Chapter one
Introduction

The bean-shaped kidneys are retroperitoneal in the posterior abdominal region. They lie in the extraperitoneal connective tissue immediately lateral to the vertebral column. In the supine position, the kidneys extend from approximately vertebra T XII superiorly to vertebra L III inferiorly, with the right kidney somewhat lower than the left because of its relationship with the liver. Although they are similar in size and shape, the left kidney is a longer and more slender organ than the right kidney, and nearer to the midline. (Elsevier Drake et al 2007)

The Kidneys (Renés) are surrounded by a mass of fat and loose areolar tissue. The long axis of each kidney is directed downward and lateralward; the transverse axis backward and lateralward. (Henry Gray 1993–2015).

Each kidney has a smooth anterior and posterior surface covered by a fibrous capsule, which is easily removable except during disease. On the medial margin of each kidney is the hilum of kidney, which is a deep vertical slit through which renal vessels, lymphatics, and nerves enter and leave the substance of the kidney. Internally, the hilum is continuous with the renal sinus. Perinephric fat continues into the hilum and sinus and surrounds all structures.

Kidney’s functions include removing waste products from the blood and regulating the amount of fluid in the body. The basic units of the kidneys are microscopically thin structures called nephrons, which filter the blood and cause wastes to be removed in the form of urine; each kidney contains around a million units of these nephrons, each of which is a microscopic filter for blood. (Shuster j et al 1982)
Each kidney is encased in a transparent, fibrous membrane called a renal capsule, which helps protect it against trauma and infection. (Tony Ogbekhuemen 2009)

The outermost layer of the kidney is called the cortex. Beneath the cortex lies the medulla, an area that contains between 8 and 18 cone-shaped sections known as pyramids, which are formed almost entirely of bundles of microscopic tubules. The tips of these pyramids point toward the Centre of the kidney.

The cortex extends into the spaces between the pyramids, forming structures called renal columns. At the Centre of the kidney is a cavity called the renal pelvis. (Tony Ogbekhuemen 2009). All the blood in our bodies passes through the kidneys several times a day, as the kidneys filter the blood they create urine, which collects in the kidneys' pelvis – a funnel-shaped structures that drain down tubes called ureters to the bladder. (Tony Ogbekhuemen 2009). Together with the bladder, two ureters, and the single urethra, the kidneys make up the body’s urinary system. (Tony Ogbekhuemen 2009)

One of the common kidney disorders is the renal stones, which are small, crystallized substances, such as calcium, that form in the kidney or other parts of the urinary tract, smaller kidney stones can pass out of the body on their own, although this can be painful. Larger stones may require surgery, or they may be broken into smaller pieces with sound waves in a procedure called ultrasonic lithotripsy. (Tony Ogbekhuemen 2009)

Kidney stone disease affects people in the prime of their lives. Kidney stones can be debilitating and painful, and recurrent stone formation may lead to a decreased quality-of-life, interruptions in work and social commitments, increased utilization of health care, hospitalization, and even kidney damage. (Peter Hughes 2006).

In this research the research is going to randomly study the prevalence of renal
stones in the students of the primary schools in the north state of Sudan as Kidney stone disease varies in frequency and between different climates and racial groups.

1.1 **Problem of the study:**

Kidney stones disease is relatively common mostly due to improper sources of drinking water; it might be asymptomatic or may be associated with one or several symptoms, and the pain with kidney stones is usually of sudden onset, very severe and colicky (intermittent). Ultrasound reliably demonstrates stones > 2mm sizes, but smaller stones, are commonly not detected, CT is commonly used for detection and is excellent but it is expensive and most of the people cannot pay its costs. (Sternberg k 2005)

1-2 Objectives of the study:

The general objective of this research was to study the prevalence of renal stones in the students of the primary school in the north state of Sudan by ultrasound, because it might be a symptomatic for long time and it might progress even to kidney damage.

**Specific Objectives of the study**

To make a sonographic survey about renal stones on a specific group of population, to find the most affected gender of renal stones, to find the most affected age of renal stones, to correlate between drinking water sources and renal stones, to reach to the poor individuals in the villages of no health services, and to correlate the findings with the predisposing factors of renal stones.

1-3 Significant of the study
This study will provide sonographic characteristics of renal stones which help in diagnosis and therefore save patient with asymptomatic renal stones.

1-4 Overview of the study

This study consisted of five chapters with chapter one is an introduction which include overview of the kidneys, problem of the study, objectives and Significant of the study. Chapter two includes background and literature review (previous study) while chapter three include material and method used for data collection and analysis. Chapter four presents the result of the study in tables and graph and finally chapter five includes the discussion, conclusion, recommendation and references.

Chapter 2
Theoretical Background and Literature

2.1 Anatomy of the kidney

2.1.1 Structure and Location
The bean-shaped kidneys are retroperitoneal in the posterior abdominal region. They lie in the extraperitoneal connective tissue immediately lateral to the vertebral column. In the supine position, the kidneys extend from approximately vertebra T XII superiorly to vertebra L III inferiorly, with the right kidney somewhat lower than the left because of its relationship with the liver. Although they are similar in size and shape, the left kidney is a longer and more slender organ than the right kidney, and nearer to the midline. (Elsevier drake et al 2007)

2.1.2 Renal fat and fascia

The kidneys are enclosed in, and associated with, a unique arrangement of fascia and fat. Immediately outside the renal capsule, there is an accumulation of extraperitoneal fat—the perinephric fat (perirenal fat), which completely surrounds the kidney. Enclosing the perinephric fat is a membranous condensation of the extraperitoneal fascia (the renal fascia). The suprarenal glands are also enclosed in this fascial compartment, usually separated from the kidneys by a thin septum. The renal fascia must be incised in any surgical approach to this organ. (Elsevier drake et al 2007)
2.1.3 Kidney structure

Each kidney has a smooth anterior and posterior surface covered by a fibrous capsule, which is easily removable except during disease. On the medial margin of each kidney is the hilum of kidney, which is a deep vertical slit through which renal vessels, lymphatics, and nerves enter and leave the substance of the kidney. Internally, the hilum is continuous with the renal sinus. Perinephric fat continues into the hilum and sinus and surrounds all structures. (Elsevier drake et al 2007).

Each kidney consists of an outer renal cortex and an inner renal medulla. The renal cortex is a continuous band of pale tissue that completely surrounds the renal medulla. Extensions of the renal cortex (the renal columns) project into the inner aspect of the kidney, dividing the renal medulla into discontinuous aggregations of triangular-shaped tissue (the renal pyramids). (Elsevier drake et al 2007)
Figure (2.2) right kidney frontal section
(imageAdoptedfromhttp://classes.midlandstech.edu/carterp/Courses/bio211/chap25/chap25.htm)
2.1.4 Renal vasculature and lymphatics

A single large renal artery, a lateral branch of the abdominal aorta, supplies each kidney. These vessels usually arise just inferior to the origin of the superior mesenteric artery between vertebrae LI and LII. The left renal artery usually arises a little higher than the right, and the right renal artery is longer and passes posterior to the inferior vena cava. As each renal artery approaches the renal hilum, it divides into anterior and posterior branches, which supply the renal parenchyma. Accessory renal arteries are common. They originate from the lateral aspect of the abdominal aorta, either above or below the primary renal arteries, enter the hilum with the primary arteries or pass directly into the kidney at some other level, and are commonly called extrahilar arteries (Elsevier drake et al 2007). Multiple renal veins contribute to the formation of the left and right renal veins, both of
which are anterior to the renal arteries. Importantly, the longer left renal vein crosses the midline anterior to the abdominal aorta and posterior to the superior mesenteric artery and can be compressed by an aneurysm in either of these two vessels. The lymphatic drainage of each kidney is to the lumbar nodes around the origin of the renal artery (Elsevier drake et al 2007).

Figure (2.4) showing the major regions of the kidney (Image adopted from http://www.metrolinachaplain.org/types/site-of-blood-cell-formation

2.1.5 Overview of kidney embryology
Kidney development progresses in a cranial to caudal direction intermediate mesoderm → urogenital ridge → nephrogenic cord → urinary system
Pronephros non-functional appears by week 4 degenerates by week 5 Mesonephros development induced by pronephric duct forms mesonephric duct (Wolffian duct) interim kidney for 1st trimester opens into urogenital system
and gives rise to male genital system. Metanephros develops from mesonephric outgrowth called ureteric bud during week 5 fully canalized and functioning at week 10. Nephrogenesis continues through 32 - 36 weeks of gestation. Derivatives include (step1-embryology/3028/kidney-embryology).

![Renal Development](image)

**Figure (2.5) Embryology of Kidney**

(Adopted from medbullets.com/step1-embryology/3028/kidney-embryology)

### 2.1.6 Peritoneal Attachments

The kidneys lie in shallow depressions against the posterior abdominal wall and behind the parietal peritoneum. This means they are retroperitoneal.

Each kidney is held in place by connective tissue, called renal fascia, and is surrounded by a thick layer of adipose tissue, called perirenal fat, which helps to protect it. A tough, fibrous, connective tissue known as the renal capsule closely envelopes each kidney and provides support for the soft tissue that is inside. (http://www.daviddarling.info/encyclopedia/K/kidney.html)
2.2 Normal Physiology of the kidney:
Since the primary function of kidneys is the removal of poisonous wastes from the blood. Chief among these wastes are the nitrogen-containing compounds urea and uric acid, which result from the breakdown of proteins and nucleic acids. Life-threatening illnesses occur when too many of these waste products accumulate in the bloodstream. Fortunately, a healthy kidney can easily rid the body of these substances. (Tim Taylor 2015)
The task of cleaning, or filtering, the blood is performed by millions of nephrons, remarkable structures that extend between the cortex and the medulla. Under magnification, nephrons look like tangles of tiny vessels or tubules, but each nephron actually has an orderly arrangement that makes possible filtration of wastes from the blood. The primary structure in this filtering system is the glomerulus, a network of extremely thin blood vessels called capillaries. The glomerulus is contained in a cuplike structure called Bowman’s capsule, from which extends a narrow vessel, called the renal tubule. This tube twists and turns until it drains into a collecting tubule that carries urine toward the renal pelvis. Part of the renal tubule, called the loop of Henle, becomes extremely narrow, extending down away from Bowman’s capsule and then back up again in a U shape. Surrounding the loop of Henle and the other parts of the renal tubule is a network of capillaries, which are formed from a small blood vessel that branches out from the glomerulus. (Tim Taylor 2015)

This process is influenced by antidiuretic hormone (ADH), also called vasopressin, which is produced in the hypothalamus and stored in the nearby pituitary gland. When the amount of salt and other substances in the blood becomes too high, the pituitary gland releases ADH into the bloodstream. When it enters the kidney, ADH makes the walls of the renal tubules and collecting ducts more permeable to water, so that more water is reabsorbed into the bloodstream. The kidneys perform several other essential functions. One such activity is regulation of the amount of water contained in the blood. It also adjusts the body's acid-base balance to prevent such blood disorders as acidosis and alkalosis, both of which impair the functioning of the central nervous system (Tim Taylor 2015)

**Maintenance of Homeostasis**
The kidneys maintain the homeostasis of several important internal conditions by controlling the excretion of substances out of the body.

**2.2.1 Ions:** Kidneys can control the excretion of potassium, sodium, calcium, magnesium, phosphate, and chloride ions into urine. In cases where these ions reach a higher than normal concentration, the kidneys can increase their excretion out of the body to return them to a normal level. Conversely, the kidneys can conserve these ions when they are present in lower than normal levels by allowing the ions to be reabsorbed into the blood during filtration.

(Tim Taylor, Anatomy and Physiology Instructor 2015)

**2.2.2 pH:** The kidneys monitor and regulate the levels of hydrogen ions (H+) and bicarbonate ions in the blood to control blood pH. H+ ions are produced as a natural byproduct of the metabolism of dietary proteins and accumulate in the blood over time. The kidneys excrete excess H+ ions into urine for elimination from the body. The kidneys also conserve bicarbonate ions, which act as important pH buffers in the blood. (Tim Taylor 2015)

**2.2.3 Osmolarity:** The cells of the body need to grow in an isotonic environment in order to maintain their fluid and electrolyte balance. The kidneys maintain the body’s osmotic balance by controlling the amount of water that is filtered out of the blood and excreted into urine. When a person consumes a large amount of water, the kidneys reduce their reabsorption of water to allow the excess water to be excreted in urine. This results in the production of dilute, watery urine. In the case of the body being dehydrated, the kidneys reabsorb as much water as possible back into the blood to produce highly concentrated urine full of excreted ions and wastes. The changes in excretion of water are controlled by antidiuretic hormone (ADH). ADH is
produced in the hypothalamus and released by the posterior pituitary gland to help the body retain water. (Tim Taylor 2015)

2.2.4 Blood Pressure. The kidneys monitor the body’s blood pressure to help maintain homeostasis. When blood pressure is elevated, the kidneys can help to reduce blood pressure by reducing the volume of blood in the body. The kidneys are able to reduce blood volume by reducing the reabsorption of water into the blood and producing watery, dilute urine. When blood pressure becomes too low, the kidneys can produce the enzyme renin to constrict blood vessels and produce concentrated urine, which allows more water to remain in the blood. REF. (Tony Ogbekhuemen Reference: Microsoft Encarta Version: 2009)

2.3 Pathology of kidney

2.3.1 Renal cysts:

2.3.1.1 Simple renal cyst

Simple kidney cyst is a round pouch of smooth, thin-walled tissue or a closed pocket that is usually filled with fluid. One or more may form within the kidneys. They are the most common type of kidney cyst, and most often do not cause harm.

Simple Kidney Cyst Causes are not fully understood, but they do not appear to be inherited. Being male is a risk factor, however, as is age: Almost half of all people over the age of 50 have one or more simple cysts in the kidneys. The size of these cysts may also increase with age.

It’s Symptoms: usually do not cause symptoms. In most cases, they are found during an ultrasound or computerized tomography (CT) scans done for another reason. However, simple kidney cysts may Cause pain in the side, back, or upper abdomen if they: enlarge and press on other organs, Bleed, Become
infected, causing fever, chills, or other signs of infection Impair kidney function (rare)(Atlas of Pathology 3rd Edition)

### 2.3.1.2 Polycystic Kidney Disease

Polycystic kidney disease causes many cysts (fluid-filled sacs) to develop in the kidneys. The most common type is an inherited condition called autosomal dominant polycystic kidney disease (ADPKD).

(ADPKD) is the most common potentially lethal single-gene disorder. Its prevalence at birth is between 1:400 and 1:1,000. It may progress to end stage renal disease by age 60 with 4.4% of patients requiring renal replacement therapy (dialysis or transplant) have ADPKD. (K Dakshinamurty 2012)

With ADPKD, problems commonly do not develop until the age of 30-50, with some people never developing any problems. The two common problems that develop are high blood pressure and kidney failure. About half of people with ADPKD develop kidney failure requiring dialysis or a kidney transplant by the age of 60. Other type is Autosomal recessive polycystic kidney disease (ARPKD). A rare condition in which Problems typically develop soon after birth. It needs two faulty genes to develop this condition one from each parent (who will be well but will be 'carriers' of one faulty gene each).
2.3.2 Renal Cell carcinoma

Renal cell carcinoma (RCC) is a type of kidney cancer that starts in the lining of very small tubules of the kidney; it occurs most often in men ages 50 to 70. The exact cause is unknown. But the following may increase the risk of RCC: dialysis treatment, high blood pressure, family history of the disease, horseshoe kidney, Polycystic kidney disease, smoking, and Von Hippel-Lindau disease (a 20hereditary disease that affects blood vessels in the brain, eyes, and other body parts)

RCC Symptoms

Abdominal pain and swelling, back pain, blood in the urine, weight loss, varicocele and flank pain. Other symptoms that can occur with this disease are excessive hair growth in females, Pale skin and Vision problems
2.3.4 Kidney Stones

The medical term for this condition is **nephrolithiasis**, or renal stone disease. “Nephrolithiasis” is derived from the Greek nephros- (kidney) lithos (stone) = kidney stone. The stones themselves are also called renal calculi. The word "calculus" (plural: calculi) is the Latin word for pebble. Renal stones are a common problem in primary care practice. Patients may present with the classic symptoms of renal colic and hematuria. Others may be asymptomatic (Curhan GC, Willett WC, Speizer FE et al).

General factors that may play a role in increasing risk of renal stones include water hardness, sunlight, and heat (Parry, ES, Lister 1975).

It is formed in the kidneys from dietary minerals in the urine. Normally, urine contains chemicals that prevent the crystals from forming. These inhibitors do not work for everyone and therefore some people form stones. If the crystals remain tiny, they travel through the urinary tract and pass out of the body via urine without causing any symptoms (de vivo mj, fine pr, cutter gr et al 1985).

High fluid intake is associated with a lower risk of developing kidney stones in men and women (Curhan GC, Willett WC, Speizer FE et al 1998) while grapefruit juice consumption was associated with an increased risk (Hirvonen T, Pietinen P, Virtanen M et al 1999).
Renal abnormalities such as medullary sponge kidney, distal renal tubular acidosis and anatomical abnormalities that predispose to urinary stasis (including polycystic kidney disease) also increase the risk of stone disease. People with spinal cord injuries have increased urinary catheterization and infection, combined with urinary stasis and immobilization and are at high risk of stones. These occur most frequently in the first months after the injury and are usually infection stones (de vivo mj, fine pr, cutter gr et al 1985)

Renal stones are typically classified by their location or chemical composition,

Stones classification by location: if it is in the kidney (Nephrolithiasis), if it is in the ureter (Ureterolithiasis) and if it is in the Bladder (Cystolithiasis).

Stones classification by chemical composition: Calcium-containing, Struvite, Uric acid, Cystine and other compounds.

The stones are usually formed by one of four substances: calcium, uric acid, magnesium ammonium phosphates (or struvite), or cysteine (Walsh J ed., Campbell’s Urology 2002)

Calcium Stones. About 70 - 90% of all kidney stones are made of calcium, usually combined with oxalate, or oxalic acid. A number of common vegetables, fruits, and grains contain oxalate. (Harvey Simon 2006)

About 6% of calcium stones are made of calcium phosphate (called brushite).

Uric Acid Stones. Uric acid is responsible for close to 10% of kidney stones. It is the breakdown product of purines, nitrogen compounds found in the body and in certain foods. Uric acid enters the bloodstream, and then passes primarily into the kidneys. From the kidneys, uric acid leaves the body in the urine. Often, uric acid stones occur with calcium stones. (Harvey Simon 2006)

Struvite Stones. Struvite stones are made of magnesium ammonium phosphate. They are almost always associated with certain urinary tract infections. Worldwide, they account for up to 30% of all kidney stones. In the United States, however, fewer than
15% of all stones are struvite. Most struvite stones occur in women. The rate of these stones may be declining in America, perhaps because of better control of urinary tract infections. (Harvey Simon 2006)

Cystine Stones. A build-up of the amino acid cystine, a building block of protein, causes 1% of kidney stones in adults and up to 8% of stones in children. The tendency to form these stones is inherited. Cystine stones grow rapidly and tend to recur. If not treated promptly, they can eventually lead to kidney failure.

Xanthine Stones. Other kidney stones are composed of xanthine, a nitrogen compound. These stones are extremely uncommon and usually occur as a result of a rare genetic disorder. (Harvey Simon 2006)

The development of the stones is typically related to increased excretion of stone-forming components such as calcium, oxalate, urate or cysteine (Curhan GC, Willett WC, Speizer FE et al 1997)
2.3.4 Toxic tubular necrosis

Acute tubular necrosis (ATN) is a pathological entity characterized by destruction of tubular epithelial cells, followed by acute renal failure (oliguria, proteinuria, blood retention of urea and creatinine). Depending on etiology, there are two types of acute tubular necrosis:
first one is toxic acute tubular necrosis, after ingestion or inhalation of toxic substance ethylene glycol, mercury, lead, carbon tetrachloride, methyl alcohol, nephrotoxic drugs and the second is ischemic acute tubular necrosis - in shock Ref.http://www.pathologyatlas.ro/toxic-tubular-necrosis.php

Toxic acute tubular necrosis is characterized by proximal tubular epithelium necrosis (no nuclei, intense eosinophilic homogenous cytoplasm, but preserved
shape) due to interference of ingested toxic agents (poisons, organic solvents, drugs, heavy metals) with epithelial cell metabolism. Necrotic cells fall into the tubule lumen, obliterating it, and determining acute renal failure (oligo-anuria). Basement membrane is intact, so the tubular epithelium regeneration is possible, if the patient survives. The interstitium and glomeruli are not affected. (H&E, ob. x20)

2.3.5 Acute pyelonephritis

Acute pyelonephritis is an exudative purulent localized inflammation of kidney and renal pelvis. The renal parenchyma presents in the interstitium abscesses (suppurative necrosis), consisting in purulent exudate (pus): neutrophils, fibrin, cell debris and central germ colonies (hematoxylinophils). Tubules are damaged by exudate and may contain neutrophil casts.

In the early stages, glomeruli and vessels are normal. (Hematoxylin-eosine, ob. x10)

Figure (2.13) acute pyelonephritis

Figure (2.14) acute pyelonephritis
(http://pixgood.com/acute-pyelonephritis-ultrasound.html)
2.5 Previous study

The studies in Arab populations were based on small numbers of patients and were mostly epidemiological screening studies for urolithiasis. (B. Abbas 2003)

Prevalence and incidence of nephrolithiasis is reported to be increasing across the world. This information regarding stone incidence and prevalence from a global perspective. A total of 75 articles were identified containing kidney stone-related incidence or prevalence data from 20 countries. 34 provided suitable information for review. Data regarding overall prevalence or incidence for more than a single time period were found for 7 countries. 5 European countries (Italy, Germany, Scotland, Spain, and Sweden). Japan and United States. The body of evidence suggests that the incidence and prevalence of kidney stones is increasing globally. In the United States, overall prevalence has doubled since the 1964-1972 time period, and appears to have stabilized since the early 1980s. other countries with documented increases in prevalence include Germany, Spain, and Italy. Regional reports from Milan, Italy, also document an increased prevalence. Only Scotland has a slight decrease in prevalence from 3.83% in 1977 to 3.5% in 1987 (Romero 2010).
The history of renal stones dates back to times of Egyptian mummies. They are found in 1% of all autopsies. The distribution of urolithiasis varies differently across the world. High incidence areas are Scandinavian countries, Mediterranean, British Isles, Northern Australia, and central Europe, parts of Malaysia, China, Pakistan, and Western India. In Asia the stone belt has been reported to stretch across Sudan, Saudi Arabia, UAE, Pakistan, India, Myanmar, Thailand, Indonesia and Philippines. In the United States, overall stone prevalence has doubled since the 1964–1972 time period, and appears to have stabilized since the early 1980s. Other countries with documented increases in prevalence include Germany, Spain, and Italy. The risk of developing urolithiasis in adults appears to be higher in the western hemisphere (5–9% in Europe, 12% in Canada, 13–15% in the USA) than in the eastern hemisphere (1–5%), although the highest risks have been reported in some Asian countries such as Saudi Arabia (20.1%). (Shamsuddeen et.al 2013).
Renal stone epidemiology: A 25-year study in Rochester, Minnesota. There are no adequate studies of the incidence of urolithiasis in the United States, in spite of earlier claims that a "stone belt" exists in the southeastern section of the country. This report is the first description of the incidence and recurrence rates for symptomatic noninfected renal stones in a well-defined population. A total of 798 patients were enrolled in the study group, of whom 672 were incidence cases having had their first episode as documented residents of Rochester, Minnesota, between 1950 and the end of 1974. The annual age-adjusted incidence rate for females was stable over the 25-year study period at 36.0 per 100,000 populations. That for males increased significantly (P < 0.02) from 78.5 per 100,000 to 123.6 per 100,000.

Recurrence calculations showed a high rate for both sexes in the first year, followed by lower but constant rates for all succeeding years. (M Johnson et.al 1978).
Studying the prevalence of renal stones based on the patients’ socio-demographic factors such as sex, age, resident region etc. and to determine the risk factors of renal stones among Omani population in the North Batinah Governorate. One of the objectives is to study on management of renal stones at Sohar Hospital. All Omani in-patients who had renal stones and were admitted in the hospital from 1st January, 2010 till 31st May, 2012 were included in the study. The results showed that renal stones disease in Omani population was more common in the age group between 30 to 39 years. It occurred in both men and women, but the risk was generally higher in men than in women. No association between the patients’ age, gender and their resident place was found in the studies conducted. There are many factors that decided the patient’s stay in the hospital such as hospital facilities, beds availability and the requirements of each patient condition. Sohar hospital was able to manage the disease and keep it under control. Around 75% of total patients left the hospital in stable condition.(Scholars Journal of Applied Medical Sciences (SJAMS)2014)
In Minnesota, a retrospective analysis of childhood incidence of kidney stones showed that, for children under the age of 18, the incidence increased from 13 per 100,000 person-year in the period of 1984-1990 to 36 per 100,000 person-years in 2003-2008 (Dwyer et al. 2012). In South Carolina, an increase of childhood incidence of kidney stones was also reported. Among 1,535 children who had had an episode of nephrolithiasis between 1996 and 2007, the incidence increased from 7.9 per 100,000 in 1996 to 18.5 per 100,000 children in 2007. Interestingly, a higher rate of increase was noted among girls (Sas et al. 2010; Sas 2011). Lifetime prevalence for kidney stones approaches 10% but it can vary according to geography (Shah and Whitfield 2002). (Dwyer et al. 2012; Sas et al. 2010; Sas 2011; Shah and Whitfield 2002)

This increase in childhood prevalence of urolithiasis is often attributed to changes in habits, and in particular in diet (Lopez and Hoppe 2010; Sarica et al. 2009).
ATLANTA -- Kidney stone prevalence increased by 70% over the past two decades -- in people without traditional risk factors for stone formation as well as those in whom they might be expected, investigators reported here. Data from a nationwide survey showed that stone prevalence rose from 5.2% from the mid-1990s to 8.8% in 2010, Charles D. Scales, MD, reported at the American Urological Association meeting. A similar proportional increase occurred in the number of individuals who reported passing a kidney stone, suggesting the results are not artifacts, Scales said. Stone prevalence increased in men and women, across all age groups, and across all racial/ethnic groups. The total kidney stone burden matches or surpasses that of several chronic diseases, including diabetes, coronary heart disease, and stroke, said Scales, of the University of California Los Angeles.(Bankhead 2012).

Keeping the history in various parts of the world in mind, this research is a Survey study of prevalence of renal stones in the primary school students of the north state of Sudan by using ultrasound scanning.