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Prevalence of Urinary Calcium Oxalate among Pregnant Women and Children Attending Benue State University Teaching Hospital, Makurdi

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Abstract: Calcium oxalate is known to be a major constituent of kidney stone disease. Calcium oxalate crystals are one of the toxic effect of ethylene glycol poisoning. To determine the prevalence of urinary calcium oxalate among pregnant women and children attending Benue State University Teaching Hospital, Makurdi.50 Urine samples was obtained from Pediatric and Antenatal Clinic in Benue State University Teaching Hospital, Makurdi and was analyze at the medical laboratory microscopically for the presence of calcium oxalate crystals. From the result children between the age of 10-15 has the highest percentage of of calcium oxalate crystals in their urine at 8(32%) compared to the least which is 2(8%) at the age of 0-5 and 15-20. Pregnant women between the age of 25-30 have 6(24%) of calcium oxalate crystals in their urine samples compared to those with the age of 36-40 that has none respectively. The higher percentages revealed that these individual has high calcium oxalate crystals in their urine which indicate high tendency of such individuals developing kidney stone disease. In terms of prevalence of calcium oxalate between children and pregnant women, children have higher percentage of 8(32%) than pregnant women which is 6(24%) respectfully.

1. Introduction

1.1. Background of the Study

Crystals are formed when a crystalline compound becomes supersaturated. In urine inorganic salts such as oxalate and phosphate and oxalate salts such as uric acid and cystine may precipitate and appear in urine as true crystals or as amorphous material. Crystal formation is enhanced when urine flow through renal tubules decrease along with pH changes in the ultra-filtrate (Broc and Hundley, 1995).

Crystals normally found in urine are urates, uric acid or calcium oxalates (Sood, 2006). The presence of these crystals is not related to pathology but they must be properly identified and reported because occasionally they may have clinical significance. For example, calcium oxalate has been considered to be one of the normal crystals as oxalates are natural end products of metabolism in the body and it is excreted out in urine. Now, if oxalate levels are too high, the extra oxalate can combine with calcium to form kidney stones and hence on several occasions it has been linked to lithiasis. Calcium oxalate crystals (COC) are the most common cause of Kidney stones and calcium oxalate (CaOx) is the most prevalent type of kidney stone which accounts for 70-80 % of the kidney stones in the population (Asplin, 2002).

Calcium oxalate crystals are chemical compound that forms an envelope shaped crystal, known in plants as raphides; a major constituent of human kidney stones (Francesco, 2005). Most kidney stones are calcium stones, usually in form of calcium oxalate. Oxalate is a naturally occurring

substance found in food, some fruit and vegetable as well as nuts and chocolates. Human liver also produces oxalate, dietary factors, high doses of Vitamin D and several metabolic disorders can increase the concentration of calcium oxalate in urine (Mayo, 2015).

The amount of oxalate excreted in urine is a major risk factor for CaOx stones formation. Another risk factor for CaOx stone is hyperoxaluria which occurs due to bowel disease (enteric hyperoxaluria) and genetic disorders of oxalate metabolism (primary hyperoxaluria) (Bhasin, Ürekli, and Mohamed, 2015). Hence in cases of dietary excess of oxalate one possible approach to prevent renal stone formation and recurrence is to decrease the consumption of oxalate rich foods (ideal daily intake should be 50 mg or less) such as tomatoes, spinach, rhubarb, garlic, oranges and asparagus (Suzanne and Watson, 2002).

The aim of this study is to determine the prevalence of urinary calcium oxalates among children and pregnant women attending Benue State University Teaching Hospital (BSUTH)

Materials and Methods

3.1. Study Area

This research was carried out in Benue State University Teaching Hospital, along Gboko Road Makurdi, Benue State.

3.3. Materials/ Equipment

The materials used in this research include:

Microscope, Centrifuge, Slides, cover slides, Sample containers, Urine samples, pencil, pen, plaster, razor blade, test tube, hand gloves, face mask, pipette, centrifuge test tube.

3.4. Sample collection

About 25 urine samples each was collected in sterile sample containers from patients of antenatal and pediatric clinic (pregnant women and children) attending Benue State University Teaching Hospital respectively, making it a total number of 50 samples in all. They are then transported to the research laboratory, Benue state university teaching hospital (BSUTH) Makurdi for microscopic analysis.

3.6. Collection of Urine Samples

Due to the nature of urine sample that may be prompt to denaturalization because of temperature and time factor. The urine sample was collected and analyzed after 3-4 hours.

Procedures:

1. Each of the patients was interviewed in other to seek their approval for the collection of their urine samples and some vital information about each patient was documented, like their names, Age, Gender, months of conceptions (pregnant women).
2. Urine samples containers were given to each of the patients for urine collection in which the urine is containers for the specimen are labeled with name, date of collection, time the patients pass the urine samples.
3. The urine samples collected from each patient were kept in a carton in which after 3-4 hours was transferred to the BSUTH laboratory for diagnosis.

3.7. Preparation of Urine Wet Mount

Procedures:

a) The collected urine samples about 6ml was poured into a clean (5-10 ml) graduated conical centrifuge labeled test tube.

b) Centrifuged at a relatively low speed (about 1,500-3,000 rpm) for 5-10 minutes until a moderately cohesive button is produced at the bottom of the tube.

c) The supernatant was decanted and a volume of 0.2 to 0.5 ml was left inside the tube.

d) The sediment was re-suspended in the remaining supernatant by flicking the bottom of the tube several times.

e) A drop of re-suspended sediment was placed on a clean glass slide and a cover slip was gently place over it by backing one edge into the liquid and then dropping it in order to minimizing bubbles under the cover slip.

f) The wet mount was Observe under low power (10x) with subdued light for elements present in low numbers such as casts for identification, and then high, dry power (40x) adjusting the diaphragm for proper light to identify elements of crystals, and miscellaneous sediment. The same procedure was conducted for the rest of the patient's samples.

3.8. Urine (Wet mount) microscopic analysis.

Each of the urine wet mount prepared was placed on the microscope stage and then examined using ×10 objective lens of the microscope, and confirmed with ×40 objective lens of the microscope. The numbers of appeared crystals were counted and recorded respectively.

3.9. Identification of Urinary Calcium Oxalate Crystals

Identification of the calcium oxalate crystals was done according to their shape (cube-like) and shiny appearance under the microscope.

3.10. Determination of the distribution of the oxalate crystal among children and pregnant women.

The rate of the distribution of the crystals was determined among pregnant women and children attending BSUTH by comparing the analyzed data among the two sampled population.

4.1. Results

Table 1 shows the prevalence of calcium oxalate crystals among children in relation to age. Children in the age group 10-15 has the highest number of calcium oxalate crystals 8(32%)while the children within the age group 0-5 and 15-20 had the least number of calcium oxalate crystals 2(8%). There is no significant difference among the numbers of calcium oxalate crystals with regard to age; $P \leq 0.05$, $X^2 = 5.019$.

Table 2 Present the prevalence of calcium crystals among children with respect to sex. Male have the highest number of calcium oxalate crystals 11(44%) while female have the least number of calcium oxalate crystals 8(32%) respectively. There was however no statistical difference among the numbers of calcium oxalate crystals with respect to age; $P \leq 0.05$, $X^2 = 3.105$.

Table 3Display the prevalence of calcium oxalate crystals among pregnant women with respect to age. Pregnant women between the age 25-30 has highest percentage of calcium oxalate crystals 6(24%) while those within the age 35-40 has the least 0(0%). There is no statistical difference among the numbers of calcium oxalate in relation to age; $P \leq 0.05$, $X^2 = 2.44$.

Table 1: Prevalence of Calcium Oxalate Crystal among Children In Relation To Age.

Age	Number examined	Number positive (%)	Number negative (%)
0-5	5	2(8)	3(12)
5-10	9	7(28)	2(8)
10-15	9	8(32)	1(4)
15-20	2	2(8)	0(0)
Total	25	19(76)	6(24)

$X^2 = 5.019$, P value=0.170, $P \leq 0.05$,df=3,

Table 2: Prevalence of Calcium Oxalate Crystal among Children WithRespect To Sex.

Sex	Number examined	Number positive (%)	Number negative (%)
Male	12	11(44)	1(4)
Female	13	8(32)	5(20)
Total	25	19(76)	6(24)

X^2=3.105, P value=0.078, P≤ 0.05,df=1,

Table 3: Prevalence of Calcium Oxalate Crystal among Pregnant Women With Respect To Age.

Age	Number examined	Number positive (%)	Number negative (%)
20-25	5	3(12)	2(8)
25-30	13	6(24)	7(28)
30-35	5	3(12)	2(8)
35-40	2	0(0)	2(8)
Total	25	12(48)	13(52)

X^2=2.44, P value=0.486,P≤ 0.05, df=3

5.1. Discussion

This study was designed to determine the prevalence ofurinary calcium oxalate among pregnant women and children attending Benue State University Teaching Hospital, Makurdi.The investigation shows high prevalence of calcium oxalate in children between the age of 10-15 and least in children between the age of 0-5 and 15-20. This result is in agreement with the work of Wiesen (2007) who reported that calcium oxalate is higher among children between the age of 10-15 and Bayen*et al*(20014) who stated a similar result in which the distribution of calcium oxalate is high in children at the age of 10-15.

The study also disclosedthat pregnant women between the age of 25-30 has the highest prevalence of calcium oxalate. This is accordance with Riley*et al* (2014) who reported high prevalence of calcium oxalate in pregnant women of the age 25-30. Similarly, Qaader*et al* (2006) disclose that pregnant women at the age of 25-30 has the highest calcium oxalate prevalence.

The distribution of calcium oxalate was also higher in male children. This agreed with the study of Mahdi (2006) who report that male children have higher calcium oxalate than female children and a study by Smith. L.H (1999)stated that male children has higher calcium oxalate than female. Vasanthamani and Sushmitha(1997) in Tamil Nadu, India revealed that calcium oxalate incidence was more in male (96%) than in female.

In general, this study shows that the distribution of calcium oxalate is more in children than pregnant women. This agreed with Yousif*et al* (2006) who reported that calcium oxalate is more in children than pregnant women. The result of this work is in agreement with previous studies such as the one mention above which determined the prevalence of urinary calcium oxalate among pregnant women and children.

5.2. Conclusion

The study revealed high level of calcium oxalate in children between the age of 10-15 with prevalence rate of 8(32%) and pregnant women between the age of 25-30 with a prevalence rate of 6(24). Male children had high calcium oxalate at 11(44%) than female children which is 8(32%).

5.3. Recommendations

1. People should reduce the consumption of high oxalate rich food such as chocolate, coffee, cranberries and beer which might increase the formation of calcium oxalate stone.
2. Public awareness on the prevalence of kidney stone diseased and possible remedy should be made known to the public by government and non-governmental organization.

3. Excessive used of vitamin D supplement increases the formation of calcium oxalate therefore the use should be minimized.

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