Chapter three

Materials and methods

3.1 Study design

This is a descriptivesurvey study type where the data were randomly collected within one week.

3.2Study population

The patients included in this study were randomly chosen from two primary schools.All of them underwent KUB ultrasound. They are(31) male and (72) female students aging from 11 to 14 years.

3.3 Sample size and type

The data of this study were collected randomly from 103studentsunderwent KUB ultrasound scan.

3.4 Place and duration of the study:

This survey study carried out in tow primary schools (Al borgaig primary school for girls and koboddy primary school for boys and girls) inthe north state of Sudan by ultrasound inSeptember 2014. A one week descriptive study was done by the researcher at the two schools in the north state of Sudan.

3.5 Materials

Standard (KUB) ultrasound performed by the researcher using fukuda portable ultrasound machine (3 to 5MHz- convex transducer). Scan Startedwith the patients in supine position and then changed to lateral position.All students were examined in supine and lateral position using a (3 to 5MHz) convex transducer .Ultrasound scanning has been done by the researcher in one of the teachers' offices using a table top as a couch. Real time imaging of ultrasound scanning is performed using both gray-scale and color Doppler techniques. The documented images had been printed.

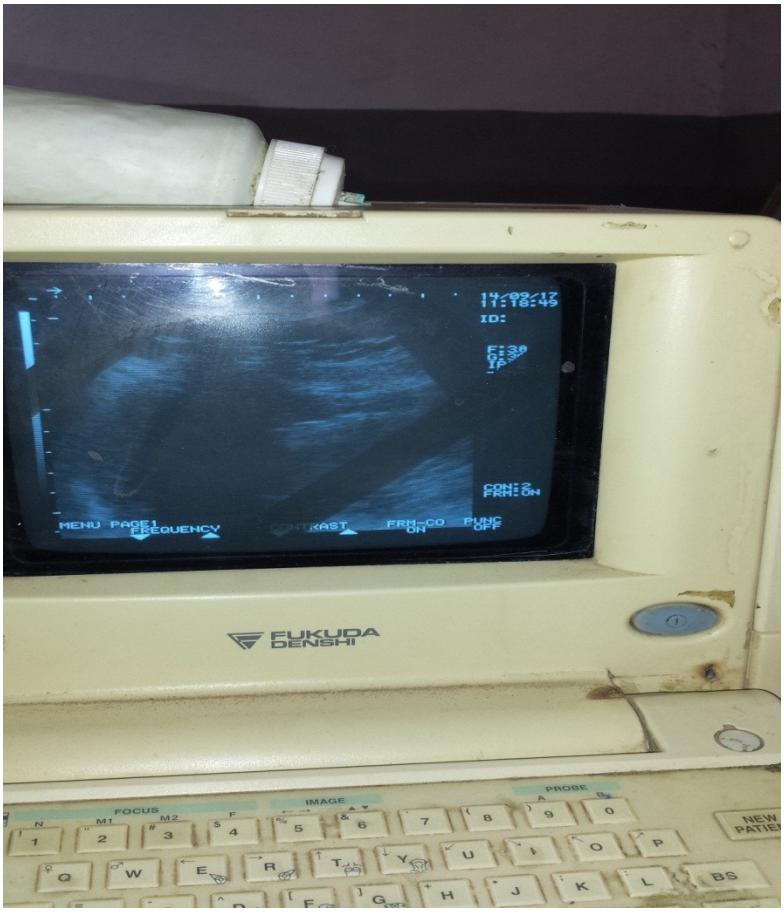


Figure (3.1) FUKUDA portable ultrasound machine which used in the survey

3.6 Methods of data collection

3.6.1 Patient Preparation:

The patient must be fasting and free of gases (fasting hours is at least for 8 hours for adults and 4 hours for kids) but in this survey the scan was being done early in the morning and all the students" abdomens were clear.

3.6.2 Patient's position:

To visualize the kidneys optimally, the patient is placed in the supine position and then turn to lateral position

3.6.3 Ultrasound technique of the kidney:

After completing a self-administered questionnaire (on: Source of drinking water, family history, Medication use, Soft drinks intake, Daily water intake, age and weight). For definitive diagnosis of stones the researcher looked for hyper echogenic spots more than 4 mm in diameter with multiplanar evaluation of specific signs as echogenicity, posterior acoustic shadowing, or positive twinkle sign.

Figure (3.2) Longitudinal US image of RT kidney in 11 years female student showing RT kidney multiple stones

Figure (3.3) Longitudinal US image of LT kidney in 11 years male student showing LT kidney multiple stones and hydronephrosis.

3.6.4 Criteria of Sonographic assessment

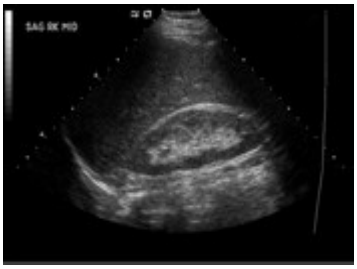
In (KUB) ultrasound the kidneys should be scanned clearly to check any hyper echoic stones, sandy stones or even gravels, Care should be taken to confirm the presence of posterior acoustic shadow in the case of sizable stones.

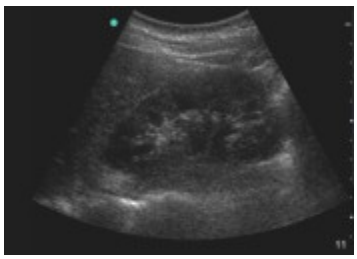
3.6.5 Data analysis method:

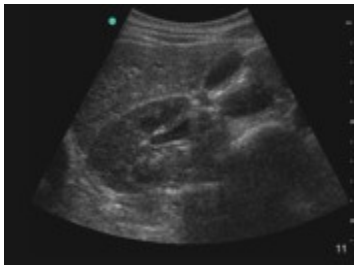
The data collected was designed to meet the purpose of the study, then the Statistical analysis of data was being carried out by using software SPSS version 20 for windows (Statistical Package for Social Sciences).Statistical significance will be determined using chi-square test.

3.6.6General ultrasound technique of the kidney

A comprehensive examination of the renal tracts should always include assessment of the urinary bladder. A 3.5-5 MHz probe is typically used to scan the kidney. For the **right** kidney, have the patient lie supine and place the probe in the right lower intercostal space in the midaxillary line. Use the liver as an “acoustic window” and aim the probe slightly posteriorly (toward the kidney). Gently rock the probe (up and down or side to side) to scan the entire kidney. If needed, you can have the patient inspire or exhale, which allows for subtle movement of the kidney. Obtain longitudinal (long axis) and transverse (short axis) views (Figure 1-2).







C

a

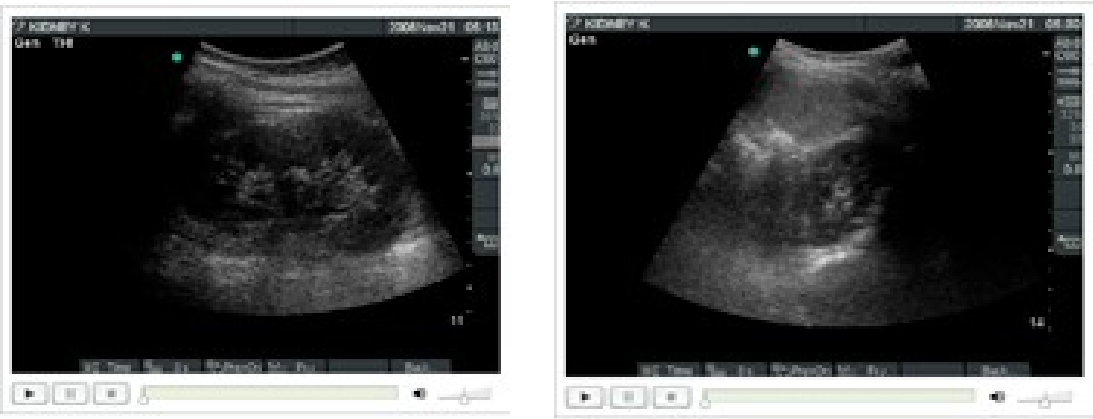
b

Figure (3.4)

aand b: Longitudinal images of normal right kidney. C:Transverse image of normal right kidney. Note the position of the gallbladder (GB) next to the liver and inferior vena cava (IVC).

Scan longitudinally right subcostally. Visualize the right kidney inferior to the right lobe of the liver,or left kidney using spleen as acoustic window. Place the probe between iliac crest and the lower costal margin to examine in the coronal plane. Ensure the kidney is thoroughly examined from edge to edge. Rotate into transverse. Scan from beyond the superior margin to inferior. Document the normal anatomy and any pathology found, including measurements and vascularity if indicated.

For the **left** kidney have the patient lie supine or in the right lateral decubitus position. Place the probe in the lower intercostal space on the posterior axillary line. The placement will be more cephalad and posterior than when visualizing the right kidney. Again gently rock the probe to scan the entire kidney. Obtain longitudinal and transverse views (fig 3.5A and B).

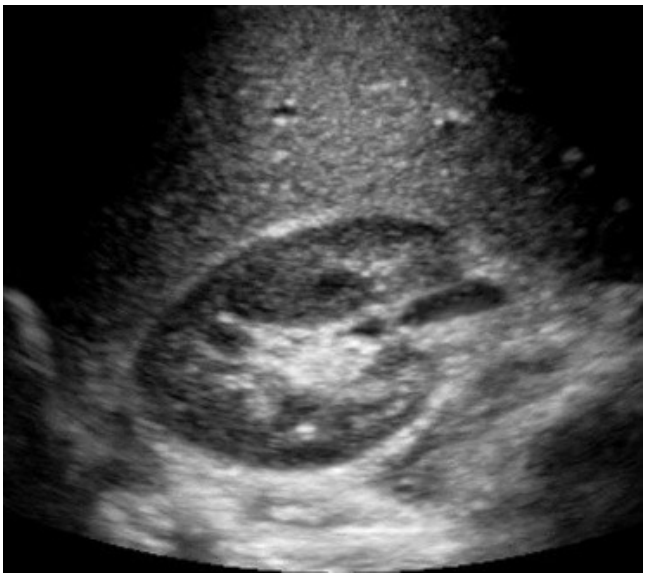


A B

Figure (3.5 A&B)longitudinal and transverse views LT kidney

Coronal scan plane for the Right Kidney	Longitudinal: Normal Kidney

Figure (3.6 a)Imaging Scan Planes



Scan plane transverse kidney	Transverse normal image

Figure (3.6 b) Imaging Scan Planes of the kidney

Depending on which axis you use to obtain your images, the sonographic shape of the kidney will change. On longitudinal view, the kidney will appear football-shaped and will typically be 9-12 cm in length and 4-5 cm in width (normally within 2 cm of each other). On transverse view, the kidney appears C-shaped. The normal kidney will have a bright area surrounding it which is made up of Gerota's fascia and perinephric fat. The periphery of the kidney will appear grainy gray which is made up of the renal cortex and pyramids. Sometimes you can see the individual pyramids, but this is not always the case. The central area of the kidney, the renal sinus, will appear bright (echogenic) and consists of the calyces, renal pelvis and the renal sinus fat. Always scan both kidneys for comparison and correlation to clinical picture. The ureters are generally not well visualized by ultrasound, but, when distended may appear as a tubular structure extending

inferiorly from the kidney (Figure3.5). The bladder, when distended with fluid, can be easily visualized in the lower pelvis as a rather thick walled, fluid-filled structure.

There are many normal variations in the anatomic structure of the kidneys. Some common ones that you may identify include: Double collecting system, where the renal sinus is divided by a hypertrophied column of Bertin; horseshoe kidney, where the left and right kidney are connected to each other, usually at the lower pole; Renal ectopia, where one or both kidneys are outside the normal renal fossa(WALSH J2002).

Chapter four

Results

Tables and figures:

Table 4-1 Frequency distribution table of students' gender

Gender	Frequency
Male	31

Female	72
Total	103

Table 4-2 frequency distribution table ofstudents' ages

age	Frequency	Percent
11 years	35	34.0
12 years	23	22.3
13 years	24	23.3
14 years	21	20.4
Total	103	100.0

Table 4-3 demonstrating the frequency of different types of renal stones in the studied sample.

Presence or absence of stones	Frequency	Percent
no stone	11	10.7
single stone	13	12.6
multiple stone	23	22.3
sandy stone	18	17.5
graviles	38	36.9
Total	103	100.0

Figure (4.1) demonstrating the frequency of different types of stones in the studied sample as pie graph

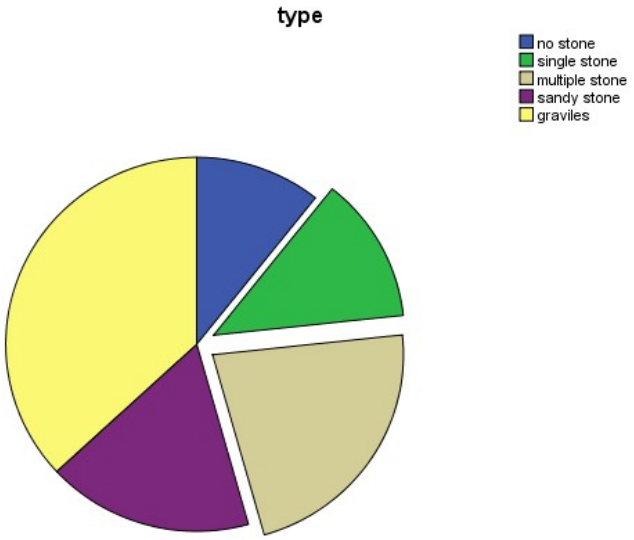
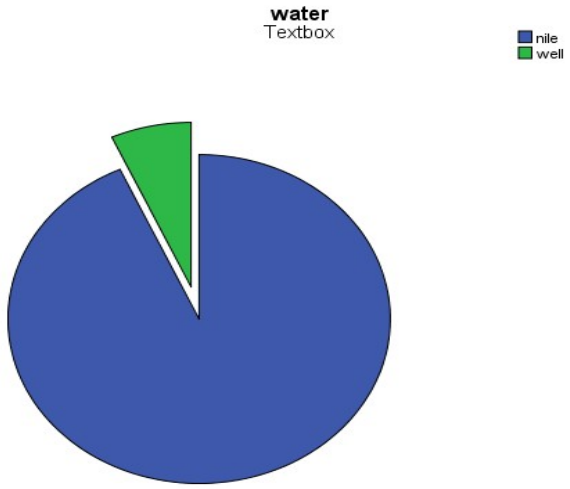


Table (4.4) demonstrating the frequency of the students' sources of drinking water

Source of drinking water	Frequency	Percent
nile	96	93.2
well	7	6.8
Total	103	100.0

Figure (4.2) demonstrating the frequency of the different sources of drinking water



e group of the students

e group of the students

39

Table (4.6) demonstrating the frequency of the studentsdaily water intake in liters

Daily water intake in liters	Frequency	Percent
less than 1 liter	4	3.9
more than 1 liter	99	96.1
Total	103	100.0

Figure (4.4) is a bar graph demonstrating thestudents' frequency of the daily water intake in liters

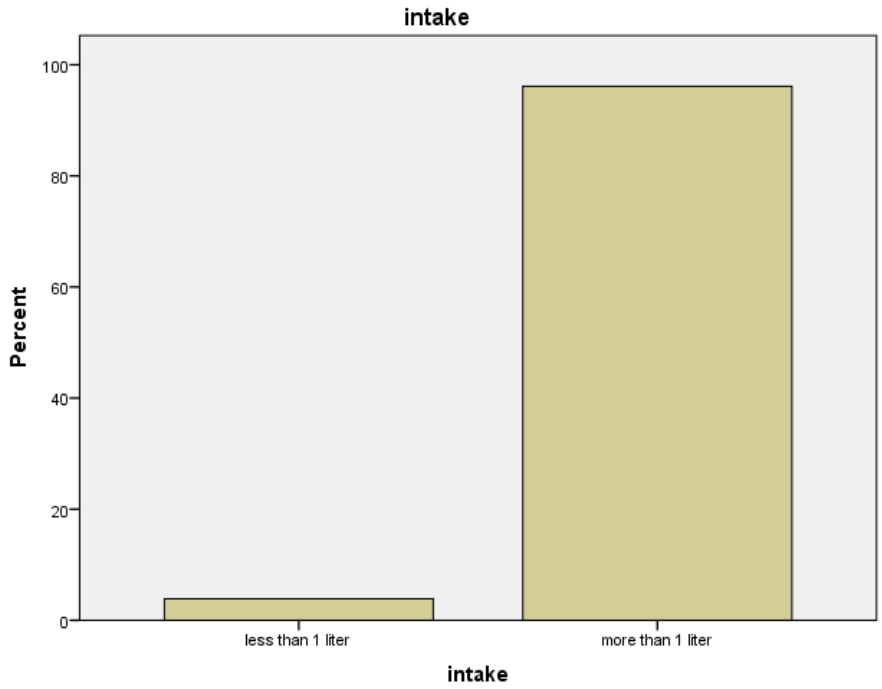


Table (4.7) demonstrating the frequency of soda intake in the group of the students

Soda intake	Frequency	Percent
yes	8	7.8
no	26	25.2
some times	69	67.0
Total	103	100.0

Figure (4.5) demonstrating the frequency of soda intake in the group of the students

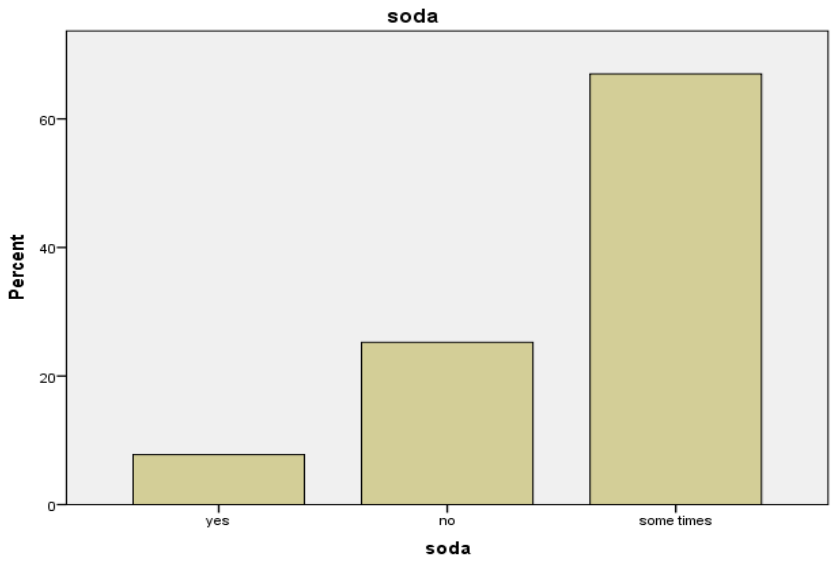


Table (4.8) showing the frequency ofstudentshistory of UTI

History of UTI	Frequency	Percent
yes	46	44.7
no	57	55.3
Total	103	100.0

Figure (4.6) is a bar graph of history of UTI in the group of the studied sample of the students

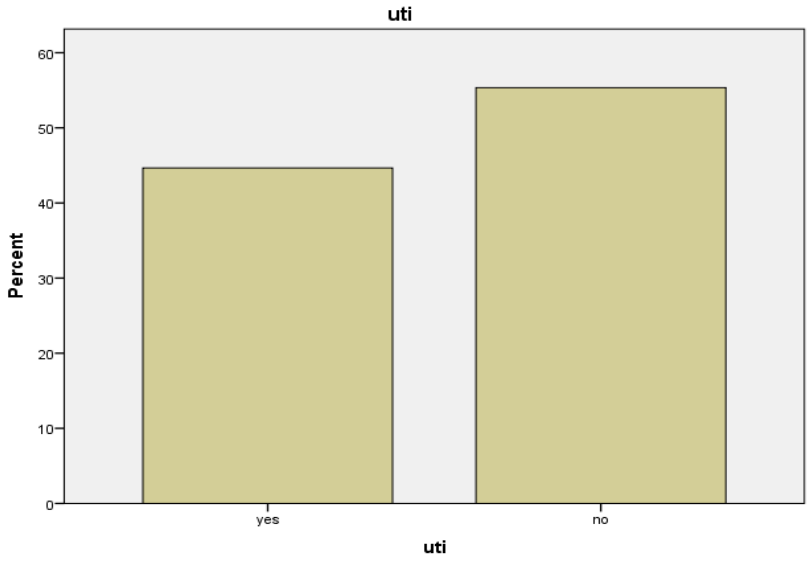


Table (4.9) showing the frequency ofstudents' weight in the group of the studied sample

Pupils weight	Frequency	Percent
less than 25 kg	23	22.3
more than 25 kg	80	77.7
Total	103	100.0

Figure (4.7) bar graph ofstudents' weight in the group of the studied sample

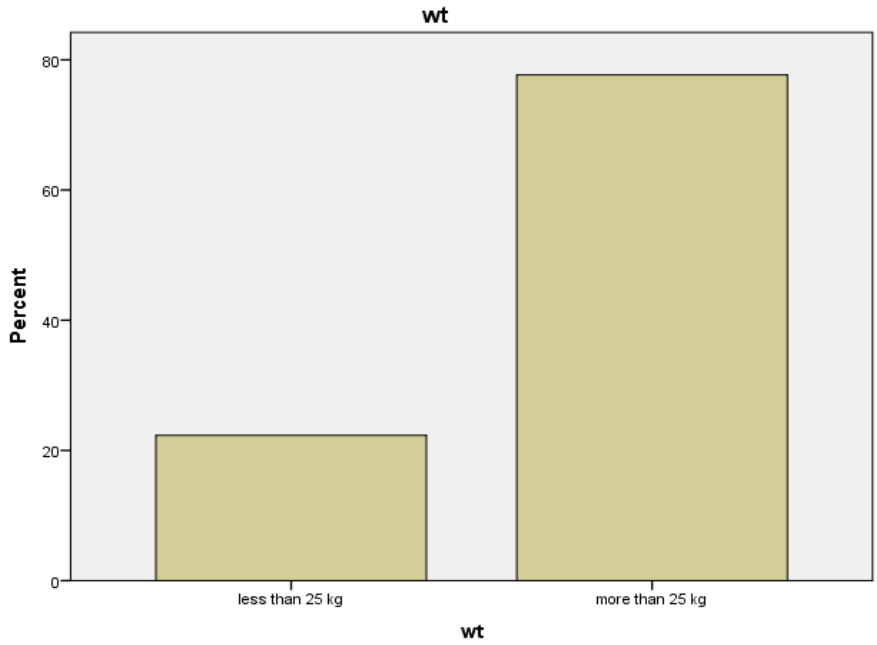
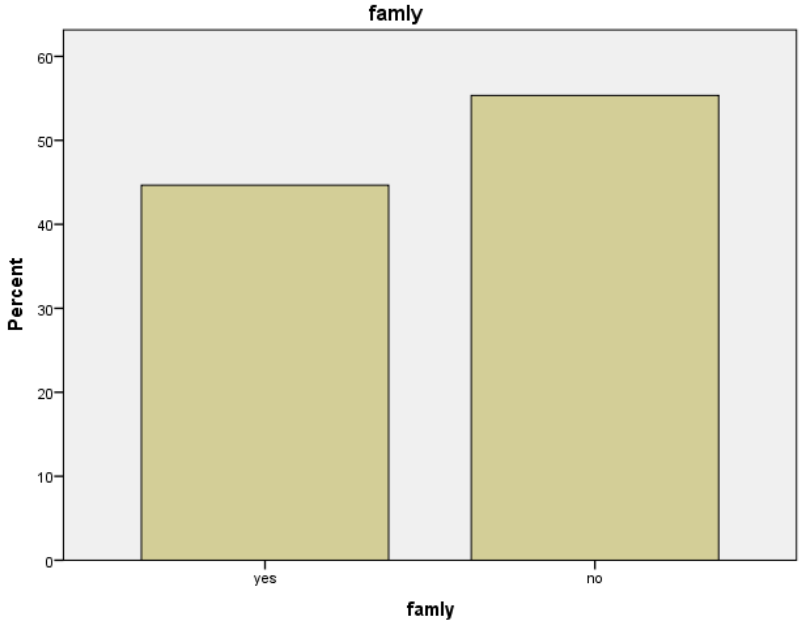


Table (4.10) showing the frequency ofstudents' positive family history of stones

Family history	Frequency	Percent
yes	46	44.7
no	57	55.3
Total	103	100.0

Figure (4.8) showing the frequency ofstudents' positive family history of stones



Crosstabs tables

Table (4.11) demonstrating stones age Crosstabulation

Pupils ages	stones		Total
	postive	negative	
11 years	28 80.0%	7 20.0%	35 100.0%
12 years	16 69.6%	7 30.4%	23 100.0%
13 years	18 75.0%	6 25.0%	24 100.0%
14 years	13 61.9%	8 38.1%	21 100.0%
Total	75 72.8%	28 27.2%	103 100.0%

Chi-Square2.356

Figure (4.9) bar graph demonstrating age * stones cross tabulation

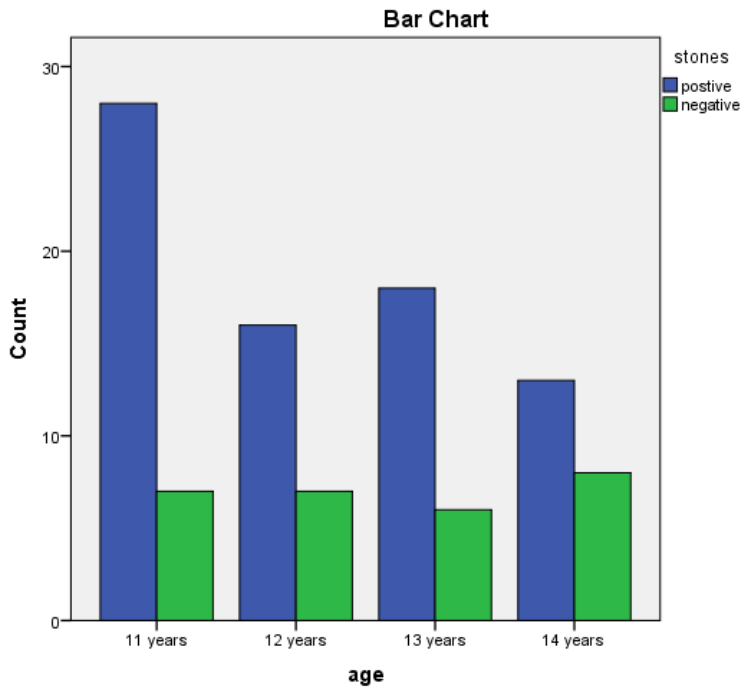


Table (4.12) showing the * stones gender Crosstabulation

Gender		stones		Total
		postive	negative	
	female	57 79.2%	15 20.8%	72 100.0%
	male	18 58.1%	13 41.9%	31 100.0%
Total		75 72.8%	28 27.2%	103 100.0%

Qui squire 4.875

Figure (4.10) showing the sex * stones Crosstabulation

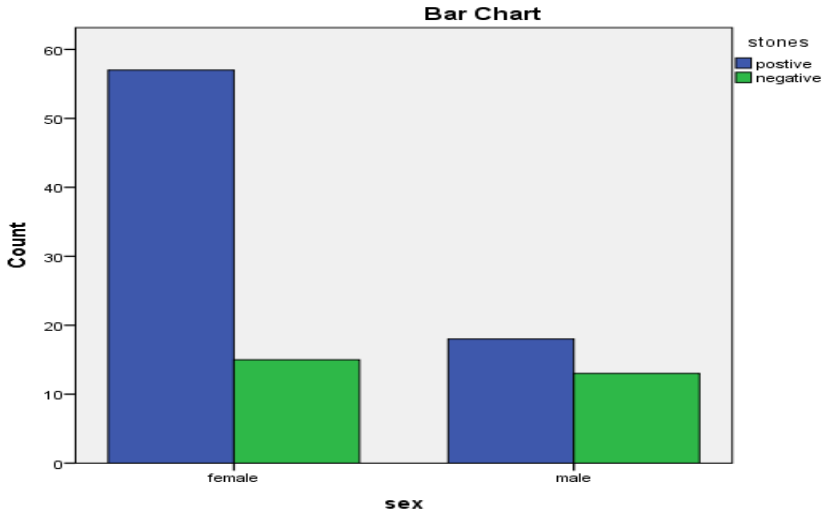


Table (4.13) showing the stones source of drinking water crosstabulation

Water source	stones		Total
	positive	negative	
Nile	68 70.8%	28 29.2%	96 100.0%
well	7 100.0%	0 0.0%	7 100.0%
total	75 72.8%	28 27.2%	103 100.0%

Qui squire 2.804

Figure (4.11) showing the stones source of drinking water crosstabulation

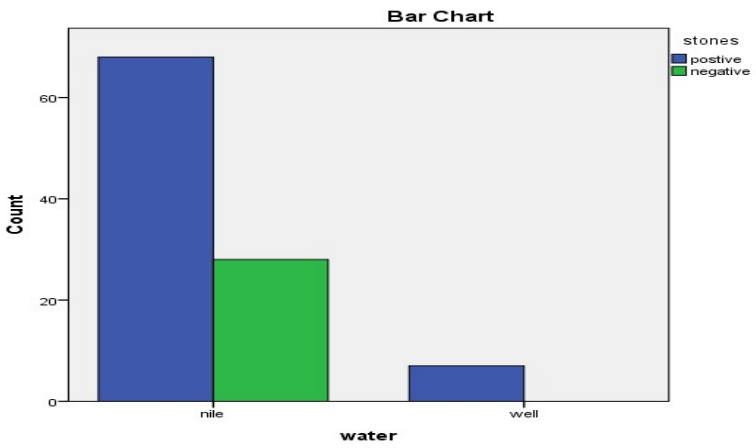


Table (4.14) demonstrating the relation between the prevalence of stones and using medications

medication	stones		Total
	postive	negative	
yes	23 63.9%	13 36.1%	36 100.0%
no	52 77.6%	15 22.4%	67 100.0%
total	75 72.8%	28 27.2%	103 100.0%

Qui squire 2.228

Figure (4.12) demonstrating the relation between the prevalence of stones and using medications

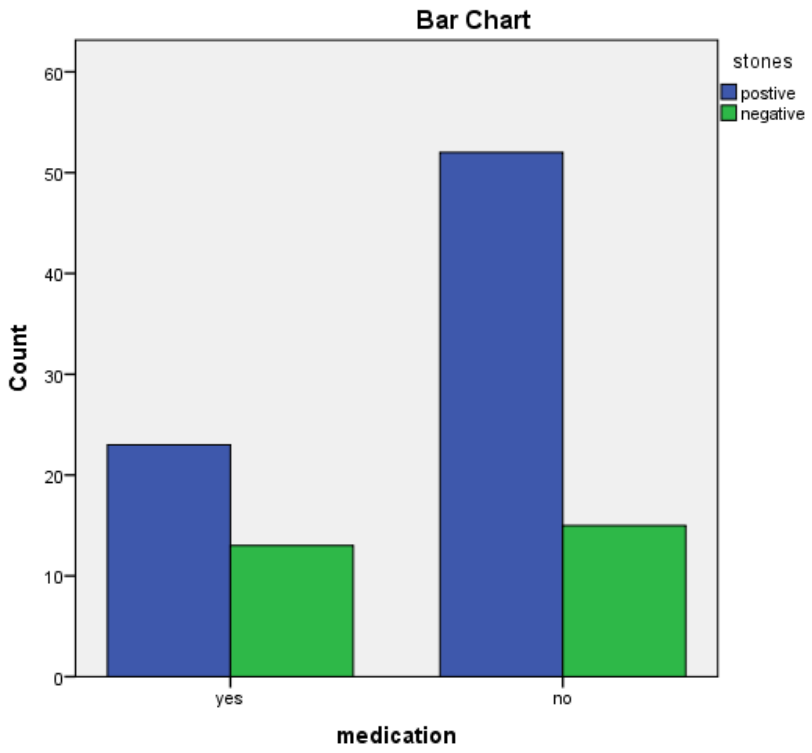


Table (4.15) demonstrating the stones daily water intake crosstabulation

Daily water intake		stones		Total
		postive	negative	
Total	less than 1 liter	1 25.0%	3 75.0%	4 100.0%
	more than 1 liter	74 74.7%	25 25.3%	99 100.0%
		75 72.8%	28 27.2%	103 100.0%

qui squire 4.807

Figure (4.13) stone daily water intake bar graph

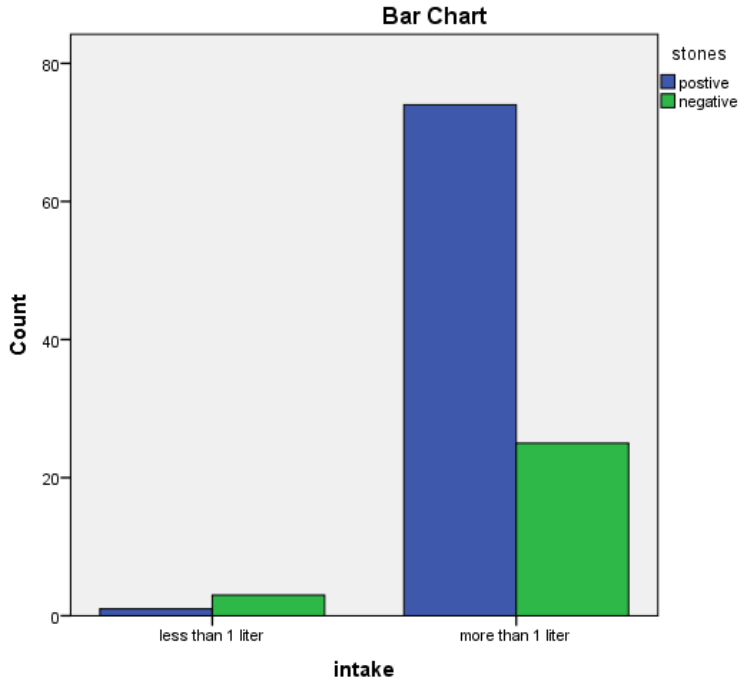


Table (4.16) stones soft drinks cross tabulation

Having soft drinks		stones		Total
		postive	negative	
	yes	5 62.5%	3 37.5%	8 100.0%
	no	19 73.1%	7 26.9%	26 100.0%
	some times	51 73.9%	18 26.1%	69 100.0%

Total		75 72.8%	28 27.2%	103 100.0%

Qui squire .473

Figure (4.14) stones soft drinks cross tabulation

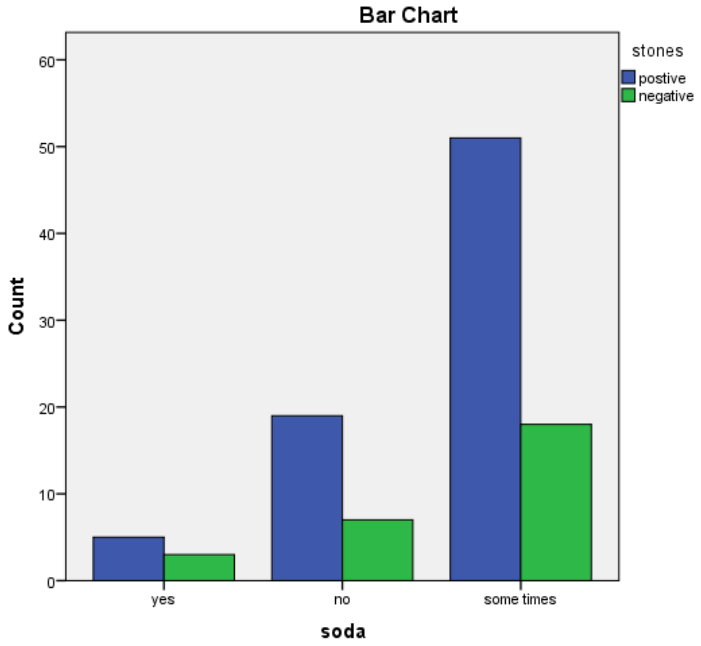


Table (4.17)stone UTI crosstabulation

		stones		Total
		positive	negative	
uti	yes	39 84.8%	7 15.2%	46 100.0%
	no	36 63.2%	21 36.8%	57 100.0%
Total		75	28	103

		72.8%	27.2%	100.0%

Qui squire 6.014[a]

Figure (4.15) stone UTI crosstabulation

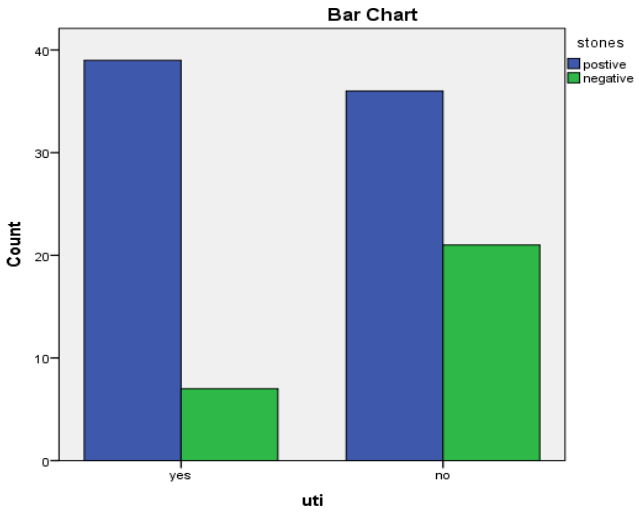


Table (4.18) stones weight cross tabulation

Pupils weight		stones		Total
		postive	negative	
	less than 25 kg	15 65.2%	8 34.8%	23 100.0%
	more than 25 kg	60 75.0%	20 25.0%	80 100.0%
Total		75 72.8%	28 27.2%	103 100.0%

Qui squire .864

Figure (4.16) stones weight cross tabulation

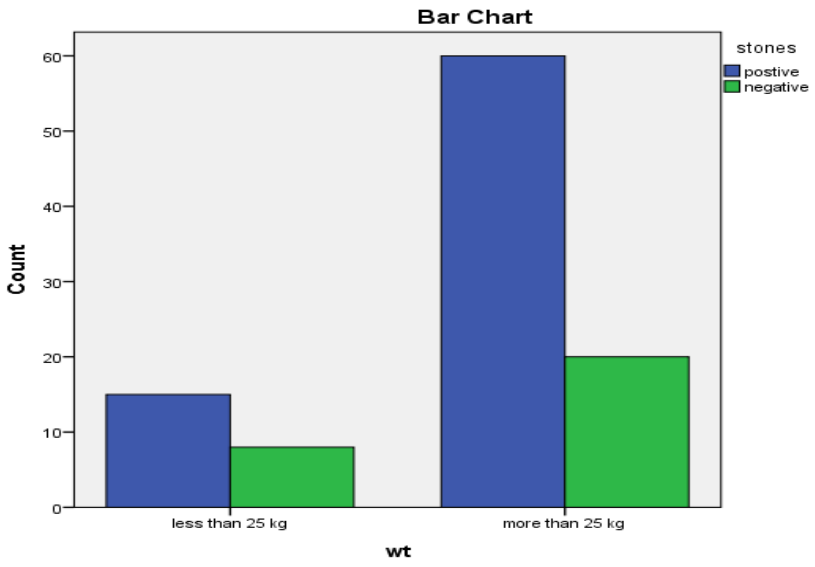


Table (4.19) gender UTI crosstabulation

		uti		Total
		yes	no	
gender	female	39 54.2%	33 45.8%	72 100.0%
	male	7 22.6%	24 77.4%	31 100.0%
Total		46 44.7%	57 55.3%	103 100.0%

Qui squire 8.748[a]

Figure (4.17) gender UTI crosstabulation

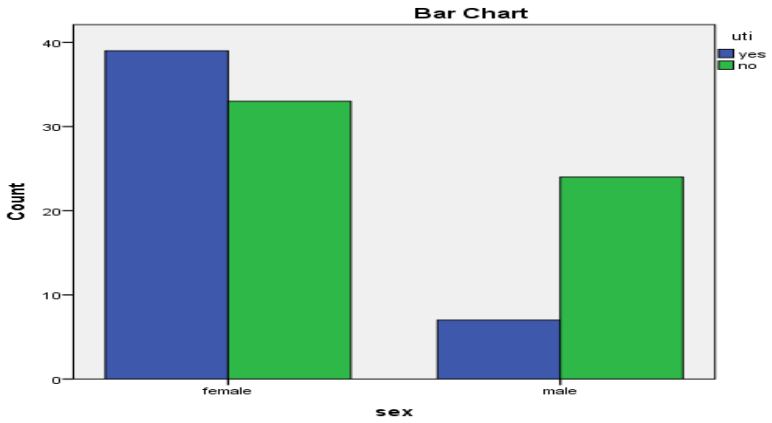


Table (4.20) stones type crosstabulation

		type					Total
		no stone	single stone	multiple stone	sandy stone	graviles	
stones	postive	0	13	23	0	38	74
		0.0%	17.6%	31.1%	0.0%	51.4%	100.0%
	negative	11	0	0	18	0	29
		37.9%	0.0%	0.0%	62.1%	0.0%	100.0%
Total		11	13	23	18	38	103
		10.7%	12.6%	22.3%	17.5%	36.9%	100.0%

Qui squire 103.000

Figure (4.18) stones types

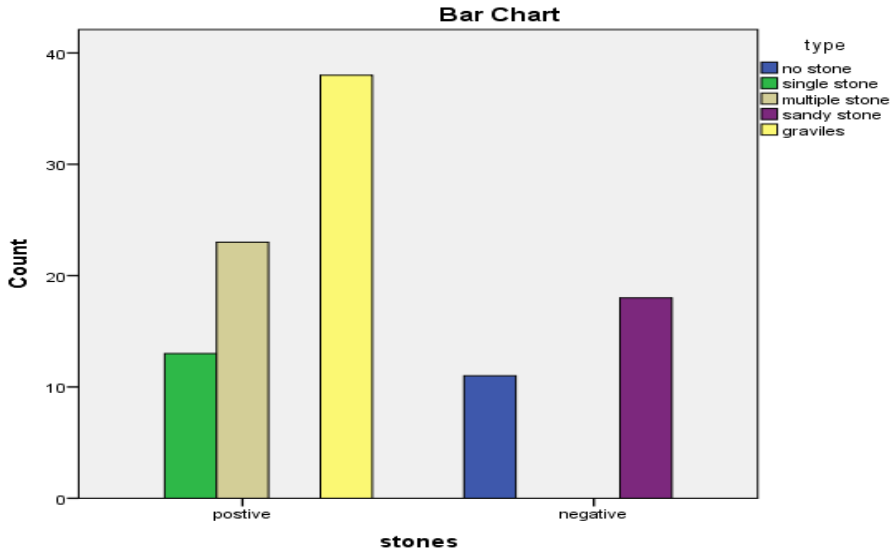


Table (4.21) showing stones family history Crosstabulation

stones * famlyCrosstabulation

		famly		Total
		yes	no	
stones	positive	31	43	74
		41.9%	58.1%	100.0%
		67.4%	75.4%	71.8%
	negative	15	14	29
		51.7%	48.3%	100.0%
		32.6%	24.6%	28.2%
	Total	46	57	103
		44.7%	55.3%	100.0%
		100.0%	100.0%	100.0%

Qui squire .815

Table (4.22) Numeric values

	Value	Numbers:			
1	Gender	1=female	2=male		
2	Age	1=11yrs	2=12yrs	3=13yrs	4=14yrs
3	Drinking water source	1=Nile	2=wells		
4	Daily water intake	1=<4cups	2=>4cups		
5	Soft drinks	1=yes	2=no	3=sometimes	
6	UTI	1=yes	2=no		
7	Family history	1=yes	2=no		
8	Weight	1=<25kg	2=>25kg		
9	medications	1=yes	2=no		
10	stones	1= positive	2=negative		
11	Hydronephrosis	1=yes	2=no		
12	others	1=cyst	2=duplex		
13	positivity	1-sngle	2=multiple		
14	Laterality	1=unilateral	2=bilateral		
15	type	1=single	2=multiple	3=sandy	4=gravels

بسم الله الرحمن الرحيم

نسبة حدوث حصاوي الكلي بالولاية الشمالية

الاسم:..... تلفون اقرب الاقربين.....

اسم الام رباعي: .....

العمر بالتقريب:.....

المهنة:.....

الجنس:زكر ☐ انثي ☐

الوزن بالتقريب:.....

مصادر مياه الشرب: بحر ☐ ابار ☐

معدل الشرب اليومي(كم كوب ماء تقريبا):.....

شرب المياه الغازية: لا ☐ قليلا ☐ كثيرا ☐

هل هنالك اصابات سابقة بالتهاب في المسالك البولية او الام الصفحة:نعم ☐ لا ☐

هل توجد حالات حصاوي كلي في العائلة:

نعم: ☐ لا: ☐

في حالة وجود حالات:-

1- ما هي صلة القرابة:-

اب ☐ ام ☐ اخ ☐ اخت ☐ عم ☐ عمة ☐ خال ☐ خالة ☐

جد ☐ جدة ☐

2- هل كانو يسعملوا اي نوع من انواع العلاج الدائم؟ نعم ☐ لا ☐

----------sonographic findings

Normal, sandy stones, gravils, single stone (size) , multiple stons, bilateral, hdronephrosis, cyst (size) renal duplex

Chapter five

Discussion, Conclusion and Recommendations

5-1Discussion

A total of 103 students of two primaryschools in the northern state of Sudan (31 male and 72 female) wererandomlyexamined by ultrasound for renal stones. Allof themunderwent standard KUB sonogram performed by the researcher at the two schools, using fukuda portable ultrasound machine.

The ages of students were ranging from 11 to 14 years oldand the regional distribution of females and males is 69.9% to 30.1% in the participant's students (table 1).

After adjustment for sources of drinking water and daily water intake the given result From table (4.12) is that the prevalence of stones among the 11 years old participants pupils (35pupils) is 80% within this age group, while 20% of them are not having stones, this prevalence is getting low with increasing pupils ages, so it is 69.6% in 12years old pupils, 75% in 13years old and 61.9% in the 14 years old pupils.

In association with gender, the prevalence of RS among the females participants is more than twice that of males,as (table 4.13) showed that 76% of the females are having renal stones while it is 24% in the males pupils.

Regarding the relationship between the renal stones and the drinking water source we can see from table (4.14) that the prevalence of stones tended to highly increase among those who are drinking wells water 7 of 7 pupils (100%), this

prevalence is also not low in those who are using the river Nile as a basic source of drinking water so it is 70.8% of the 96 pupils.

According to table (4.15) we can see that 23(63.9%) pupils of the 36 who are using medications are having renal stones and 13(36.1%) of them are not having stones, 52 (77.6%) of the 67 pupils who are not using any medications are having renal stones and 15 (22.4%) of them are not having stones.

In this survey of 103pupils, 99 of them are having more than four cups of water per day (approximately 1.5 liters), 74(74.7%) of these 99 pupils are suffering renal stones ,and 1 of 4 who are having less than four cups of water a day (approximately 1.5 liters), are suffering renal stones with percentage of 25%.(table 4.16)

In association with soft drinks (62.5%) of the pupils who are drinking soft drinks are having RS , (73.1%) the pupils who are not drinking soft drinks are having RS while (73.9%) who are sometimes drinking soft drinks are having RS. This is what is given from table (4.17)

Table (4.18) showed that among the pupils who had RS, (84.8%) of 46 pupils suffersfrom UTI during their life time compared to (63.2 %) of the 57 pupils who do not suffers UTI during their lifetime.

This finding confirms the importance of considering that urinary tract infection is one of the predisposing factors for renal stones.

As we can see from table (4.19) that among all the pupils with RS (65.2%) of 23 pupils had weight less than 25kg while (75%) of the 80 pupils who had weight more than 25 kg are having RS

From table (4.20) UTI (which is consider to be one of the predisposing factors of renal stones) is showing high rate (54.2%) in the 72 participant females pupils while it is only (22.6%) in the 31 male pupils

From table (4.21) only sizable single or multiple stones are classified as positive renal stones cases but sandy stones and gravels which can spontaneously disappear are not real RS

The counts of each type of them is17.6 % single stone, 31.1% multiple stones 51.4% gravel

Keeping the history in various parts of the world in mind, this research is a Survey study of prevalence of renal stones in the north state of Sudan by using ultrasound which revealed a high a symptomatic prevalence (35%)

Theprevalence of renal stones in this survey is absolutely higher than that in the surveys reported in some Asian countries such as Saudi Arabia (20.1%),and12% in Canada, and 13–15% in the USA (Shahida Banu Shamsuddeen et.al nov.- dec. 2013).

All the cases in this study were detected incidentally by ultrasound during the survey; this means that some cases of renal stones may be undiagnosed for long time.

5-2 Conclusion

As from the above mentioned results it seems that the renal stones can be asymptomatic for long time.

The lifetime prevalence of kidney stones in the primary school students of borgaig city in the north State of Sudan at the time of the survey was significantly great. (35%)

Risk patterns for kidney stones were strongly associated with the source of drinking water.

The fact that the age- and gender-specific prevalence appears to be high emphasizes the importance of environmental factors.

Future studies should target environmental risk factors with the ultimate goal of reversing the growth of kidney stone disease.

The predisposing factors are the basic factors to rule out the presence or absence of renal stones.

Maintaining a healthy source of drinking water is playing a great role in preventing the occurrence of renal stones.

5-3 Recommendation

The researchersuggests that there is a need for further studies in the prevalence of renal stones in Sudan to be carried out in a larger sample sizes with good ultrasound machines and other investigation tools, because all the previous studies found in Sudan were about the composition of renal stones or about the ESRD.

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