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Original Article,

Hyperuricemia And Its Relation With Obesity Among Children In Anbar Province

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Abstract:

Background; The prevalence of pediatric hyperuricemia is increasing worldwide. No other similar study was done in Anbar province previously.

Objective: This study was designed to show the prevalence of hyperuricemia among children from 6 to 16 years old in Ramadi teaching hospital for maternity and childhood, Anbar province, Iraq. Studying the relation of hyperuricemia with childhood obesity, in addition to its relation with gender, residency, and economic status of their families.

Material and Methods: Across sectional study was done for 6 months from the first of January 2021 to the end of June 2021, to determine the expected prevalence of hyperuricemia among a randomized sample of children of ages from 6-16 years with either gender. Weight and height were measured for all cases, a body mass index was calculated for each child for estimation of obesity. For all studied cases, other data was collected for socioeconomic status and residency. All cases were sent for serological calculation of uric acid levels.

Results: The total number of studied children was 520, the overall prevalence of hyperuricemia among these cases was (11.3%). The overweight's and obese children had a higher prevalence of hyperuricemia (29.3 %) compared with only (3.3%) among those who were not. Girls had more prevalence than boys with female to male ratio (2.2:1). Most of the cases were from middle-economic status families with a non-significant relation when compared with control, while it was more and significant among urban area residence.

Conclusions: A higher prevalence of hyperuricemia was found among obese children in Anbar province, and this requires a specific educational program given to the families in explaining the risk and how to deal with obesity.

Keywords: Hyperuricemia, Prevalence rate, Obesity, Children, Anbar Province.

Introduction:-

Hyperuricemia is a state described as an abnormal elevation of serum levels of uric acids.[1] Although the risk factors for hyperuricemia have not been fully determined, recent studies have shown that the condition is a part of genetic abnormalities [2], a part of a bad lifestyle, or maybe due to some dietary factors. As uric acid is an ultimate purine metabolism production, hyperuricemia is directly related to the intake of purine-rich food. Studies also showed that food like seafood, red, and poultry meats had a high content of purine.[3,4]

Hyperuricemia is a global problem, and that the overall worldwide prevalence is ranging from (0.1% to 10%) and it differs from one country to another. The asymptomatic hyperuricemia is mostly diagnosed among middle and elderly old ages, and even it is mostly presented among some ethnic groups.[5,6] The hyperuricemia prevalence was increased in the last decades in both developed and developing countries populations. However, its prevalence is still higher among developed countries.[6]

The normal serological levels of uric acid among children and adolescents differ in both genders and among different age groups. Many and frequent studies on serum uric acid among healthy populations, showed that the levels are increased

gradually with age from birth till adolescence and that differences between the genders arose from about 12 years of age. Hormonal changes are cited as the reason for this trend. Therefore, it is of great significance to establish age-and-gender-specific reference intervals for the uric acid level in children. [7,8]

Obesity in children and adolescents is a global problem seen in both developed and developing countries.[9] The association between serum uric acid and obesity may be attributed to a variety of mechanisms. Researchers suggest that obesity or excessive body fat maybe lead to excessive production of uric acid and its poor excretion, due to insulin resistance, this will result in impairment of the metabolism of uric acid and then hyperuricemia. [10] On the other hand, hyperuricemia can induce obesity by accelerating liver and peripheral fat production.[10,11]

Hyperuricemia among children and adolescents required management, as pediatric patients with hyperuricemia are at increased risk of mortality, especially due to renal and heart complications[12]. As overweight and obesity are the main leading etiology for hyperuricemia among the healthy pediatric age group, serious and efficient programs for reducing body weight through changes in lifestyles which include, diet therapy, and increase physical activities are mandatory. The use of medication therapy with allopurinol is only for refractory cases .[13]

This study was aimed to;

1. Identify the prevalence of hyperuricemia among children from 6 -16 years old in the outpatient clinics in Ramadi teaching hospital for maternity and childhood.
2. Identify the relation of hyperuricemia with childhood obesity.
3. Identify the relation of hyperuricemia among age, gender, economic status, and residency.

Material And Method:-

A cross-sectional study was done for 6 months from the first of January 2021 to the end of June 2021, to assess the prevalence of hyperuricemia among children from 6-16 years old in the Anbar province. The collection of data was randomly among different ages and different genders and was done among persons who visit outpatient clinics of Ramadi teaching hospital of maternity and childhood, Anbar, Iraq. The study was approved by the Anbar health directorate researches committee. Informed consent was taken from families and studied cases after giving them a full explanation about the purpose of the study. Blood samples were taken from all studied cases for the measurement of serum uric acid. Normal serum uric acid levels cases were considered as a control group throughout this study. Participants were labeled with hyperuricemia based on Mayo Clinic Laboratories reference value which was standardized by the US Food and Drug Administration depending on age, and sex.[14]

Exclusion criteria;

1. Children with Down syndrome, diabetes mellitus, chronic renal diseases, and genetic metabolic disorders.
2. Ages less than 6 years and more than 16.
3. Persons who refuse the test.

A questionnaire data form was prepared for each studied case including;

1. Age, which was divided into 4 groups, from 6-10 years, from 10-12 years, from 12-14 years, and 14-16 years.
2. Sex.
3. Body mass index was calculated for each studied person for the determination of overweight and obese persons. This was done after measuring the weight and height for each case according to age and gender. The calculations of the body mass index were done by using this equation (weight in kilograms divided by the height in meter square) .[15] Overweight diagnosis when the value is between (85%)and (95%), of the expected value for age and sex among children and the obesity is diagnosed when the value more than (95%).[15]
4. Data about any chronic disease like diabetes, renal failure, or inherited metabolic disease.
5. Data about the economic state of each studied case. Which is divided into three groups, poor, intermediate, and high economic status depending on the family number, monthly income to the family, and if they live in their own house or not.
6. Residency, rural or urban.
7. Collected data were checked by using the Statistical Package for Social Sciences (SPSS), and the p-value was calculated after measuring the Chi-square. The P-value levels

of <0.05 were considered significant in this study.

Reseults:-

The total number of children ages from 6-16 years old involved in this study were (520). Hyperuricemia was diagnosed among 59 cases (11.3 %) from those studied cases. From all studied cases, there were (160) overweight and or obese child, and (360) child with a normal weight depending on the measurement of their body mass index. Hyperuricemia was reported in 47(29.3 %) children among the overweight obese obesity group, while among non-overweight and non-obese children it was diagnosed in only 12(3.3 %).Table1. The relationship was statistically significant when compared with control.

Tables:-

Table 1. Distribution of all studied cases among gender.

Gender	Normal	Hyperuricemia	Total
Male	246 (93.2%)	18 (6.8 %)	264
Female	215 (84%)	41(16%)	256
Total	461 (87.7%)	59(11.3%)	520

p-value =< 0.0001.

Table 2. Distributions of all studied cases among different ages.

Age group	Normal children	Hyperuricemic children	Total
6-10 years	179(91.3 %)	17(8.7%)	**196**
10-12 years	112(88.2%)	15(11.8%)	**127**
12-14 years	96(88.1%)	13(11.9%)	**109**
14-16 years	74(84.1%)	14(15.9%)	**88**
Total	461	59	**520**

p-value =0.35.

Table 3. The distributions of all studied cases among different body weights.

Variable	Normal serum uric acid	Hyperuricemia	Total
Overweight and obese children	113(70.6%)	47(29.4%)	160
Normal weight children	348(96.7%)	12(3.3%)	360
Total	461	59	520

P-value is significant =< 0.001.

For male studied cases (n=264), there was 18 (6.8 %) case reported with hyperuricemia, 14 cases were obese and overweight one and 4 were with normal body weight. Female studied cases (n=256), there were 41 (16%) cases diagnosed with hyperuricemia, 33 of them were of overweight and obese one and 8 cases were from normal body weight. The gender difference was significant as compared with the control.

Table 2.

From ages between 6-10 years (n=196), there were 17 (8.6%) cases diagnosed with hyperuricemia, 15 children of them were overweight or obese, and only 2 with normal weight. From ages between 10-12 years (n=127), there were 15 (11.8%) cases with hyperuricemia, 11 of them were obese or overweight, and only 4 with normal weight. From ages between 12-14 years (n=109), there were 13 (11.9%) cases with hyperuricemia, 9 of them were obese or overweight and 4 of them were of normal weight. From ages between 14-16 years (n= 88), there were 14 (15.9%) cases with hyperuricemia, 12 of them were an obese or overweight child and only 2 were of normal body weight. The p-value among different age groups was non-significant as compared with the control. Table 3.

For an economic state of families, for children living in low economic families (n= 130) there were 15 (11.5 %) cases diagnosed with hyperuricemia, from children living in middle economic state families (n=288) there were 32(11.1 %) cases with hyperuricemia, and lastly from children living in high economic state families (n=102), there were 12(11.8 %) cases

with hyperuricemia. Table 4. The relationship was non-significant as compared with the control.
From children living in urban areas(n=312) there were 43(13.8 %) cases diagnosed with hyperuricemia, and from children living in rural areas(n= 208), there were 16(7.7 %) cases diagnosed with hyperuricemia. Table 5. The relationship with residence was significant when compared with control.

Table 4. The distributions of all studied cases among familial economic states.

Economic state	Normal children	Hyperuricemic children	Total
Low economy	115(88.5%)	15(11.5%)	130
Intermediate economy	256(88.9%)	32(11.1%)	288
High economy	90(88.2%)	12(11.8%)	102
Total	461	59	520

P-value non-significant = 0.981.

Table 5. The distributions of all studied cases among residence.

Residence	Normal children	Hyperuricemic children	Total
Urban	269(86.2%)	43(13.8%)	312
Rural	192(92.3%)	16(7.7%)	208
Total	461	59	520

Discussion:-

The prevalence of hyperuricemia among children and adolescents ranges from 0.6% to 50.4% in several countries, and this depends on different gender, ages, ethnicity, and region.[16] Till now, there was no documented study on children and adolescents in Iraq.
The normal uric acid titer among children varies with age, body size, and gender. Additionally, the relationship between hyperuricemia and obesity has been elucidated among adults[17]. Among healthy children, the serum uric acid level may increase with body mass index. Nevertheless, studies on the quantitative relationship between body mass and uric acid are rare. In the present study, the overall prevalence of hyperuricemia according to age, and gender depending on Mayo Clinic Laboratories reference value which was standardized by the US Food and Drug Administration was (11.3%). Other studies showed variable results, in a study in Korea[18] the prevalence was (9.4%). However, higher results were obtained in the Pakistan study (26.02%) [19], and in U.S [20] study (30.2%). These differences among studies can be explained as hyperuricemia is the result of combinations of many factors including, genetic, variable lifestyles, and environmental risk factors, in addition to different age group samples among each study.

The association between overweight and obesity with serum uric acids in the present study showed that hyperuricemia among obese children was much higher than that reported among non-overweight and non-obese children. The prevalence of overweight and obesity among children and adolescents studied previously in Anbar province showed very high levels which were (16.79%) and (26.78%) respectively 21,22. In another study in Spain 23 among children demonstrated that overweight and obesity were big risk factors for hyperuricemia. The association may be due to the dietary habits of increasing purine consumption that result also in excessive increases in body weight. Researches proved that the mean uric acid levels turn out is higher among overweight and obese children and that an excessive increase in body weight is associated with a significant uric acid elevation in early adolescence [24.]
Concerning sex differences in the present study, the prevalence of hyperuricemia among girls was more than in boys. Similar results were obtained in the US [20] study. However, the result was different from that reported in other studies in Brazil and Japanin children and adolescents in which boys were diagnosed more with hyperuricemia than girls.[25,26] The age-related increase risk of hyperuricemia was non-significant in this study, generally, the serum uric acid concentration increases gradually with age from the first year till puberty, and it is nearly equally among both genders. In the adults and elderly age group population, the age-related increase of the

serological levels of uric acids was due to the changes in renal functions with increasing age, and that the kidney's elimination of the uric acid from the body may not be correct. [27]

In the present study, there was a non-significant relationship between hyperuricemia and the economic status of the families, however, this result is different from many other studies in children and adults [28,29] which demonstrate an association of hyperuricemia with high-class families explaining this with high red meat consumption. community, the majority of families are derived from middle economic status, and this can explain the non-significant association with higher economic families. The prevalence of hyperuricemia was reported more in urban regions than in rural regions in this study. Many other studies demonstrate the same results [30,31], this may due to the differences in lifestyle activities which is more among the rural population. The limitation of this study is the small sample size, and the participant refusal in involvements in this study.

Conclusion:-

The overall prevalence of hyperuricemia in this study was (11.3%), Overweight and obesity were significant risk factors of hyperuricemia. The prevalence of hyperuricemia more among the urban population. Public intervention educational programs in health centers are needed for the risk of obesity and on a healthy diet. Other researches are recommended for studying the main etiological factors of this high prevalence of hyperuricemia among children.

Conflict Of Interest

The authors declare that there is no conflict of interest.

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