesity rate is followed by an increase in the incidence of fatty liver. New findings on the role of liver in the development of metabolic syndrome and the role of visceral fat as an endocrine organ give far greater importance to the appearance of fat liver infiltration and possible progression to NASH and liver cirrhosis especially when it occurs in childhood. There is a link between fat-changed liver with insulinemia and insulin resistance. The occurrence of almost all non-contagious chronic diseases are associated with proven pathophysiological changes in relation to the small intestine, mesentery, liver and brain (Bush & Sarah 2017).

In our study, in the sample of 300 children aged 6-15 years, fatty liver was found in 22 pupils, which is 7%. Twice the higher incidence of fatty liver is detected in boys. Approximately same prevalence of fatty liver in children of the same age was established in other epidemiological studies, regardless of the applied diagnostic procedures. If different diagnostic procedures are applied, the overall prevalence of NAFLD in pediatric populations in the world is 3-12% (Bush & Sarah 2017).

New findings on clinical manifestations of NAFLD with a large number of general systemic symptoms with the occurrence of autonomic nerve dysfunction indicate that the disease also significantly affects the quality of children's lives. (Schwimmer & Sarah 2016).

Psychosocial disorders, depression and reduced self-esteem bring these children into isolation, so they feel neglected and easily enter the virtual world of cell

phones and social networks, which can additionally have a negative impact on the course of the disease (Kerker et al. 2013).

Following the results of the prevalence of obesity and the present appearance of NAFLD, activities on the implementation of healthy lifestyles, which are primarily related to healthy nutrition and adequate physical activity, have been initiated.

CONCLUSION

NAFLD occurs in a significant percentage of school age children.

Current treatment needs to be based on the principles of personal medicine and focused on healthy lifestyles including physical activity, nutrition and psychosocial activity to maintain a healthy mental status.

Adequate application of the primary prevention program could largely prevent this trend and enable children to grow healthy and have quality of lives.

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Contribution of individual authors:

Nizama Salihefendić: conception and design of the manuscript, collecting data and literature searches, analyses and interpretation of data, manuscript preparation and writing the paper; and gave final approval of the version to be submitted.

Muharem Zildžić: made substantial contributions to conception and design, literature searches, and interpretation of data, participated in revising the manuscript and gave final approval of the version to be submitted.

References

1. Bralić I, Jovančević M, Predavec S, Grgurić J: *Pretilost djece - novo područje multidisciplinarnog preventivnog programa. Paediatr Croat* 2010; 54
2. Bush H, Golabi P, Younossi ZM: *Pediatric Non-Alcoholic Fatty Liver Disease. Children (Basel)* 2017; 4:9
3. Firneisz G: *Non-alcoholic fatty liver disease and type 2 diabetes mellitus: the liver disease of our age? World J Gastroenterol* 2014; 20:9072-89
4. Kerker N, D'Urso C, Van Nostrand K, Kochin I, Gault A, Suchy F et al.: *Psychosocial outcomes for children with nonalcoholic fatty liver disease over time and compared with obese controls. J Pediatr Gastroenterol Nutr* 2013; 56:77-82
5. Kistler KD, Molleston J, Unalp A, Abrams H, Behling C, Schwimmer JB: *Symptoms and quality of life in obese children and adolescents with nonalcoholic fatty liver disease. Aliment Pharmacol Ther* 2010; 31:396-406

6. Manti S, Romano C, Chirico V, Filippelli M, Cuppari C, Loddo I et al.: Nonalcoholic Fatty Liver Disease/Non-Alcoholic Steatohepatitis in Childhood: Endocrine-Metabolic "Mal-Programming". *Hepat Mon* 2014; 14:e17641
7. Newton JL: Systemic symptoms in non-alcoholic fatty liver disease. *Dig Dis* 2010; 28:214-9
8. Ng M, Fleming T, Robinson M: Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: A systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014; 384:766–781
9. Schwimmer JB: Clinical advances in pediatric nonalcoholic fatty liver disease; *Hepatology* 2016; 63:1718-25
10. Schwimmer JB, Deutsch R, Kahen T, Lavine JE, Stanley C, Behling C: Prevalence of fatty liver in children and adolescents. *Pediatrics* 2006; 118:1388-93
11. Tilg H: Adipocytokines in nonalcoholic fatty liver disease: key players regulating steatosis, inflammation and fibrosis. *Curr Pharm Des* 2010; 16:1893-5
12. Vajro P, Lenta S, Socha P, Dhawan A, McKiernan P, Baumann U et al.: Diagnosis of nonalcoholic fatty liver disease in children and adolescents: position paper of the ESPGHAN Hepatology Committee. *J Pediatr Gastroenterol Nutr* 2012; 54:700-1

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