# EPIDEMIOLOGICAL PATTERN OF PRESENTATION OF PARAGONIMUS INFECTION IN THE HUMAN HOST IN SOUTH EAST NIGERIA AND THEIR CORRELATIVE SONOGRAPHIC FINDINGS IN SOME ORGANS

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**ABSTRACT**

In a cross-sectional survey, 304 subjects whose sputum and faeces tested positive for paragonimus out of a total of 1125 from Amagunze, Lokpanta and Oduma which are areas known for the parasite endemicity in Southeast Nigeria were enlisted into the study.

The liver, spleen, and kidney of these subjects were sonographically examined in order to characterize the sonographic features specific for paragonimus in these organs. A total number of 456 subjects were also enlisted as control.

Characterization was based on echotexture scoring on a 4 point likert scale of normal, dark (echopoor), coarse and echogenic texture and presence of cysts, which were validated by three independent experts. The organ dimensions were also included as criteria for the characterization.

Three hundred crabs collected from these locations were also examined using standard method for the burden of the parasite. Using SPSS version 16.0, ANOVA and students t-test were done on the length of the liver, spleen and kidneys with age and sex as factors and to determine difference of continuous variables between two independent groups. Out of the 300 crabs examined, only 25 (8.3%) were positive mainly for paragonimus uterobilateralis and the burden ranged from 1-75 per crab. Two hundred and twenty four (224) 73.7% out of 304 subjects showed presence of paragonimus in the sputum while only N=80 (26.3%) had the parasite in the stool. The male – female ratio of the infected subjects were 168:136. The echotextural characterization show that N=25 were echopoor (dark), 20 had liver cyst and 7 had coarse echotexture. The mean organ dimensions of the liver, spleen and kidneys in infected subjects were; 13.8 + 1.03cm, 11.57 + 2.11cm and 9.6 + 1.27cm respectively. The mean organ dimensions of the liver, spleen and kidneys for the control subjects were; 12.56 + 1.66cm, 10.83 + 2.05cm and 9.65 + 1.66cm respectively. No significant differences were demonstrated in the organ dimensions between the infected and control (p > 0.05).

The sonographic features observed in this study include, hepatosplenomegaly, pleural effusion, dark echotexture, coarse and echogenic texture and liver cyst.

#### CHAPTER ONE

**INTRODUCTION**

#### BACKGROUND OF THE STUDY

Paragonimiasis also known as lung fluke disease is a parasitic disease in humans and other mammals caused by infection with paragonimus species (Nkouama et al, 2009; Procop 2009; Sohn et al, 2009). Paragonimus species are widely distributed globally and have a broad diversity of domestic and wild animal hosts (Diaz, 2013). There are over forty species in the paragonimus genus. Over ten of these infect humans (Nguyen, 2004). It was first discovered from two Bengal tigers that died in zoos in Europe in 1878 (Muller,1996; Procop,2009). Paragonimus species are highly evolved parasites with a complex life cycle that involves at least three different hosts ie snails, crustaceans and mammals. Manson proposed the snail as an intermediate host and various Japanese workers detailed the whole life cycle in the snail between 1916 and 1922(Groove, 1990). The first case described in humans was at autopsy in Taiwan in 1897, when adult flukes were found in the lung (Liu et al, 2008). Eggs in the sputum were discovered independently by Manson and Erwin Von Baelz in 1880 (Muller, 1996; Manson, 1881). The parasite is easily spread. Human infection is acquired by the consumption of raw or improperly cooked crustaceans including crayfishes and crabs. It often occurs by ingestion of infectious metacercariae in freshwater crab or crayfish (Sugiyama et al, 2009). There are cases where patients diagnosed with paragonimiasis reported that they had never eaten freshwater crabs or crayfish. It is also possible that they ate food contaminated with metacercariae from the fingers or cooking utensils of people who recently handled these crustaceans (Nakamura et al, 2002). Consumption of animals which feed on crustaceans can also transmit the parasite for cases have been cited in Japan where raw boar meat was the source of human infection (Markell and Voges, 2006). Pickling and salting which are food preparation techniques do not eliminate the causative agent. Development of eggs first occur in water after being expelled by coughing or being passed in human faeces. Paragonimus ova passed in the sputum or faeces hatch into miracidiae which then infect certain snails in which they develop into radiae and cercariae. The primary source of infection is the lung but other organs may also be involved. Paragonimus infection has a gradual onset and is characterised by low grade fever, productive cough and occasionally dry cough, night sweats, excruciating chest pain, diarrhoea, and blood stained, rust brown sputum (Cheesbrough, 2005). Infection with paragonimus can either be acute or chronic.

The acute phase of the infection is said to be the stage of parasite invasion and migration. This phase lasts for several weeks and the symptoms include; abdominal pain, diarrhoea and urticaria. These initial symptoms are then followed a few days later by fever, dyspnoea, chest pain, malaise, sweats, hepatosplenomegaly, and eosinophilia. The chronic phase manifestations may be pulmonary or extra-pulmonary. Chronic pulmonary manifestations consist of dry cough followed by a cough productive of persistence and rusty or golden sputum. This phase is also characterised by haemoptysis, chest pain and radiographic abnormalities that can persist even

several years after treatment (Moyou-Somo and Tagni, 2003). Pulmonary symptoms begin approximately 6 months after infection and are often mistaken for symptoms of tuberculosis. The American college of chest physicians has established clinical practice guidelines for TB and other infections (Rosen, 2006). Extra-pulmonary paragonimiasis can be divided into cerebral, abdominal, subcutaneous, and miscellaneous forms of the disease. It can occur either from the migration of young or mature flukes to various organs or from eggs that enter the circulation and are carried to any of the following sites; liver, spleen, kidney, brain, intestinal wall, peritoneum, mesenteric lymph nodes, muscle, testis/ovary, subcutaneous tissues, and spinal cord. Cerebral paragonimiasis is the most common extra-pulmonary site of infection and is responsible for 50% of all extra-pulmonary disease (Liu et al, 2008). Moreover it is seen in as many as 25% of patients requiring hospitalization. About 20% of patients with paragonimiasis are asymptomatic (Uchiyama et al, 1999).

During the journey from the intestine to the lungs, where juvenile worms mature, the juvenile worms often cause damage to the liver capsule and parenchyma (Yakogawa, 1965; Hu et al, 1982; Li et al, 2012). The parasites excyst in the small intestine penetrate the intestinal wall and enter the peritoneal cavity. They then proceed to the diaphragm, pleural cavity and the lung (Noble and Noble, 1982). The juvenile worms enter into the abdominal muscles and stay there for 5 -7days and come back into the abdominal cavity. They finally reach the lung where they become mature adult worms. Sometimes infection usually resolves without treatment and persons with light infections may have no symptoms. Lesions within the abdomen are probably common but are rarely recognised because they do not show symptoms and may not be shown without computed tomography (CT) or ultrasound. No age is immune to this infection but the disease is particularly prevalent in the 10 to 14 year age group (Nwokolo, 1972a).

Paragonimus species are extremely successful parasites and are widely geographically distributed. They are found in tropical, subtropical and temperate climates (Procop, 2009). Infection with paragonimus is more common in Southeast Asia because of their life styles. Raw seafood is a popular deilicay in these countries. In Taiwan for instance, crab hunters string raw crabs together and bring them for sale in the markets thereby making it more accessible to those who consume them.

In Africa paragonimiasis is geographically clustered around the intertropical zone (Aka et al, 2008) as 80% of the ten countries in the continent where paragonimiasis has been reported are in this zone. Two species of paragonimus are described on this continent (Voelker and Vogel, 1965) and other two species were suspected (Cabaret et al, 1999). Paragonimus africanus and paragonimus uterobilateralis are known as the main pathogens of human paragonimiasis in Africa.

In Nigeria the first case of paragonimiasis was diagnosed in 1939 and since then several cases have been detected. There was an outbreak of paragonimiasis in Southeastern Nigeria during the Biafran war that took place from 1967 to 1970. During this period there was a lot of food

scarcity and because of this many people changed their eating habit, particularly by consuming crabs. Most patients were children and originated from the region of Okigwe. Paragonimus utrobilateralis was recognized as the responsible species (Nwokolo, 1964; Nwokolo, 1972; Nwokolo, 1973; Voelker, 1975). Since 1974, several papers demonstrated that the neighbouring districts of Okigwe and Umuahia in the eastern part of Nigeria were endemic zones for paragonimiasis. According to (Sachs and Voelker, 1975), the two factors favouring parasitosis extension were local habits to eat crustaceans and lack of hygiene of these populations. Crabs are still eaten in many communities where they are found in large numbers and mainly by children of school age. These children catch the crabs either in burrows or the streams without the knowledge of their parents or guardians, prepare them and eat them. Preparation is usually by cooking or roasting and may not be properly done. Crab collectors string raw crabs together and bring them to markets and other strategic locations for sale. Eating of crabs in these communities is seen as a source of protein. Some adults also eat these crabs for one reason or the other. There is an unestablished claim that crabs are used to cure cough in the communities where they are consumed. This they do by boiling the crabs and the water remaining after cooking is then given to the patient in a quantity as may be determined by the care giver. Pregnant women are also encouraged to eat crabs in these communities because according to them this helps to keep the foetus vibrant and also to develop strong bones. They are also local delicacies in these communities. Many species of crabs constitute an important part of the local food chain in sub- saharan Africa (Bell-Osuji et al, 2006).

There is a need for accurate and sensitive diagnosis of paragonimiasis both at individual and community levels. A diagnostic procedure can be used for a number of applications, ranging from clinical diagnosis of an individual case to the evaluation of control measures. The most reliable means of diagnosis of pulmonary paragonimiasis is finding of parasite eggs in sputum, faeces, pleural effusion and bronchoscopic washing or biopsy specimens (Toscano et al, 1995). However sputum examination for detection of eggs is less sensitive method for diagnosis of paragonimiasis and up to seven sputum examinations are recommended in suspected patients (Toscano et al, 1995). The parasite eggs are not detected during the dormant period of infection or in extra-pulmonary paragonimiasis and the eggs are not present until 2 to 3 months after infection. Occasionally however, eggs are also seen in effusion fluid or biopsy material. Several efforts have been made in the past to develop immune-diagnostic methods for detection of paragonimiasis. One of the earliest tests used for diagnosis is intradermal test (ID test) (Blair et al, 1999). However, its major disadvantage is the cross reactions with other trematodes (Blair et al, 1999) and allergic reactions caused in some patients after their skin test (Chen, 1985). Subsequently enzyme linked immmunosorbent assay (ELISA) for detection of antibodies against lung flukes became popular because of suitability for mass screening (Pariyanonda et al, 1990; Maleewong et al, 1990). Many workers have used ELISA for detection of antibodies against host sera. However, most of these workers used crude somatic antigens with the result cross- reactivity with sera of persons suffering from schistosomiasis clnorchiasis and other trematodes were reported. Another important limitation of using somatic antigen is cross reactions with sera

of persons having schistome cercarial dermatitis (Narian et al, 2005). Attempts have been made to reduce cross-reactions by either using partially purified antigens or subjecting test sera to adsorption with heterogenous antigens prior to ELISA (Choi et al, 1992). Superiority of excretory/secretory antigens for increasing the specificity of the ELISA has been demonstrated by several workers (Maleewong et al, 1990). Antibody detection is useful in light infections and in the diagnosis of extra-pulmonary paragonimiasis. In the United States, detection of antibodies to paragonimus westermani has helped physicians differentiate paragonimiasis from tuberculosis in Indochinese immigrants. Radiological methods can be used to x-ray the chest and look for damages caused by the parasite. This method is easily misdiagnosed because pulmonary infections look like tuberculosis, pneumonia, or spirochaetosis. Radiological images show nodular infiltration, sometimes pleural fluid and/or cavities. Olympic ring pictures seen on chest radiographs are pathognomic of paragonimiasis (Aka et al, 2008). In order of frequency the common shadows seen on radiographs are either well defined patches of cavitation, ill defined cotton wool lesions, streaky shadows or bubble cavities (Ogakwu and Nwokolo 1973). The midzones are most commonly affected but any part of the lung may be marked. The shadows are generally of low density and may be difficult to differentiate from the early lesions of pulmonary tuberculosis. Imaging studies may increase the confidence of clinical diagnosis and demonstrate the extent of involvement.

There is resurgence of tuberculosis in human immune virus/acquired immunedeficiencysyndrome (HIV/AIDS) patients and also an increase in the incidence of neglected tropical diseases including paragonimiasis. This further complicates the diagnosis of paragonimiasis. There is therefore the need to develop other imaging technique with high specificity for paragonimiasis in order to improve management.

Ultrasonography is increasingly being used as the investigation of first choice in soft tissue imaging, in obstetrics and gynaecology and in the evaluation of upper abdominal abnormalities. The mobility of the equipment and ease of use together with the fact that it is non-invasive and causes no harm to the patients make ultrasound the ideal technique for investigating possible soft tissue changes associated with paragonimiasis. It can be used as a valuable tool for localisation of abnormalities and detecting different types of disease conditions. Ultrasonography is relatively safe and serves as a means of imaging internal anatomy. It does not involve the use of ionizing radiation and it is relatively cheap and affordable. Changes demonstrated in ultrasonography include change in organ size, shape, echogenicity and echopattern. This limited number of parameters may be affected by a wide range of disease processes and thus it is not surprising that many sonographic features are very non specific. The ultrasonographer must be able to demonstrate as many sonographic abnormalities as possible and also interpret these abnormalities in the light of any clinical information given and the results of other investigation.

#### STATEMENT OF PROBLEM

1. Public health significance of paragonimiasis is not quite recognized because this disease is frequently misdiagnosed as pulmonary tuberculosis. In countries where both diseases co exist, there is usually a public health problem in identifying the particular disease due to similarities in their clinical and radiological presentations thereby increasing the chances of diagnostic errors. Some cases of pulmonary paragonimiasis have been diagnosed as smear negative tuberculosis and were subsequently treated with anti-tuberculosis drugs. The implication of this blind therapy is considerable, because the patient gets anti-tuberculosis treatment for a non-tubercular condition. Normally communities in remote areas perceive treatment success or failure with the disappearance of symptoms (haemoptysis and chronic cough) in this situation (Mahajan, 2005).
2. In spite of some reports of this parasitosis in Africa, the total number of patients affected by this disease cannot be accurately quantified because of the following reasons (Aka et al, 2008);
   * Tuberculosis offends paragonimiasis in their flagrant clinico-radiological similarities thus often causing their differentiation only after a long series of investigations.
   * Paragonimiasis is not listed in the official registers of illness kept by different African ministers of public health yet it poses great threat to human health in areas endemic with the parasite.
   * Owing to the lack of awareness of local health professionals to paragonimiasis, this disease is little evoked in the face of chronic cough simulating pulmonary tuberculosis so that probably several cases of paragonimiasis are long undetectable.
3. Paragonimiasis is a neglected tropical disease and with the resurgence of tuberculosis in HIV/AIDS patients, the diagnosis is further complicated.
4. The correct diagnosis of smear negative tuberculosis in areas where paragonimiasis and tuberculosis coexist cannot be sufficiently made using x-ray and clinical history alone.
5. The need to assess the potentials of soft tissue imaging and isolation of feature specific for paragonimus for ease of identification.

#### AIMS AND OBJECTIVES

General Objective

To assess the sonographic features of paragonimus infestation of some abdominal organs in confirmed infected subjects.

Specific Objectives

* + 1. To determine the load of paragonimus in crabs from Lokpanta, Amagunze and Oduma. 2 . To determine the load of paragonimus in the infected subjects.

1. To characterize the echotexture of the liver, spleen and kidneys in persons infected with paragonimiasis.
2. To assess the size of the liver, spleen and kidneys in infected individuals.
3. To compare the echotexture and size of the organs in infected persons and normal (control) subjects.
4. To correlate sonographic changes with the degree of infestation.

#### SIGNIFICANCE OF STUDY

1. This will help in making early and appropriate diagnosis for this disease condition.
2. It will help to eliminate the confusion that occurs between paragonimiasis and tuberculosis because of the similarities that exist in their clinical features.
3. The number of cases that will advance to the pulmonary stage will be reduced or eliminated.

#### SCOPE OF STUDY

This study was carried out in Lokpanta, Oduma, Amagunze and University of Nigeria Teaching Hospital Enugu from January 2010 to September 2014. It involved children and adults.

#### OPERATIONAL DEFINITION OF TERMS

1. EPIDEMIOLOGY: This means the scientific study of the distribution of diseases.
2. PARAGONIMIASIS: Paragonimiasis also known as lung fluke is a parasitic disease in humans and other mammals caused by the infection with paragonimus species (Nkouama, 2009).

3 PARASITE: An organism that leaves on or in an organism of another specie known as the host from the body of which it obtains nutrient. Parasites can cause disease in humans. Some parasitic diseases are easily treated and some are not. The burden of these diseases often rests in communities in the tropics and subtropics, but parasitic infections also affect people in developed countries.

1. ORGAN: A part of the body composed of more than one tissue that forms a structural unit responsible for a particular function(s). Examples are heart, lungs, liver, kidneys etc.
2. INFESTATION: This means the presence of animal parasites either on the skin or inside the body.
3. INFECTION: Infection is the invasion of the body by harmful organisms (pathogens), such as bacteria, fungi, protozoa, ricketsiae, or viruses. The infecting organism may be transmitted by a

patient or carrier in air borne droplets expelled during coughing and sneezing or by direct contact such as kissing or sexual intercourse, by animal or insect vectors, by ingestion of contaminated food or drink and organisms from animal intermediate hosts.

1. ZOONOSIS: An infectious disease of animals that can be transmitted to man.
2. ENDEMIC: Occurring frequently in a particular region or population.
3. HEPATOMEGALY: Enlargement of the liver to such an extent that it can be felt below the rib margin. This may be due to congestion (as in heart failure), inflammation, infiltration and tumour.
4. SPLENOMEGALY: Enlargement of the spleen. It most commonly occurs in malaria, schistosomiasis and other disorders caused by parasites; in some infections, in blood disorders including some forms of anaemia or lack of platelets.
5. CYST: An abnormal sac or closed cavity with epithelium and filled with liquid or semisolid matter. There are many varieties of cyst occurring in different parts of the body.
6. PREVALENCE: In epidemiology it is the proportion of a population found to have a condition (typically of a disease or a risk factor such as smoking). It is arrived at by comparing the number of people found to have the condition with the total number of people studied, and it is usually as a fraction or percentage or as the number of cases per 10,000 or 100,000 people.
7. ULTRASONOSGRAPHY: The visualisation of deep structures of the body by recording the reflections of the echoes of ultrasonic pulses directed into the tissues. Use of ultrasound for imaging or diagnostic purposes employs frequencies from 1.6 to 10 MHZ.
8. FREEZE FRAME: Control that stops a moving real time image for photography or prolonged evaluation (WHO, 1995).
9. TIME GAIN COMPENSATION (TGC): This control compensates for the loss (attenuation) of the sound beam as it passes through tissue.
10. PLEURAL EFFUSION: Is the excess fluid that accumulates in the pleural cavity, the fluid space that surrounds the lungs. Excessive amounts of such fluid can impair breathing by mass effect, limiting the expansion of the lungs during ventilation. Various kinds of pleural effusion depending on what caused its entry into the pleural space are, hydrothorax (serous fluid), haemothorax (blood), chylothorax (chyle) or pyothorax (pus). Pneumothorax is the accumulation of air in the pleural space.

#### CHAPTER TWO LITERATURE REVIEW

* 1. **: EPIDEMIOLOGY AND RISK FACTORS**

There are several species of paragonimus that cause most infections. The most common is P. Westermani which occurs primarily in Asia including China, Japan, the Philipines, Vietnam, South Korea, Taiwan and Thailand. P. Africanus causes infection in Africa and P. Mexicanus in Central and South America. Specialty dishes in which shellfish are consumed raw or prepared only in vinegar, brine or wine without cooking play a key role in the transmission of paragonimiasis. Raw crabs or crayfish are also used in traditional medicine practices in Korea, Japan and some parts of Africa.

In Kupe mountain (Cameroon) a significantly higher prevalence was noted in females compared to the male’s group. This seen difference was attributed to the belief by the Bakosi tribe which constitutes the population of the zone, that crabs are a valuable aid to fertility in females (Moyou-somo et al, 2003).

In Nigeria it is a source of protein to many who live in areas where crabs are found and this form a major delicacy for this group of people. There is a belief that pregnant women who eat crabs stand the chance of having well formed, vibrant and strong fetuses that will be delivered with very strong bones. Crabs are also used to treat cough by the villagers in some parts of Southeast Nigeria. This is done by boiling the crabs to an extent as determined by the care giver. The water that is left after boiling is then given to the patient as determined by the care giver.

Although rare, human paragonimiasis from P. Kellicotti has been acquired in the United States, with multiple cases from the Midwest. Several cases have been associated with the ingestion of uncooked crayfish during river raft float tips in Missouri.

This parasite is easily spread because it is able to infect other animals. An assortment of mammals and birds can be infected and act as paratenic hosts. Ingestion of the paratenic host can lead to infection of this parasite. As agents of a neglected tropical disease (Utzinger et al, 2012), there is tendency for people to regard lung flukes as unimportant and imposing a decreasing and trivial burden on human populations, having been eliminated in many formally endemic areas. This is dangerous and misleading; recent estimates indicate that paragonimiasis is a major and continuing problem with 292 million people at risk (Utzinger et al, 2012; Furst et al, 2012) and

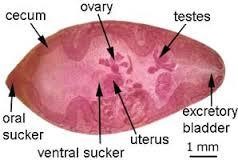
about 23 million people in 48 countries (mostly in China) actually infected in the year 2005 (Utzinger et al, 2012).

#### : MORPHOLOGY OF PARAGONIMUS

Paragonimus westermani is an adult of the haemaphroditic generation. It is a plump reddish brown oval worm measuring about 7.5mm to 12mm long and 4mm to 6mm wide. The size, shape and colour resemble a coffee been when alive. The thickness ranges from 3.5mm to 5mm. The skin of the worm (tegument) is heavily covered with scale-like spines. The oral and ventral suckers are similar in size, with the later placed slightly pre-equatorially. The excretory bladder extends from the posterior end to pharynx. The lobed testes are adjacent from each other located at the posterior end, and the ovaries are off centred near the centre of the worm. The uterus is located in a tight coil to the right of the acetabulum, which is connected to the vas deferens. The vitelline glands which produce the yolk for the eggs are widespread in the lateral field from the pharynx to the posterior end. By viewing the tegumental spines and shape of the metacecariae, one could distinguish between the 30 species of paragonimus spp.

Paragonimus westermani eggs range from 80 to 120 cm long by 45 to 74cm wide. They are yellow-brown, ovoid or elongate, with a thick shell, and often asymmetrical with one end slightly flattened. At the large end, the operculum is clearly visible. The opposite (abopercula) end is thickened. The eggs are unembryonated when passed in sputum or faeces. The cercariae are often indistinguishable between species. There is a large posterior sucker, and the exterior is spined. The metacecariae are usually encysted in tissue. The exterior is spined and has two suckers.

*MORPHOLOGY OF PARAGONIMUS WESTERMANI*



## PARAGONIMUS WESTERMANI ADULT

Fig 2.2 Image of paragonimus egg

*Life cycle image and information courtesy of DPDx*

***PARAGONIMUS WESTERMANI EGG/CDC***

**2.3: LIFE CYCLE**

## PARAGONIMUS WESTERMANI EGG/CDC

Fig 2.2 Image of paragonimus egg

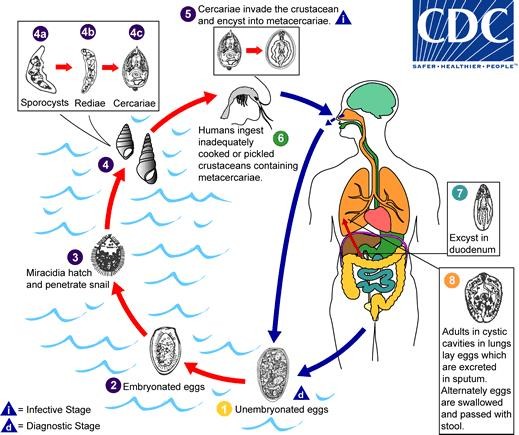
*Life cycle image and information courtesy of DPDx*

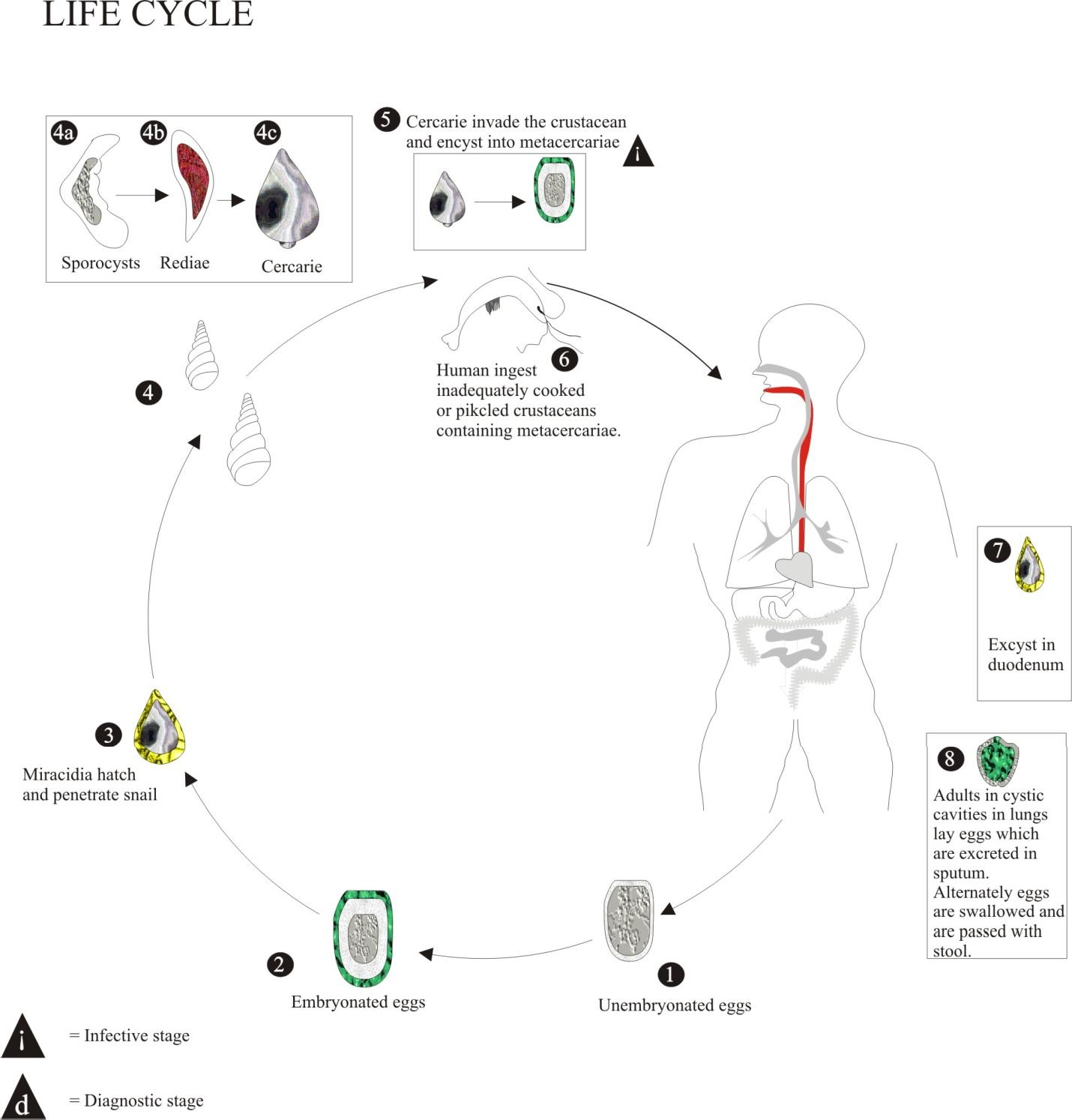
* 1. LIFE CYCLE

Paragonimus is a typical digenean trematode of carnivorous mammals. Large immature eggs are spread throughout in stool, and mature to miracidia in freshwater. They infect snails in which they undergo three generations of asexual reproduction (redia, daughter redia and cercaria). The life cycle of these flukes involves two intermediate hosts plus humans. Its complex life involves seven distinct phases: egg, miracidium, sporocyst, redia, cercaria, metacercaria and adult. Adult flukes live in human lungs and deposit eggs into the bronchi. Eggs are expelled either by coughing or by being swallowed and deposited in human faeces. Eggs then develop in water for 2-3 weeks and ultimately release miracidia which invade the first intermediate host (a specific species of freshwater snail). These miracidia develop through sporocyst and rediae stages into cercariae. The cercariae emerge and invade the second intermediate host (crustacean such as crabs or crayfish), in which they become metacercariae.

#### LIFE CYCLE:

*Life Cycle Image and Information Courtesy of* **DPDx***. Fig 2.3 Image of life cycle of p.westermani*

***Life Cycle Image and Information Courtesy of DPDx Fig. 2.3: Image of life cycle of p.westermani***



#### Fig 2.4 Diagramatic representation of the life cycle

When humans ingest raw infected crustaceans, larval flukes develop in the small intestine and penetrate the intestinal wall into the peritoneal cavity 30 minutes to 48 hours after encysting. They then migrate into the abdominal wall or liver where they undergo further development. Approximately one week later, adult flukes reenter from the abdominal cavity and penetrate the diaphragm to reach the pleural space and lungs. The eggs may then be expectorated or swallowed. If these eggs reach a water source, the life cycle will start all over again (Boe, 2007). Flukes mature, a fibrous cyst wall develops around them and then egg deposition starts 5-6 wks after infection. Lung flukes may live 20 years or more. In Japan, transmission has also occurred following human ingestion of raw pork from wild pigs that contained the juvenile stages of paragonimus species.

#### : PUBLIC HEALTH AND PREVENTION STRATEGIES

The prevention strategies programme should be geared towards more hygienic ways of preparing food especially by adopting safer cooking methods and more sanitary handling of potentially contaminated seafood. The elimination of the first intermediate host, the snail is not tenable due to the nature of the organisms habit (Yokagowa, 1965). Control of this organism in the wild is not feasible because of the wide geographic distribution of crayfish and mammalian intermediate hosts that eat crayfish and serve as definitive hosts for this parasite.

Research particularly, that of behaviour should be a major component of prevention strategies. As part of prevention strategy the training of physicians should be such as to create more awareness of this disease and the education targeted at the general population.

There is the need to provide information to radio and television media and also to local and national print to promote the knowledge and awareness of this disease. Consumption of traditional meals containing improperly cooked freshwater crustaceans should be avoided by travellers.

#### : ANATOMY AND PATHOLOGY.

**LIVER:** The Liver is the largest abdominal organ, weighs 1.5kg and lies in the upper abdomen, predominantly on the right side. It has an overall wedge-shape tapering from the right to the left with a domed upper surface that fits under the cupola of the diaphragm.

The flatter inferior surface is actually tilted quite markedly so that it faces posteriorly and to the left-thus it is more informatively described as the visceral surface. The superior surface is relatively featureless but by contrast the visceral surface is complex because it contains the liver hilum (porta hepatis) and also is indented by the shallow fossae that accommodate the organs that are in direct contact with the liver. These are the stomach on the left, and moving to the right the diaphragm and the gallbladder, the inferior venacava and the right kidney.

Anatomically the liver is divided into larger right and smaller left lobes separated by the inter lobar fissure. In addition there are two smaller lobes, the caudate and quadrate lobes. The caudate lobe lies between the IVC and inter lobar fissure and gallbladder caudal to the porta hepatis. It has its own blood supply and it is posterior to and separated from the left lobe by the ligamentum venosum (a remnant of the fetal sinus venosus) which appears as an echogenic interface posterior to the left lobe. The caudate lobe may be considered as a finger like extension from the upper posterior part of the right lobe (Brown et al, 1984). The porta hepatis is the site where the portal vein, common bile duct and proper hepatic artery (portal triad) enter the liver. It is located just anterior and lateral to the IVC. It extends into the liver until the point at which the portal vein takes off from the main portal vein.

The assessment of the echoes from liver parenchyma forms part of virtually every upper abdominal ultrasound (US) examination and yet the information derived from these US reflections is one of the least well utilized facets of ultrasound scanning (Cosgroove, 1993). The normal liver parenchyma returns a homogeneous background of low level echoes within which the normal hepatic and portal venous structures can be identified. Various pathological processes may result in either increase or decrease of echo pattern and in the alteration of the shape of the liver. All US features need to be evaluated whenever the liver is examined.

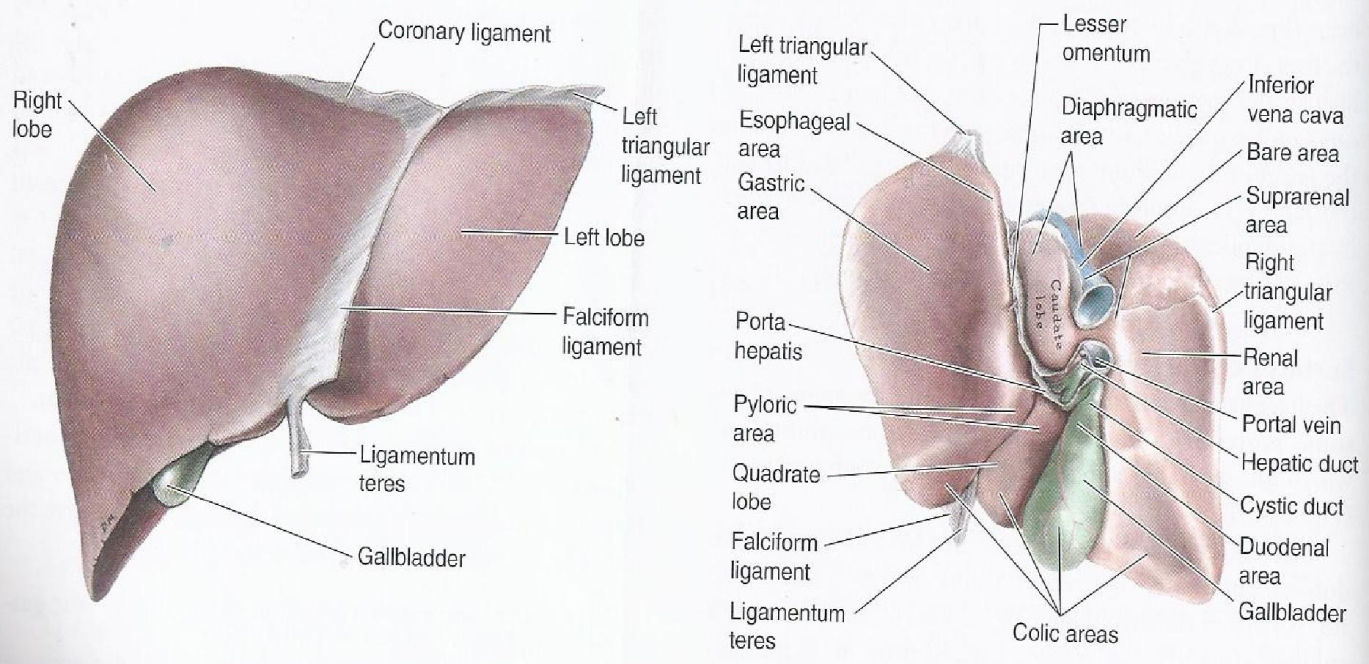


Fig.2.5: Surfaces and peritoneal ligaments of the liver showing the anterior part of the diaphragmatic surface of the liver and the visceral surface of the liver.

( Moore (1999) Clin. Anat., 264)

**FATTY INFILTRATION:** The accumulation of fatty droplets within hepatocytes occurs in response to a variety of infections to the liver that interfere with the normal metabolism, deficiency of hypotropic or transportation of abnormally large amount of fat to the liver. The more important causes encompasses a long list including alcohol, diabetes mellitus, obesity, pregnancy, drugs (especially corticosteroids) and toxic substances, malnutrition due to dietary deficiency or wasting diseases, parenteral hyperalimentation and in born errors of metabolism (Scataridge et al, 1984,; Campito, 1986). Fatty infiltration is adynamic process; its severity may alter rapidly over weeks or even days. Fat causes increased reflectivity presumably due to the interphase produced by multiple fat droplets producing increased echo amplitude of the parenchyma, giving the typical appearance of a bright liver.

**CIRRHOSIS:** This is a pathological condition due to severe liver damage in which the liver shows evidence of both damage and repair. Pathologically it can be divided into two; micro and macronodular forms depending upon the size of the regenerating nodules though in the late stage cirrhosis the two forms merge as microscopic nodules enlarge. The two commonest causes are alcoholic damage and viral hepatitis.

The pathological features of the cirrhosis of the liver are parenchymal destruction with nodular regeneration and fibrosis resulting in architectural destruction. In cirrhosis the liver becomes hyperechoic, decreases in size and starts to develop a nodular border. In long standing, end stage cirrhosis, the liver becomes atrophied and echogenic. Splenomegaly and ascites may be present. Portal hypertension will occur with advanced cases.

The US appearances are not specific for any particular type of cirrhosis and while some cirrhotic livers may appear normal on ultrasound scans, abnormalities can be recognized in approximately two thirds of cases. Increased hepatic echogenicity is seen more frequently in micronodular than macronodular cirrhosis though the later is associated with a greater incidence of hepatoma which may complicate five percent of cases. Regenarating nodules are rarely seen sonographically and when identified may be indistinguishable from hepatoma.

**SPLEEN:** The spleen is the predominant organ in the left upper quadrant. It lies immediately under the left hemidiaphragm and may be difficult to see because of gas in the neighbouring lung and ribs. It lies superior to the left kidney and lateral to the adrenal gland and tail of the pancreas. The left lobe of the liver is often in contact with the spleen. In the young adult the spleen is approximately 3x18x13cm and weighs 20- 300mg but the size is very variable and may change in short space of time in response to and other stress. It is larger in relation to total size and decreases in size in middle and old age.

**SPLENOMEGALY:** The size and shape of the spleen are very variable, some being long and thin while others are short and thick. This variation together with the natural tendency of splenic size to vary during infective episodes makes assessment of minor changes in size very subjective. Despite this splenomegaly is usually demonstrable sonographically before it is clinically evident. The enlarged spleen may extend inferiorly over the left kidney improving renal visualization.

Splenic enlargement occurs in a wide range of systemic or focal diseases: acute and chronic infections (malaria, tuberculosis), blood dycrasias, tumours, hereditary storage disease (Gaucher’s), chronic liver disease (portal hypertension, portal and spenic vein thrombosisma and sarcoids).

**KIDNEY:** The kidneys are reddish brown, bean shaped organs situated retroperitoneal on the posterior abdominal wall. They extend from thoracic vertebrae to lumbar vertebrae (T12-L3). Normally the kidney is the size of a mouse and measures approximately 11-12cm in length, 5-

6cm in width and 2.5-5.3cm in thickness. They have superior and inferior pole, medial and lateral margins and an anterior and posterior surface. The superior pole of each kidney is deep to the rib cage. For the right kidney its superior pole is at the 12th rib and for the left, the superior pole is at ribs 11 and 12.

On the medial margin of the kidney is a concave region called the renal hilum. The renal hilum is the entrance of the renal sinus. Structures such as the renal veins, artery, nerves and lymphatic vessels are located in the renal hilum. The renal sinus is a fat filled cavity inside the kidney that extends from the hilum. At the hilum the ureters also exit the kidneys. The kidney is covered by a fibrous renal capsule. Each kidney is completely surrounded by perirenal fat which extends in the renal pelvis.

The cortex and medulla are the two distinct internal organs of the kidney. The cortex is the superficial outer layer of the kidney located underneath the capsule.

The medulla is the inner layer and it extends from the cortex to the renal sinus.

The renal pelvis is a funnel shaped structure that is continuous with the ureters. It is divided into calyces. Each pelvis receives about two major calyces which in turn collect urine from the papilla.

Posteriorly the kidneys are related to the diaphragm, qudratus lumborum muscle, transversus abdominis muscle 11and12th rib (left kidney) and 12th rib (right kidney), costodiaphragmatic recess, subcostal iliohyogastric and ilioinguinal nerves.

Anteriorly the right kidney is in relation to the right supra renal gland, liver, descending portion of the duodenum right coli flexure. Anteriorly the left kidney is related to the stomach, spleen, pancreas, jejenum and left coli flexure.

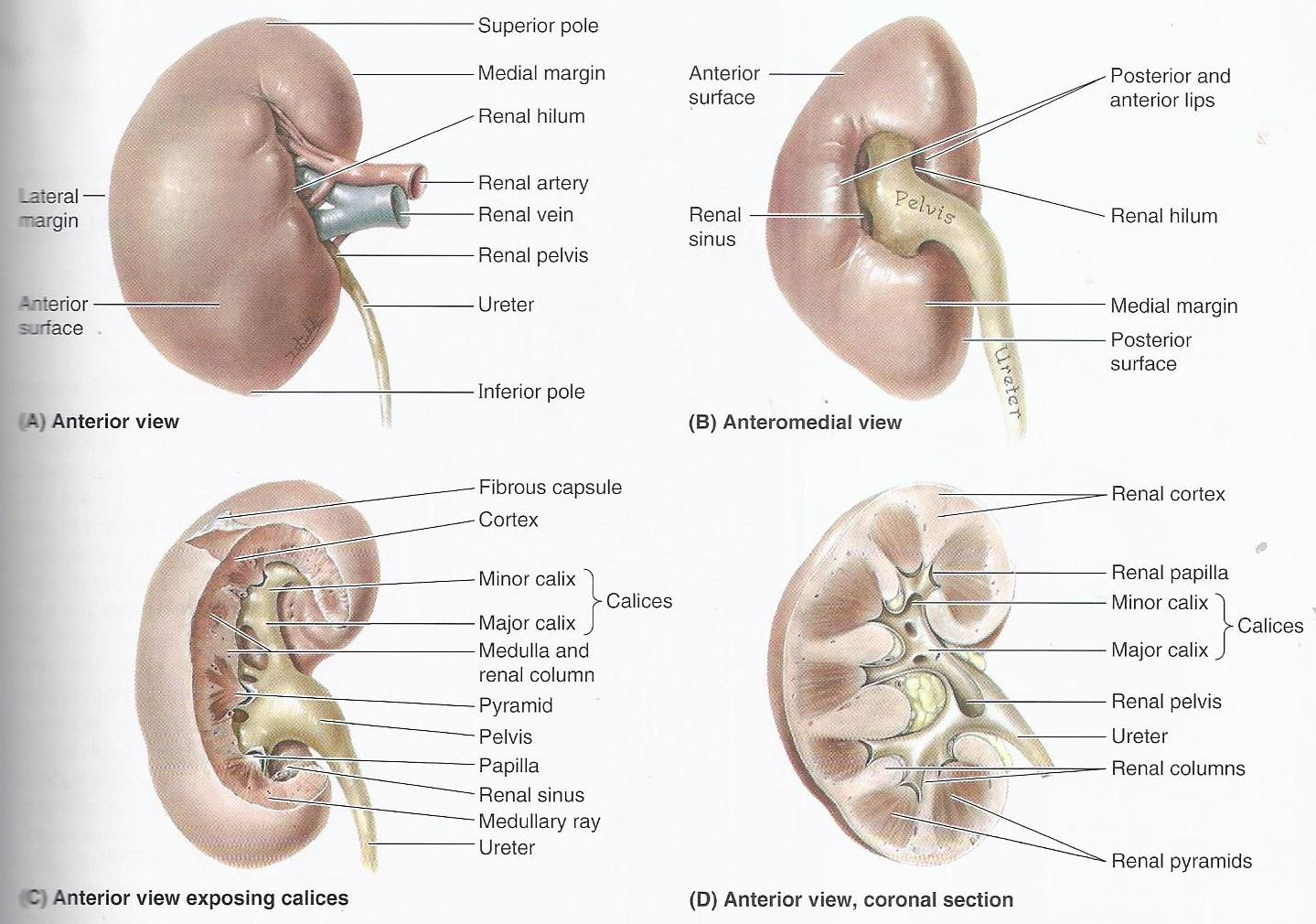


Fig. 2.6; External and internal appearances of the kidneys. (Moore (1999) Clin. Anat., 285)

PLEURAE: Each lung is invested and enclosed in a serous pleural sac that consists of two cutaneous membrane, the pleurae and consist of;

Viscera pleura: This is also known as the pulmonary pleura. It invests the lungs including the surfaces within the horizontal and oblique fissures. It cannot be dissected from the lungs. It provides the lung with a smooth, slippery surface, enabling it to move freely on the parietal pleura. The viscera pleura dips into the lung fissures so that the lobes of the lung are also covered with it. . It is continuous with the parietal pleura at the hilum of the lung where structures comprising the root of the lung enter and leave the lung.

Parietal pleura: This lines the pulmonary cavity and so adheres to the thoracic wall, mediastinum and diaphragm. It consists of four parts namely, the costal, mediastinal, diaphragmatic and

cervical pleurae. There is a potential space between the layers of pleura which contains a capillary layer of serous pleural fluid. This lubricates the pleural surfaces and allows the layers of pleura to slide smoothly over each other during respiration. Its surface tension also provides the cohesion that keeps the lung surface in contact with the thoracic wall, consequently the lung expandas and fills with air when the chest expands while still allowing sliding to occur much like a layer of water between two glass plates.

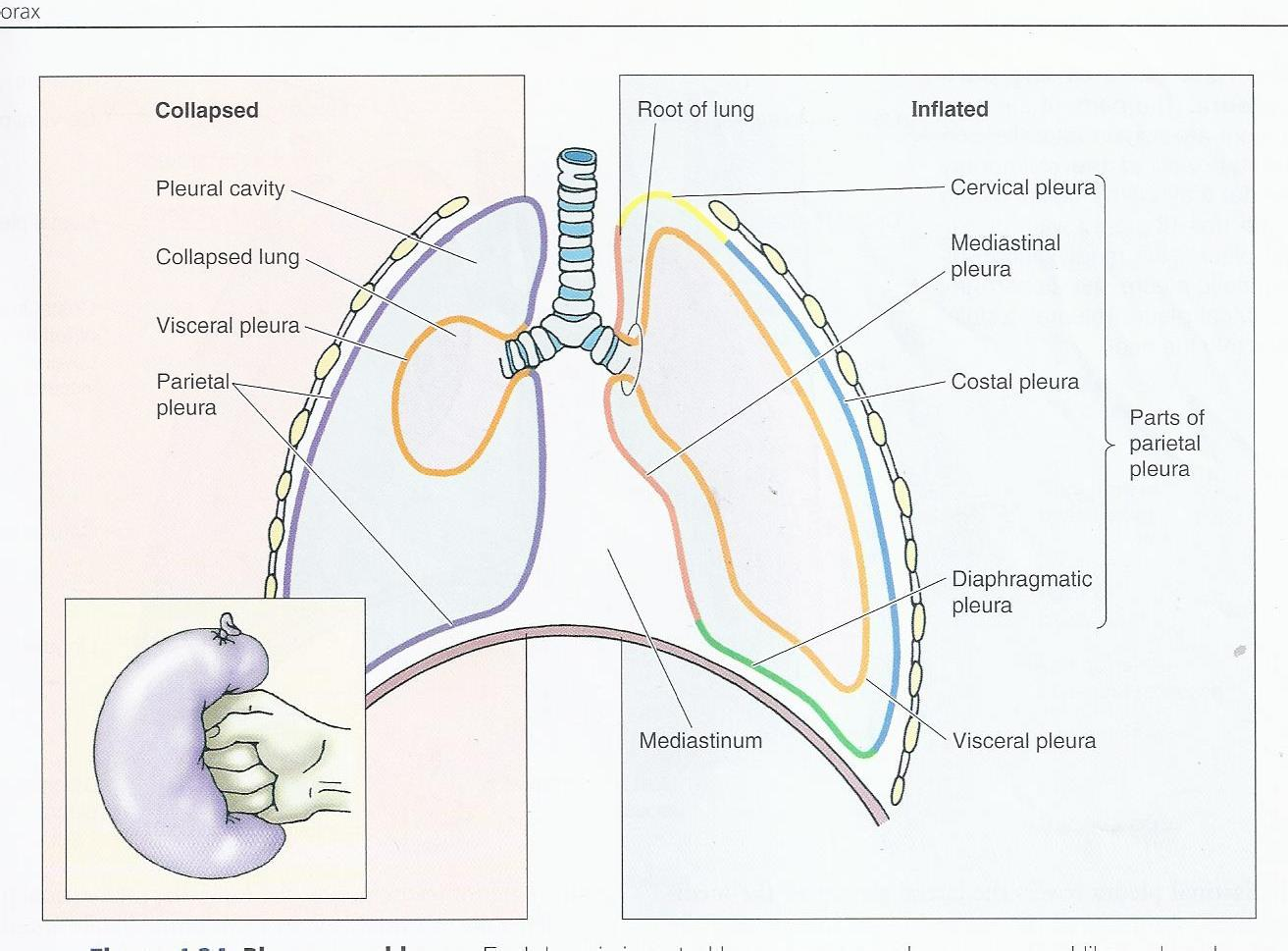
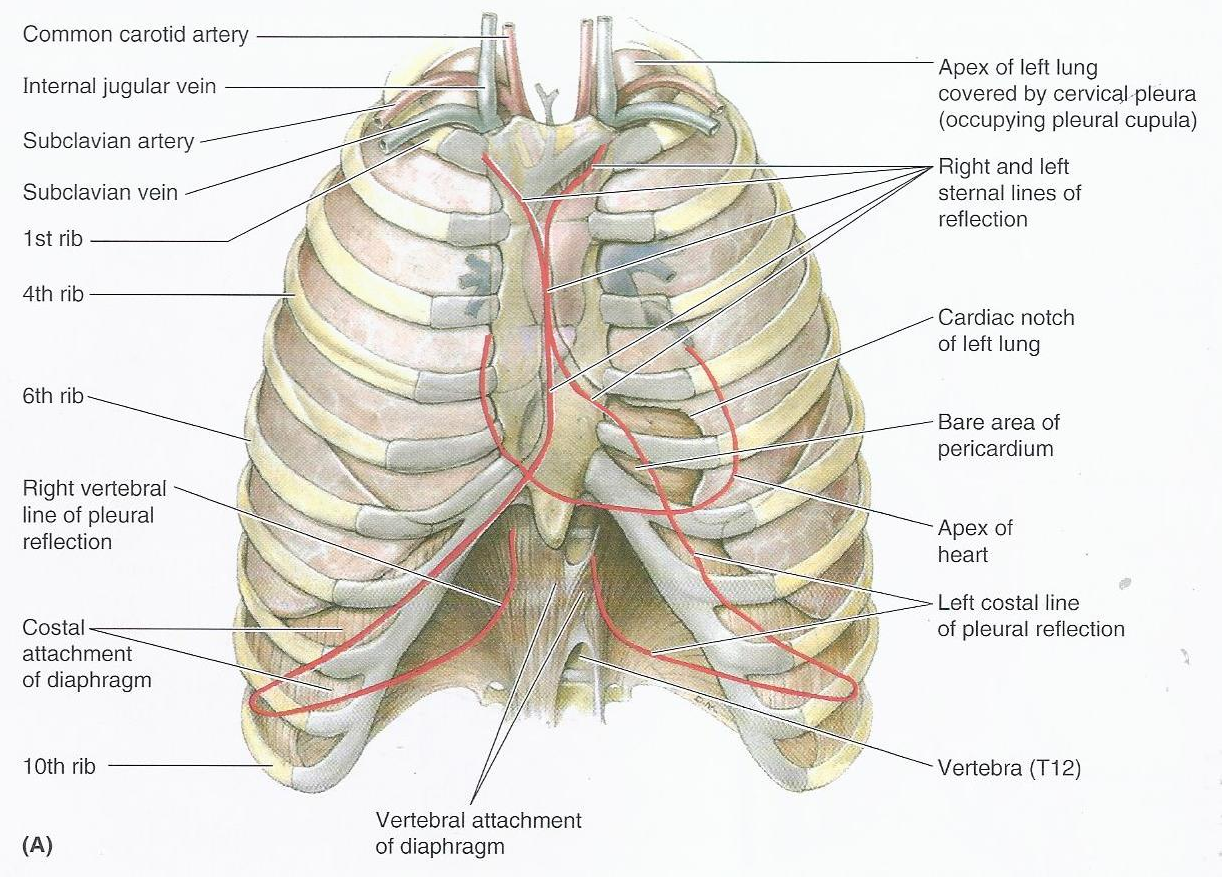


Fig. 2.7: Pleurae and lungs. Each lung is invested by a serous membrane arranged like a closed sac- the pleura which is invaginated by the lung.

( Moore (1999) Clin. Anat., 95)



#### Fig. 2.8: Contents of the thorax and outline of the plura and lungs ( Moore (1999). Clin. Anat., 97)

**(PLEURAL EFFUSION:** Pleural effusion is excess fluid that accumulates in the pleural cavity, the fluid-filled space that surrounds the lungs. This excess can impair breathing by limiting the expansion of the lungs. Various kinds of pleural effusion, depending on the nature of the fluid and what caused its entry into the pleural space, are hydrothorax (serous fluid), hemothorax (blood), urinothorax (urine), chylothorax (chyle), or pyothorax (pus). Pneumothorax is the accumulation of air in the pleural space.Pleural effusion are usually echofree, wedge shaped areas that lie along the posterolateral inferior aspect of the lung. Occasionally they contain internal echoes, sometimes indicating the presence of a neoplasm. Internal echoes may be due to blood or pus, especially when the collection is loculated. Loculated effusions do not necessarily lie adjacent to the diaphragm and may be located anywhere on the chest wall. Subpulmonic effusions lie between the lung and the diaphragm.

#### : INFESTATION OF CRABS WITH PARAGONIMUS SPECIE

Crabs belong to the group of animals known as decapods crustaceans. Many species of crabs constitute an important part of the local food chain in sub-Saharan Africa (Bell-olusoji, et al, 2006). Some of these crabs are of immense epidemiological importance. The species sudanautes is the intermediate host of paragonimus uterobilateralis in eastern Nigeria (Udonsi, 1987). In parts of Southeastern Nigeria there is frequent eating of sudanautes africanus, the West African freshwater crab belonging to the family potamonautidae, with over 88 species and is present in all the streams and rivers across Africa (Aka, et al, 2008). The level of crab infections are epidemiological factors in paragonimiasis transmission (Hosseni, et al, 2012).

The seasonality of abundance and infection rate with paragonimus uterobilateralis among crabs in Southeastern Nigeria was assessed by Uttah (2013). Crabs were collected from their natural habitat as well as bought from the market over a period of twelve months. They were then examined in the laboratory for the infection with metacercariae. The prevalence of metacercarial infection of crabs in the groups showed no seasonal variation but oscillated throughout the year. In all, 151 (6.9%) of the crabs caught were infected with paragonimus metacercariae. The monthly percentage of total infected crabs exhibited seasonality as the relative abundance, being relatively higher in the dry season months; peaking in the month of September but lowest in January. There is need for innovative measures to discourage the local population from eating improperly cooked crabs so as to cub the epidemiological dangers of eating infected crabs.

The presence of metacercariae in Japanese crabs bought in a market in Japan was studied by Sugiyama et al (2009). The crabs purchased were sawagani originating from three prefectures between April 2004 and February 2008. Lung fluke metacercariae was detected in 44 (17%) of 266 examined crabs. The positive crabs harboured a total of 169 metacercariae being 3.8 and

0.64 per positive crab of the total number of crabs examined respectively. The maximum number of metacercariae in a single cab was 23 and was found in a crab originating from Miyazaki prefecture.

The study of Kim et al (2009) investigated the infestation status of paragonimus westermani in freshwater crabs (n=63) and crayfish (n=31) from October 2007 to October 2008 using the crush method. All of the freshwater crabs were caught in Haenem Jeollanam-do and there were 8-59 (mean 28.4) metacercariae per infected crayfish. These results suggest that paragonimus

westermani metacercariae are still transmitted by crayfish enzootically in southern Korea, and that freshwater crabs may transmit metcecareiae only on rare occasions.

Status of metacercarial infections of paragonimus westermani was observed in freshwater crabs which were purchased at three markets in its peak season of 1990 (Cho et al 1991). All of the 85 crabs were Eriocheir Japonicus. There was no other species of Eriocheir found. When crushed muscle and viscera were examined individually, the infection rate was 11.8% and mean number of metacercariae was 2.1 per infected crab. They stated that unless adequqately cooked, freshwater crabs are still potential sources of human paragonimiasis.

Sugiyama et al (2004) collected the crabs, chiromantes dehaani between August 2002 and July 2003 from 12 locations along the Arakawa river that flows through Tokyo. Nine hundred and twenty two crabs were captured. One hundred and seventy seven (19%) from 61 locations were infected with paragonimus metacercariae. The prevalence of metacercariae at 6 locations ranged from 5 to 89%. The number of metacercariae per infected crab ranged from 1 to 190, with an average of 13.1.

#### : EPIDEMIOLOGY OF PARAGONIMIASIS

Paragonimiasis is a parasitic infection of the lungs caused by zoonotic lung flukes of the genus paragonimus. Most cases are reported from Asia and caused by paragonimus westermani following consumption of raw crustaceans. With the exception of imported cases, human paragonimiasis was rarely described prior to 1984 in the United States (US), which has only one indigenous lung fluke paragonimus kellikotti (Diaz, 2013). The cyst wall of the metacercaria is digested by the host and the larva penetrates the intestine, ingesting host tissue as it passes through the peritioneal cavity, diaphragm and pleura into the lungs over a period of approximately four weeks. During the next three months to one year, the larvae migrate within the lungs form cysts, and mature into adult flukes. Cystic cavities containing flukes communicate with the bronchioles and become partially epithelised. At this stage ova appear in the sputum and faeces and are detected in man three months to one year after infection.

Aka et al (2008) reviewed human paragonimiasis in Africa. An up to date review on human paragonimiasis in Africa was carried out by them to determine the current geographical distribution of human cases and analyse the animal reservoir, snails and crustaceans which intervene in the local life of paragonimiasis species. Two countries; Cameroon and Nigeria were

mainly affected by the disease while the distribution of human cases in other eight states of the intertropical zone was scattered. Infected patients were currently few in number and two paragonimus species; P. africanus and P. uterobulaterralis were found. The animal reservoir is mainly constituted by crab eating mammal. The identity of the host snail they said remained doubtful and was either a prosobranch or land snail. Due to the low prevalence of human paragonimiasis recorded in Africa and the high cost of wide screening for this disease, training of technicians in anti-tuberculosis centres would be the most realistic attitude to detect mycobacteria and/or paragonimus eggs during the smear sputum examination.

An epidermiological study of pluero-pulmonary paragonimiasis among pupils in the peri-urban zone of Kumba town, meme division Cameroon was carried out by Moyou-somo et al (2003). A total of 1482 pupils was examined in the five villages. They recruited 309 on the presence of one or more signs of paragonimiasis. Eggs of paragonimus africanus were found in stools and/or sputum of pupils from all five villages giving an overall paragonimiasis prevalence of 2.56%. Males were infected more than females. All of the 38 paragonimiasis egg positive subjects presented with cough, 23(60.53%) complained of chest pain while 16(42.11%) had haemoptysis. They concluded that in addition to the two previously described paragonimiasis foci of kupe mountain and Mundani, the identification of autochtonus cases of paragonimiasis in the peri- urban zone of Kumba town makes the south west province the most endemic zone of paragonimiasis in Cameroon at present.

Prevalence and intensity of paragonimus uterobilateralis among school children in Oban village, south east Nigeria was studied by Ochigbo et al (2007). They surveyed paragonimiasis infection among primary school children aged 6-10 years in Oban village, Akamkpa local government area of Cross-River State, Nigeria. A total of 198 children were examined: 112(56.6%) were boys while 86(43.4%) were girls. Eleven of the subjects were sputum positive for paragonimus eggs, giving an overall prevlance of 5.5%. Their findings showed that paragonimiasis is a significant health problem in South east Nigeria: the risk of infection could be minimized by proper cooking of freshwater crabs before consumption.

The prevalence and intensity of paragonimiasis among inhabitants of Yakurr Local Government Area in Cross River basin of Nigeria was reported (Arene et al 1998). Diagnosis was based on a single sample detection of eggs of paragonimiasis in 5ml of sputum. Out of 880 subjects, 12.27% were infected. The infections were due to paragonimus uterobilateralis.

Prevalence of the infection increased with age, up to a peak prevalence of 23.7% (19 out of 108) among subjects between the ages of 17-22years old. Thereafter it declined progressively with increase in age to much lower values such that by the age of 53-58 years old infection had fallen more than 75%. Prevalence of the infection was significantly higher among females, 13.08% (58 out of 108), than males 11.36% (50 out of 108) (P < 0.05). Intensity of infection (eggs/5ml sputum) ranged from 12-123 eggs/5ml sputum with subjects between the ages of 17-22years old being the most heavily infected group. Prevalence and intensity of the infection were positively correlated (P < 0.497). The need for control measures to reduce human suffering due to infections in the area, particularly among women and children was emphasized.

Udonsi (1987) conducted a 24 month longitudinal study on a renewed outbreak of paragonimus infection on Igwun Basin, Nigeria. One thousand, nine hundred and seventy three individuals were examined. A total of 332 (16.8%) individuals were found infected with paragonimus uterobilateralis. There was evidence of increasing animal prevalence rates from 15% in 1983 to 16.7% in 1984 and 18.7% in 1985. Infection was present in all age groups, with prevalence of 18.9% in males and 14.5% in females. Twelve point three percent (12.3%) of the infections were of high intensity, over 100 eggs in, 5ml of sputum; 20.5% were of moderate infections 50-100 eggs in 5ml of sputum. The remaining 67.2% were of low intensity, less than 50 eggs in 5ml of sputum. The increasing annual prevalence rates and intensity of infection resulted from increased crab consumption. The commonest crab was sudanautes africanus, whose population and level of infection with metacercariae showed seasonal fluctuations with peaks among the dry season months. There was evidence that the snails of the genius melania are involved in transmission of

P. uterobilateralis in the area.

Lane et al (2012) studied paragonimus kellicotti flukes in Missouri, United States of America. They noted that cases of paragonimiasis which are caused by paragonimus kellicotti are rare. Only seven autochthnous cases of paragonimiasis were reported during 1968 to 2008. In 2009 they reported three new case patients with paragonimiasis who had been seen at their medical centre over 18 month period. Six additional case patients were identified in St. Louis, Missouri, USA and treated at Washington University affiliated health centres in 2009 to 2010. They reported detailed descriptions of these case patients which included unusual clinical manifestations and also described public health interventions that were undertaken to inform the general public and physicians about the disease and its mode of transmission.

Parasitological and sero-epidemiological surveys for human paragonimiasis were conducted in three provinces of Vietnam (Doanh et al, 2011). A total of 590 participants from two known endemic areas of human paragonimiasis (Sinho district of Laichau province and Lucyen district of Yenbai province) and from Darkrong district of Quangtri province where they recently found crab hosts heavily infected with paragonimus westermani cercariae was studied. By multiple dot- ELISA screening, 28(12.7%) out of 220 participants in Sinho district and 4(3.3%) out of 120 participants in Lucyen district province were proven to be anti-body positive against the paragonimus antigen. None of the 250 sera of the residents in Dakrong gave sero positivity. Among a total of 32 sero-positive patients, paragonimus eggs were found in 6 cases. ITS2 sequences were successfully determined from a single paragonimus egg from each patient. The results of homology search by BLAST and alignment clearly confirmed that paragonimus eggs collected from 6 patients were all paragonimus heterotremus. The pathogenicity of P. Westermani for human paragonimiasis in Vietnam is still questionable and needs to be experienced in the future.

During their epidemiological surveys for paragonimus species in Central Viet Nam, Doanh et al, (2012) found 4 morphologically different paragonimus metacercariae in mountainous crabs. They were identified as paragonimus westermani, P. bangkokensis, P. Proliferus and P. harinasutai in the order of their prevalence in crab hosts. This is the first discovery of P. harmasutai in Viet Nam co-inhabiting with P. bangkokenesis and other species.

The prevalence of paragonimus infection in Ebonyi state was studied by Nworie et al (2013). Deep sputum samples from 3600 individuals and stool samples from 900 individuals in nine local government areas of Ebonyi state were examined for paragonimus ova using the concentration technique. The overall prevalence of pulmonary paragonimiasis infection in the area was 16.3%. Six foci of infection were identified in Ebonyi North and Ebonyi Central but none was identified in Ebonyi South. The intensity of the infection was generally moderate. Of the 720 individuals examined, 16 (12.2%) had less than 40 ova of the paragonimus in 5ml sputum and 114 (86.36%) had between 40 and 79 ova of paragonimus in 5ml sputum. Furthermore, there was higher prevalence of the infection during the rainy season than in dry season. Their result indicated the growing public health threat posed by paragonimiasis in Eboyi North and Ebonyi Central. They recommended a combination of chemotherapy to bring relief to

people already infected by the disease and public health education related to paragonimiasis transmission to increase awareness of infection in the areas.

Southeast Asia is a major endemic area for paragonimiasis (Vidamaly et al 2009). They said that diagnosis relies on identification of ova in the sputum, pleural fluid or tissue specimen or serology. Low awareness they reported resulted in the disease being overlooked. Nine cases presenting as primary, massive and protracted pleural effusions were studied, all patients had evidence of paragonimus spp in the pleural fluid; one discharged an adult worm through a chest tube during treatment with praziquantel. In three cases resolution of symptoms and pleural effusion could not be achieved despite repeated fluid evacuation procedures and courses of praziquantel which contradicts the widely accepted statement of paragonimiasis being self limited and easy to cure. The disease should be considered in any case of elusive pleural effusion occurring in endemic areas.

Singh et al (2012) in a reviewed article studied paragonimus and paragonimiasis in India and stated that the available data may be a tip of the iceberg as the study areas covered were restricted to the Northeast Indian states. They reported that the result of the research on paragonimiasis in India have revealed valuable information on the epidemiology, life cycle, pathobiology and specification of Indian paragonimus. Ingestion of undercooked crabs and raw crab extracts were the major mode of infection. Pulmonary paragonimiasis was the commonest clinical manifestation while pleural effusion and subcutaneous nodules were the common extra pulmonary forms. Clinico radiological features of pulmonary paragonimiasis simulated pulmonmary tuberculosis. Intradermal test, ELISA and Dot-immunogold filtration assay (DIGFA) were used for diagnosis and epidemiological survey of paragonimiasis.

The study of Diaz (2011) analyzed all cases of paragonimiasis found in Missouri River Basin and compared an earlier series of six cases reported during the period 1984 to 2005 with a relatively recent reported cluster of nine cases from Missouri during the period 2006 to 2010 in order to determine any significant behavioral and recreational risk factors for paragonimiasis and to recommend early diagnostic, treatment and preventive strategies. Significant and behavioural risk factors included eating raw crayfish while on canoeing trips on local rivers (P=0.002), eating raw crayfish while on canoeing trips in Missouri (P=0.0020), and eating raw crayfish while intoxicated (P= 0.007). The male: female case ratio was 9.3: 1.0 and more than 80% of cases presented with fever, cough, pleural effusion, and peripheral eosinophilia. One patient developed

cerebral paragonimiasis and one patient died of pneumonic asepsis. He suggested that clinicians should inquire about consumption of raw or undercooked crayfish in all patients with unexplained fever, cough, eosinophilia, and pleural effusions in patients returning from camping or canoeing in P.kellicotti endemic areas of the Missouri River Drainage Basin. To also institute diagnostic evaluation by specific parasitological and serological methods and treat all cases as soon as possible to avoid the pulmonary and cerebral complications of paragonimiasis.

Devi and colleagues (2007) studied pleuro-pulmonary paragonimiasis in Northeast India and stated that parasitological and immunological surveys revealed that paragonimus was hyperendemic in parts of Arunachal Pradesh in India. Egg positivity in the sputum was 20.9% and 4.1% in children (age > 15 years) and adults (age > 55years) respectively. Antibody positivity against excretory-secretory antigen of adults was 51.7% and 18.9% respectively. Chronic cough (99.2%) and haemoptysis (83.3%) were common respiratory symptoms among egg positive cases. Chest radiography ( n=68) image from egg positive cases showed that air space consolidation (75%), cavitory lesion (147%) and mediastinal adenopathy (11.8%) were very frequent. Less frequent findings were nodular lesions, bronchiectasis, mediastinal adenopathy, pleural thickening and pleural effusion. Deoxy nucleic acid (DNA) extracted from eggs from the sputum of patients from Arunachal Pradesh was sequenced. Analysis of the second internal transcribed specimen (ITS2) of rDNA revealed that the species responsible is paragonimus heterotremus.

Paragonimiasis is a parasitic infection endemic in Asia but uncommon in the United States. It presents most frequently with cough and haemoptysis. Pleural effusions are common and can manifest occasionally as pseudochylothorax, but true chylothorax has to our knowledge never been reported (Wright et al 2011). They reported a case of chylothorax from infection with paragonimus westermani. The case is also unique because it occurred in a native Californian who had not travelled to Asia and was infected by eating raw crabs at a local Sushi restaurant. The freshwater crabs had been imported from Asia.

Due to the non-specific nature of paragonimiasis presentation and rarity in the United States, the diagnosis may first be suggested by the pathologist on biopsy review (Boland et al, 2011). Definitive diagnosis may need serologic testing for confirmation. Four cases of pleuropulmonary disease caused by United States acquired P. westumani, which were identified in the consultation files of the authors were reported. Patients (3 men and 1 woman aged 20 to 66 years) presented

with pulmonary complaints and chest imaging abnormalities including cavitary infiltrates (2), lung mass (1), pleural effusion (I) and pneumothorax (I). Biopsy showed chronic eosinophilic pneumonia and organizing pneumonia in all cases. Other pathologic findings included granulomatous inflammation with geographic necrosis (3) vasculities (3) and pleurities (3). Paragonimus organisms and/or eggs were identified in 2 cases. Serologic studies were positive for P. Westermani in 3 cases (2 ELISA and 1 immunoblot). Paragonimiasis should be considered in the differential diagnosis of patients with eosinophilic pleuropulmonary disease in the United States. Although eosinophilic pneumonia was a consistent finding, the biopsies may be non specific as the organisms and/or eggs are not always visualized. Unusual features include marked pleurities, foci of geographic necrosis and granulomatous vacuities. A history of ingestion and targeted serologies are the keys to diagnosis.

A study on new focus of paragonimiasis in India was conducted by Singh et al (2009). Their aim was to determine the prevalence of paragonimiasis among the patients who were attending the tuberculosis (TB) clinics at the community health centre in Nagaland, and also to determine the species of paragonimus that cause infection in humans and the crustacean host that acts as the infectious source of humans. Sputum specimens were examined microscopically for paragonimus eggs and acid fast Bacilli. Blood samples were tested by microenzyme-linked immunosorbant assay for paragonimus specific immunoglobulin G antibodies. Crab extracts prepared by digestion with artificial gastric juice were examined for paragonimus metacercariae under a stereoscopic microscope. The species identification of the parasite was based on morphological and molecular characterizations of eggs and metacercariae employing polymerase chain reaction and DNA sequencing.

Seven out of the 14 patients tested seropostive for paragonimiasis and paragonimus eggs were detected in sputum of two out of the seven seropositive patients indicating a prevalence of 50% and an egg detection rate of 14% respectively. The prevalence was highest in the 10-30 year age group. More males got the infection than females, the ratio being 5:2. Paragonimus heterotremus was identified as the causative agent of human paragonimiasis and potamiscus manipurensis as the crab host. This study revealed that paragonimiasis has been endemic in Nagaland, and half of the patients attending the TB clinic were actually suffering from pulmonary paragonimiasis.

#### : IMAGING FINDINGS OF PARAGONIMIASIS

Heptaic paragonimiasis is a rare form of ectopic infestation caused by paragonimus. Kim et al (2004) experienced a case of hepatic paragonimiasis that showed characteristic imaging findings. A 42 year old visited their hospital with chronic cough, bloody sputum and weight loss of 5kg for one year. He had a history of ingesting under cooked crabs at times.

Chest CT scan showed a 2cm well circumscribed nodule in the left upper lobe. This nodule appeared to be clustered cysts. Several smaller nodules were additionally found in the periphery of both lungs. Liver CT scan at the arterial phase showed a cluster of small 1mm enhancing cysts at the subcapsular area of the segment VII and wedge shaped enhancement of adjacent parenchyma. At liver MR1, the lesion appeared as low signal intensity on TI – weighted images and bright signal intensity on T2 – weighted images, indicating cystic nature. Sputum cytologic examination revealed a few paragonimus egg confirming paragonimiasis.

The computed tomography findings in disseminated paragonimiasis was studied by Singh et al (1998). Study involved an 18 year old man who was referred to Changmai university hospital for the diagnosis and management of progressive headache and left haemiplagia of 1 week duration. Seven months prior to admission, he developed fever, right upper guardant abdominal pain and jaundice and has been diagnosed in a provincial hospital as having hepatitis. A chest radiograph as at that time revealed bilateral pleural effusion but despite this abnormality he improved clinically and was discharged. Six months later, he was readmitted to the same hospital for abdominal pain and hepatomegaly. This time, a chest radiograph revealed a small nodule in the left upper lobe in addition to bilateral pleural effusion. The sputum and pleural fluid were negative for mycobacterium but he was receiving tuberculosis treatment when a left hemiplagia, occurred. On examination he had a spiking fever, hepatomegaly with mild tenderness and a dense left hemiplagia.

A CT brain scan showed a large mixed density mass in the right fronto-temporal region which had dense irregular enhancement at its base and a component with ring enhancement.

Tayler and Switt (1992) reported on two cases of pulmonary paragonimias in Loatian refugees. In case I a 31year old female complained of persistent cough producing white sputum, accompanied by left pleuritic chest pain. Chest radiographs revealed pleural thickening and ill defined, patchy infiltrates with no adenopathy. A perihilar infiltrate, containing lucent cyst was seen within the left upper lobe.

Case 2 involved a 32 year old man who is the husband of the patient in case I. He was asymptomatic; however a screen radiograph revealed pleural thickening with a rounded mass like life particular divert and streaky, ill defined density involving the right middle and right lower lobes.

Uchida et al (1995) assessed the sonographic appearance of pleural fluid in a patient with pleural effusion containing paragonimus ova. They discovered numerous floating particles containing parasitic ova and granulation tissue. The floating particles appeared as diffuse hyperechoic foci in the anechoic pleural effusion on ultrasonography. They concluded that rupture of the intrapulmonary paragonimiasis lesion into the pleural cavity caused the formation of these floating particles. According to them this is the first report describing the sonographic appearance of pleural effusion in paragonimiasis.

Moyou-somo and Tagni (2003) conducted a prospective study of paragonimiasis from September to July 1997 in the mount Kupe zone of the South West province of Cameroon. Three hundred and twelve subjects presented with one or more signs of paragonimiasis and eggs of paragonimus were found in 30 subjects (9.6%). These patients then underwent chest x-rays to assess radiological lesions due to paragonimiasis before and after treatment with praziquantel. Before treatment chest x-rays demonstrated perinodular shadows in 22 patients (72.33) pulmonary infiltration opacity in 12(40%), pulmonary nodules and cavitations in 3(10%), pulmonary calcification in 3 (10%) and critical lesions in 2(6.66%). Radiological findings were normal in 8 (26.6%). Following treatment parasitological and clinical cure was achieved at 1 and 2 months in all cases but x-ray abnormalities persisted for six months in 56.6% of cases. The most notable change included disappearance of perihilar shadow in 8 out of 22 patients (36.36%) and worsening of radiological findings in 3 patients (13.66%). In 13 patients treatment had no effect on x-ray findings in comparison with base line. They concluded that absence of pleural effusion and high incidence of perihilar shadows may be specific features of paragonimiasis in central Africa where the incidence of concomitant parasitic fungal and microbial disease is high. Chukwuka and onyedum (2010) reported a case of a 42 year old rural dweller who presented with cough in University of Nigeria Teaching Hospital Enugu. The patient had a three month history of cough, chest pain and haemoptysis and a ten week bilateral leg swelling. He recalled having cough 18 years ago with rusty brown sputum and chest pain and was treated for TB even though the investigation was not positive to any acid fast bacilli (AAFB) on two occasions.

Sputum for ova of paragonimiasis was positive. Chest radiograph revealed patchy opacities, tubular shadowing and prominent pulmonary cornus. Echocardiography showed dilated right atrium and ventricle without septated and valvular lesions.

Diagnosis of paragonimiasis was made and the patient was treated with praziquantel. Repeated x-ray showed some improvement in the features. They concluded that paragonimiasis is an important tropical lung disease and the most frequent symptoms are cough and haemoptysis. The radiological features include cavities, cysts, and calcified nodules all of which make differentiation from pulmonary TB difficult in endemic areas. Patients who have cough and haemoptysis should have their sputum examined by an experienced microbiologist for paragonimiasis.

The radiological findings in 100 cases proved pulmonary paragonimiasis as seen in Nigeria was reviewed by Ogakwu and Nwokolo (1972). Hundred patients whose sputum examination confirmed the presence of ova of paragonimus but were negative for acid fast bacilli and were sent for x-ray were included in this study. They observed that in order of frequency the common shadows are either well defined patches of cavitations, ill defined “cotton wool” lesions “streaking” shadows or “bubble” cavities. The midzones are commonly affected but any part of the lung may be marked. The shadows are generally of low density and may be difficult to distinguish from the early lesions of pulmonary tuberculosis.

A 38 year old man had complained of dysponea on exertion occurring six months after ingestion of raw fresh water crabs (Iwahashi et al, 1991). He was admitted in the hospital for further examination of bilateral pleural and pericardial effusions. X-ray films and CT scans of the chest revealed massive bilateral pleural and pericardial effusions. Antibody against paragonimus Miyazaki antigen was detected in patient’s serum as well as pleural and pericardial fluids by the ouchtertony test. The patient was treated effectively with bithanol.

Yumine and colleagues (2003) encountered three cases of P. Westermani caused by ingestion of Chinese fresh water crabs. All patients were Chinese living in Japan. A few months later, they complained of cough, chest pain and dyspnoea. On examination their peripheral blood showed a remarkable increase in eosinophils. Chest radiographs revealed the presence of pleural effusion in all cases and of pneumothorax in one. Paragonimus westermani was determined in a positive serum antibody test. They stated that paragonimiasis must be kept in mind in the differential

diagnosis of cases of pleural effusion with eosinophil. They also emphasized the importance of careful history taking from patients and detection of parasite specific antibodies.

Mukae et al (2001) reviewed their recent experience with pleuro-pulmonary paragonimus westermani. Thirteen patients were diagnosed to have pulmonary paragonimiasis. They observed that chest radiograph and CT showed pleural lesions (62%) and parenchymal lesions (92%). Of note was the high frequency of solitary nodular lesions (62%) mimicking lung cancer, tuberculosis or fungal disease. They concluded that their findings indicate that their patients with

P. westermani presented with a wide variety of radiographic findings which were different from the classic presentations reported earlier.

The epidemiological, pathological and clinical aspects of pleura pulmonary paragonimiasis was reviewed by strobe et al (2005). They stated that the main symptoms are protracted cough and recurrent haemoptysis. Abnormal pleura-pulmonary imaging features are, constant, but protean and non specific leading to frequent confusion with tuberculosis. Diagnosis is achieved early by ova search in the sputum or pleural fluid or by serotype.

Ikehara and collegues (2010) reported a case of paragonimiasis in a person whose symptoms were shown 22 years after emigration of Japan from Laos. A 52 year old man from Laos had come to Japan at 30 years of age and had maintained the habit of eating raw fresh water crabs. He became ill and had visited a physician for left chest pain in January 2007. A chest x-ray was taken and showed infiltration and mass like shadows in the left superior and inferior lobes. Diagnosis could not be made by bronchial brushing, but eggs of paragonimus were presented in sputum cytology 3 days after bronchospy. Paragonimiasis was therefore diagnosed.

A case of pulmonary paragonimiasis with involvement of abdominal muscle in a 9 year old girl was described by Cho et al (2011). The patient presented with a 1 month history of abdominal pain, especially in the right flank and right inguinal area, with anorexia. Chest radiograph revealed pleural effusions in both lungs, and her abdominal sonography indicated an inflammatory lesion in the right psoas muscle. The pleural effusion tested by ELISA were positive for antibodies against paragonimasis. It was discovered that she had ingested raw freshwater crabs 4 months previously. The diagnosis was pulmonary paragonimiasis accompanied by abdominal muscle involvement.

Tonitar et al (2000) encountered seven cases of pulmonary paragonimiasis. All patients were adult males and 6 of 7 cases were over 50 years old. Except for one case of chronic pleural emphysema, 6 patients were referred to the department of surgery because of having a mass lesion on roetgenography which was indistinguishable from malignancy. Three patients had haemoptysis but none of them showed classical rusty sputum. Paragonimus eggs were detected in transbronchial biopsy specimens from 4 patients. All patients seen were positive for paragonimus specific 1gG, antibody by immunodiagnosis. Surgical option was undergone only for one patient with chronic emphysema which was not cured by repeated chemotherapy. They concluded that when a pulmonary mass lesion or emphysema is detected in patients who live in paragonimus endemic areas, paragonimiasis should always be included in the differential diagnosis of lung disease. Paragonimiasis is a rare parasitic disease encountered in France (Guiard et al 1998). The authors observed a case of a 52 year old man who developed dyspnoea, cough, mild fever and chest pain. He had pleural effusion which suggested pulmonary embolism or tuberculosis. Cell counts in the blood and pleural fluid reveled major eosinophila in this patient who had recently returned from trip to Japan. Paragonimiasis was confirmed by ELISA. They stated that clinical and radiographic features of paragonimiasis are often similar to tuberculosis with pleuropathy, mild fever and dsyponea.

Spinal paragonimiasis is a rare form of ectopic infestation caused by paragonimus Westermani. Kim et al (2011) reported a case of pathological prowess intradural paragonmiasis associated with concurrent intracranial involvement. A 44 years old female presented with severe neurogenic claudication owing to spondylolisthesis at the level of L4 – L5. Neurological examination revealed right side homonymus hemianopsia and monoparesis in the right arm. The level of paragonimus specific antibody (1gG) in cerebrospinal fluid (CSF) was border line negative on ELISA. Magnetic resonance imaging of the lumbar spine revealed multiple well defined intradural masses. They appeared marked hypointense on T2 weighted images. T1 weighted images showed slight peripheral rim enhancement. Computed tomography scan showed multiple calcified nodules in the lumbar intradural space. Magnetic resonance imaging of the brain revealed multiple well defined nodular or cystic masses in the left occipital and parental lobes that had mixed signal intensity on both T1 and T2 weighted images, with no contrast enhancement.

A presumptive diagnosis of spinal and cerebral paragonimiasis was made based on the image obtained from CT and MRI examinations. The patient underwent lumbar fusion for coincident spondylolisthesis, hemilarminectomy of the L3 and complete excision of encapsulated intradural, cystic masses containing creamy fluid. Histopathology of the resected specimen confirmed the diagnosis of paragonimiasis.

John et al (2009) reported three cases of paragonimiasis in a family in a modern urban City in Korea. All members of the family were infected with paragonimus after ingestion of Kejang (drunken crab). The mother was hospitalized for general myelgia, and weakness first, followed by the father who was hospitalized for dyspnoea two months later. They asked their daughter to visit the hospital because she had also eaten the fresh water crabs soaked in Soybean Sauce. Peripheral blood of the three patients revealed hypereosinophila and computed tomography (CT) scans of their chest showed pleural effusion.

A retrospective study of MR1 features of paediatric cerebral paragonimus in active stage was carried out by Zhang et al (2006). They retrospectively reviewed the MR images of the brains of six children (age 5-23 years) who had cerebral paragonimiasis in the early active stage. Diagnosis was based on a positive antibody test enzyme linked immune-sorbent assay (ELISA) for paragonimiasis in serum. Their most common finding was irregular hemorrhage of various degrees in five patients. In three cases some multiple irregular lesions with surrounding oedema appeared to be conglomerated and aggregated. The rare appearance seen on one patient was a tunnel sign which showed with the migrating track of the adult worm. In one patient with absence and minimal haemorrhage, diffusions weighted imaging (DWI) showed a heterogenous high signal of lesions. Other findings include slight (one patient), or marked (one patient), irregular contrast enhancement, and large oedamatous areas surrounding small centres of haemorrhage (two patients). They concluded that MR1 findings of conglomerated lesions with haemorrhage or tunnel sign may, help to establish the diagnosis of active stage of cerebral paragonimiasis.

Transrectal ultrasonography (TRUS) and endorectal surfacoil MR1 were used to study perirectal cystic paragonimiasis (kim et al 1999). The patient presented with voiding difficulty. Transrectal ultrasonography showed a well demarcated oval shaped hypoechoic mass in the perirectal space. On endorectal MR images, the lesion was depicted as a well defined cystic mass with homogeneous intermediate signal intensity on T1 – weighted images and heterogeneous

hypersensitivity on T2 – weighted images. Their finding showed that ectopic paragonimiasis can appear as a well defined cystic mass in peritoneum and should be included in the differential diagnosis of cystic mass in the abdomen and pelvic cavity including the perirectal space.

Jeong (1999) described a case of retroperitoneal paragonimasis presenting as periureteral masses. In their study CT showed a conglomerate of enhancing nodules with subtle show attenuation at the iliac fossa and clustered ring like enhancing lesions at the left renal hilum. They stated that when a retroperitoneal conglomerate of ring like enhancing lesions is associated with pleuropulmonary disease suggestive of paragonimiasis can be found in endemic regions or migrants from those regions one may expect ectopic retroperitoneal paragonimiasis.

A study was carried out by Cha et al (1994) to evaluate the CT and MR features of early active cerebral paragonimiasis. They retrospectively reviewed the CT scans (n = 29) and MR images (n

= 7) of the brain in twenty patients between 7 and 59 years old who had cerebral paragonimiasis in the early active stage. They observed that the most common and characteristic imaging finding was a conglomerate of ring like enhancing lesion (grape cluster appearance) with surrounding oedema in one cerebral hemisphere in 11 patients (55%). Other non specific findings included a solitary ring like lesion (n =2), enhancing lesions and a poorly defined non haemorrhagic, non enhancing lesion (n=1), localized haemorrhage with (n=3) or without (n=2). They concluded ring enhancing lesions seen in approximately half of the cases of early cerebral paragonimiasis are suggestive of cerebral paragonimiasis.

Kaw and Sitoh (2001) whilst studying a case of a 36 year old Korean man who presented with a history of epilepsy using MR imaging of the brain observed multiple conglomerated nodules that were hypo intense in both T1 and T2 weighted images. These were located at the left temporal and occipital lobes and had surrounding encephalomacia. Computed tomography scan confirmed the presence of calcified nodules in the corresponding regions. These imaging findings were typical of chronic cerebral paragonimiasis.

Pleuropulmonary paragonimiasis usually manifests as a subplural or, subtissural nodule of about 2cm in diameter that frequently contains low attenuation area (Kin et al 2005). The CT findings in 31 patients with pleuropulmonary paragonimiasis was studied. The authors observed that the constellation of the focal pleural thickening and subpleural linear opacities leading to a necrotic pulmonary nodule is another frequent CT finding of paragonimiasis. A CT brain scan showed a large mixed density mass in the fronto temporal region which had dense irregular enhancement

at its base and a component with ring enhancement controlling. There was also a smaller ring enhancement nodule with surrounding oedema in the left parietal multiple irregular nodules with surrounding parenchyma reaction in the left lung. On abdominal CT, cystic masses were noted in right lateral chest wall, left paravertebral region and splenic hilum, several small focal areas of low attenuation were observed in the left hepatic lobe. There was however numerous paragonimus eggs found in pleural fluid, ascitic fluid and faeces. Liver biopsy also showed numerous paragonimus eggs with eosinophilic infiltration and abscess formation. The diagnosis of disseminated paragonimiasis, was made and a course of praziguantel was given.

Cutaneans paragonimiasis with pleural effusion was described by Danichi et al (2003) in a 55 year old man who developed itching in the right lateroabdominal region 10 days after eating fresh water crab. It was surgically excised 2 months later and the examination of this revealed an abscess containing many eosinophilia. The diagnosis of P. westermani was made. Three months after eating the crab a chest x-ray film showed a pleural effusion. P. Westermani specific 1gG antibody was also detected in pleural fluid. The pleural effusion gradually disappeared after medication with praziguantel.

In Brazil, Lamos et al (2007), reported the first case of paragonimiasis in a 59 year old white female who experienced cough and progressive dyspnoea after 18 months that she was admitted in a hospital with respiratory insufficiency. Chest x-ray showed peribroncho vascular infiltrate predominating in the lower half of the lung fields and small opague nodules. The high resolution computed tomography (HRCT) scan done presented compatible pattern with airways disease especially with small airways, with air trapping tree sprouting images, central tubular nodules and bronchiectasis making the results compatible with broncholitis and bronchiectasis. The transbronchobiopsy unvailed granulomatous lesions with necrosis, where a structure compatible to a parasite case was noticed and the research of parasite eggs in the sputum was positive to paragonimiasis. Because there has not been any case of paragonimiasis diagnosed in Brazil, the authors concluded that the contamination could have been as a consequence of economic globalization where importation of parasitized crustacean may be the cause.

Lane et al (2009) described the features of 3 patients proven probable paragonimiasis with unusual clinical features. The patients were sent at a single medical centre during an 18 month period. Case I involved a 26 year old who presented with cough, fever, malaise, night sweats and vomiting. He was treated for community acquired pneumonia, and later returned when symptoms

persisted. Computed tomography scan was performed and it revealed a left pleural effusion, and focal opacity at the apex of the lower lung lobe. Patient tested positive for paragonimiasis, when ELISA was used. Case 2 was a 32 year old male who presented with 3 months history of recurrent fever, myelgia, and cough producing minimal brownish sputum. Chest radiograph revealed hazy bilateral upper lobe infiltrates and small bilateral pleural effusion. He was treated for community acquired pneumonia but condition persisted and he was referred to another hospital. Again chest x-ray revealed upper bilateral infiltrates and magnetic resonance imaging of the brain showed an enhancing lesion in the occipital lobe. Diagnosis of paragonimiasis was later made using ELISA. In case 3 a 31 year old male presented with a history of fever and pharnygitis. Investigation including chest x-ray revealed no significant finding. He was treated but the illness continued. It was later found out that he ate raw crayfish in river Missouri when he was drunk. Enzyme linked immunosorbent assay test proved positive for paragonimiasis.

The diagnosis of chronic pulmonary paragonimiasis was made by Requena et al (2008) in an African borne with chronic recurrent haemoptysis. They could not establish the identification at the species level. The patient was treated with a three day course of praziquantel. Seven months later the haemoptysis had not reappeared. They reported that chronic infestations results from the pulmonary cyst in the lung and the predominant symptoms are cough and haemoptysis. They also reported that cavitation and bronchiectasis may be observed on chest radiographs or CT. The chest radiographic findings of patients with pulmonary paragonimisais in the Lao people Democratic Republic (PDR) was compared with a report from Korea (Kampitaya et al 2010).

The clinical and radiological characteristics of 50 Laotian pulmonary paragonimiasis patients were studied between March and June 2007. In 49 patients the chest radiographs showed abnormal findings (98%). Pulmonary parenchymal abnormalities were found in all 49 patients while pleural effusion was only found in 11 patients (22%). The three most common intra parenchymal findings were multiple small cysts (90%), irregular linear densities (68%) and nodular opacities (40%). They observed that the number of patients who had these three findings were significantly different from the Korean report (P < 0.01). In conclusion they noted that radiographic findings of pulmonary paragonimiasis may vary among countries.

A retrospective study was done by In et al (1993). It involved 78 patients who lived in South Korea and had chest radiographic findings of pulmonary disease and who were subsequently shown that they had paragonimiasis. The diagnosis was based on positive results for serology for

paragonimus specific antibody or detection of eggs in sputum samples. Radiologic finding from these patients were correlated with pathologic and radiologic findings from a study of experimentally induced paragonimiasis in 21 cats. Findings from the correlative study documented that the typical radiologic features of pulmonary paragonimiasis vary with stage of disease. Early findings include pneumothorax or hydrosalpinx, focal air space consolidation, and linear opacities and are caused by migration of juvenile worms. Later findings include thick walked cysts, dense massive consolidation, nodules or bronchiectasis due to worm cysts.

Han et al (1996) reported a case of adrenal paragonimiasis simulating adrenal mass using CT. Computed tomography finding showed a well enhanced oval mass at right adrenal gland and ultrasonogram showed a dumb bell shaped hyperechoic mass saddling on the left of the kidney. Takemasa et al (2002) reported a case of liver paragonimus westermani complicated with migrating subcutaneous induration and multiple involvements in the liver. It involved a 33 year old female who was admitted in the hospital with chief complaints of abdominal pain, fever, cough and migrating subcutaneous induration who had consumed half cooked crabs 3 months ago. Chest x-ray revealed pleural effusion, nodular shadow in the right upper lung while CT revealed multiple low density areas in the liver. They could not detect parasite eggs in sputum, stool and bronchogenic secretions. However immunological test revealed an infection of paragonimus. Oral administration of praziquantel resulted in the disappearance of nodular shadow in the right upper lung, multiple low density areas on CT as well as migrating subcutaneous induration.

In et al (1992) reviewed 71 patients who had evidence of pleuropulmonary paragonimiasis on chest radiograph and CT scans. Their aim was to describe the radiological manifestations of pleura- pulmonary paragonimiasis with special emphasis on worm cysts and migrating track. On chest radiographs 59 patients (83%) had pulmonary lesions and findings included patching or space consolidation (n=37) with or without any damages, ring shadows (n=16) and peripheral linear opacities (n=29) which were more prominent in patients with pleural effusion. Twelve patients (17%) had bilateral pleural effusions or pneumothorases. On CT scans round low attenuation cystic lesions (5-15mm), filled either with fluid (n=5) or gas (n=5) were characteristically seen within the consolidation. They stated that peripheral linear opacities seen on radiographs were suggestive of worm migrating tracks on CT scans. They concluded that although the findings vary depending on the stage of the disease, findings on chest radiographs

are usually typical of paragonimiasis. Computed tomography they said provides more specific information about the worm cyst and worm migrating track.

The re-emergence of paragonimiasis in Nigeria was reported by Eke and Ezinne (2010). A healthy young looking man was admitted into the hospital with chronic cough and haemoptysis. Zeil Nelson test was done daily for 3 days for acid fast bacilli. Direct sputum smear microscopy for paragonimus was done. Chest x-ray films were also examined. The patient was diagnosed to have paragonimiasis. They opined that because, eradication programme was relaxed in Imo State, the re-emergence occurred. This they said could occur anywhere in the world with similar disease transmission.

A 31 year old woman who had pulmonary paragonimiasis and had a history of two bouts of pneumonia, chest pain at coughing and haemoptysis was misdiagnosed by x-ray radiogram (Nagakawa et al, 2002). She was admitted at a local clinic and a chest radiogram revealed diffuse nodular lesions in both lung fields (right centre field and left front field). Computed tomography scan revealed diffuse multiple lesions at right S4,S6, 510 and left S1+ 2 regions as well detected by x-ray. A nodular lesion in the thorax cavity by MR imaging with this case, the smears of sputum was re-checked by an inspection technician’s discernment, eosinophila and charcot–leyden crystals were detected. They observed that in suspected cases of tuberculosis, a history of crab eating plus sputum examinations, imaging findings and serodiagnosis are necessary to rule out paragonimiasis.

Nabakumar et al (2004) studied a case of a 27 year old married man in Manipur who presented with cough, fever, haemoptysis, anorexia and weight loss and was treated with anti-tuberculosis drugs for one year without improvement. He also had a history of ingestion of raw crabs. Chest radiograph revealed right mid zone lesion with cavitations. Sputum smear revealed eggs of P. westermani. He responded well to the treatment with praziquantel 25mg/kg, three times, a day for 3 days. Pulmonary paragonimiasis must be considered in the differential diagnosis of slow resolving pneumonias especially in the appropriate clinical setting because effective treatment with praziquantel can be rewarding.

Shim et al (2012) reviewed radiological images of patients with paragonimus westermani (PW) that simultaneously involved the chest and abdomen. The study involved four patients with serologically and histopathologically confirmed paragonimiasis. Abdomen CT (n=3) and chest CT (n=3) scans were available and abdominal wall ultrasonography was performed in all

patients. They retrospectively reviewed the clinical, radiological and histopathological findings of these patients. The most common abdominal CT findings were ascites and intraperitoneal or abdominal wall nodules. Low attenuated serpentine lesions of the liver were another common and relatively specific feature. They concluded that radiologists should consider the possibility of paragonimus westermani when these abdominal CT findings are noted especially with pleural effusion or subpleural nodules in patients with abdominal symptoms.

Qiang et al (2013) investigated the features of hepatic paragonimiasis in contrast enhanced ultrasound imaging (CEUS). Fifteen patients with hepatic paragonimiasis who were admitted in their hospital between March 2008 and August 2012 were enrolled for this study. After conventional ultrasound and CEUS examination were performed, the CEUS features were retrospectively reviewed and correlated with pathological findings. They concluded that subcapsular location, hypoechogenicity and tract like enhanced areas could be seen as the main features of hepatic paragonimiasis.

A rare case of paragonimiasis manifesting with intracerebral haemorrahage in a ten year old girl was observed by Koh et al (2012). The girl presented with a sudden onset of dysarthris, right facial palsy, and clumsiness of the right hand. Brain imaging using MRI and CT showed acute intracerebral haemorrhage in the left frontal area. An occult vascular malformation or small arteriovenous malformation compressed by the haematoma was initially suspected. The lesion progressed for over two months until a delayed surgery was undertaken. Pathologic examination was consistent with cerebral paragonimiasis. After chemotherapy with praziquantel, she was monitored without neurological deficits or seizure attacks for six months. They concluded by saying that this case alerts practicing clinicians to the domestic transmission of a forgotten parasitic disease due to environmental changes.

A comparative study of radiological findings in pulmonary tuberculosis and paragonimiasis in a Southeastern Nigeria fishing community was conducted by Oloyede et al (2014). Their study was designed to identify the chest radiological features that could be consistently used to differentiate pulmonary tuberculosis and paragonimiasis in children. Two hundred and forty children aged between 5 and 18 years were selected from a public primary and secondary school in Ewang village, Mbo Local government area of Akwa Ibom State. They were screened for the presence of paragonimiasis and tuberculosis. Those positive underwent a chest x-ray examination in a full inspiration. Ten (4.9%) were sputum positive for paragonimiasis while four

(1.96%) were positive for TB. The signs and symptoms were the same. Radiologically, subcutaneous wasting was an important differentiating feature between the two diseases. Their result showed that both conditions coexist in this locality. The clinical features of both conditions were similar hence differentiation on clinical grounds was difficult. Thus in a child being investigated for TB, the absence of subcutaneous tissue wasting radiologically should prompt further investigation for paragonimiasis.

Peritoneal radiological findings were reported by Rha et al (1999) who studied the CT findings of intraperitoneal manifestations of parasitic infections including paragonimiasis. Common features are localized hazy omental infiltration and the presence of a peritoneal mass (predominantly a multiseptated cystic heterogeneous or calcified granulomatous mass), especially in the case of paragonimiasis showing multiple scattered, densely calcified small nodules.

Chenz et al (2013) described the angiographic abnormalities of the cerebral arteries seen in two children in whom cerebral paragonimiasis was associated with haemorrhagic stroke. The patients presented with acute intracerebral and subarachnoid haemorrhage. Angiography revealed a beaded and long segmental narrowing of arteries consistent with arteritis. In both patients, involved vesssels were seen in the area of the haemorrhage. The vascular changes and haemorrhage together with new lesions that developed close to the haemorrhage and improved after praziquantel treatment were attributed to paragonimiasis.

Sim et al (2010) reported a case of a 39 year old woman who was belatedly diagnosed of as having paragonimiasis with a parasitic migration to the tip of the left finger after initial misdiagnosis of tubercular serositis. They observed that to the best of their knowledge that this is the first case of paragonimiasis found in the tip of the finger.

#### : RE EMERGENCE OF PARAGONIMIASIS

Uttah (2013) studied paragonimiasis and renewed crab eating behavior in six communities from two ethno cultural clusters in Southeast Nigeria. He assessed the prevalence of paragonimiasis and crab eating behavior in these communities. Sputum examinations and questionnaire administrations were carried out. Prevalence was 13.2% and was significantly higher among females (14.6%) than males (11.2%). Overall 72.2% of the respondents across the communities eat crabs, and this was comparable between males (76.4%) and females (77.6%). The prevalence was comparable between the two ethno cultural groups and between communities in the two

ethno cultural group (P > 0.05). The mean age of the crab eaters was 43 years while that of non crab eaters was 26 years. Many (46.3%) infected individuals presented with low intensity infections (1-50 eggs/ova per 5ml sputum), while 28.8% and 73.0% presented moderate (51-100 eggs/ova per 5ml sputum) and high (above 100 eggs/ova per 5ml sputum) intensity infections respectively. Infection risk among weekly eaters of crabs was three times higher than that of monthly eaters. Concerted awareness campaign, he said is needed to curb the scourge in endemic Southeast Nigeria.

The predisposing factors for re-emergence of paragonimiasis in Nigeria was reported by Eke et al (2013). Two thousand seven hundred and sixty households from the identified twelve villages with the endemic disease were systematically selected. Pretested questionnaires were administered to the head of the selected household. The data collected were analyzed quantitatively and qualitatively. The predisposing factors they said precipitated the emergence of the disease included low level of awareness of the disease by the entire populace including the health workers. This included the causative agent, the mode of transmission and control; conservative cultural habits of preparing crab meal, eating improperly cooked crab and also insanitary disposal of faeces and sputum. They concluded by saying that a holistic eradication programme should be planned to have sustained activities that will usher in everlasting disease free area. The programme should involve all people, policy makers, health workers and entire populace taking care of the peculiarities of the people’s habitats.

To provide additional information to the reviewed literature and to establish our own standard, the main purpose of this study is to assess the sonographic features of paragonimus infestation of some human abdominal organs.

#### RESEARCH DESIGN

**CHAPTER THREE RESEARCH METHODOLGY**

This is a prospective descriptive cross-sectional study that involved adults and children. The study included subjects that were positive for paragonimus infection and also a number of those who were not infected that were used as controls.

#### STUDY AREA/DURATION

The study was community based and it involved adults and children in Oduma, Amagunze and Lokpanta. Patients who presented in the chest clinic of University of Nigeria teaching hospital Enugu who had cough or haemoptysis and tested negative for tuberculosis but whose sputum were positive for paragonimiasis were also included in this study.

Lokpanta is in Isuochi local government area of Abia state. This community was chosen because crab eating is a common practice here and they are also sold in large quantities along the road in this community. The community also belongs to the Imo River Basin where paragonimiasis have also been noted to be common.

#### MAP SHOWING THE LOCATION OF LOKPANTA

**Latitude in decimal degrees:** 6.0022

#### Longitude in decimal degrees: 7.4717

**Latitude in degrees, minutes, and seconds:** 6° 0' 8" North

**Longitude in degrees, minutes, and seconds:** 7° 28' 18" East

**Height above sea level:** 98 m, 321.52 ft, 3858.27 in

**Geographical feature:**  P (Populated place type feature)

**Feature designation code:** P.PPL (Populated place)

Google map Imagery (2015)

Fig. 3.0: A3 shows the location of Lokpanta.

Amagunze is in Nkanu East Local government area of Enugu state. This community was chosen because it is a rural community and has a lot of streams and rivers which is a common habitat for crabs. The inhabitants are predominantly farmers. Crabs are also consumed in large quantities by the inhabitants of this community as a delicacy.

MAP OF AMAGUNZE



**Geographic data Amagunze**

**Map whit coordinates longitude latitude of: Amagunze**

Google map state map extended Enugu-State

Trip Planner road route Enugu State Vita aerial and Situation in the ZIP code map

Latitude longitude coordinates Amagunze 6.3267,7.6539 Fig. 3.1: Google map Imagery (2015)

Oduma is a rural community in Aninri local government area of Enugu state. Crab eating is also a common practice in this community as they are used as supplements for protein. This community is also located in the Imo River Basin where paragonimiasis have been noted to be common.



* Latitude : 6.073513
* Longitude : 7.57771 Google Imagery data (2015).

Fig. 3.2: A3 shows the location of Oduma.

The chest clinic of the University of Nigeria Teaching Hospital Enugu was also chosen because of the clinical similarities that exist between tuberculosis and paragonimiasis. Patients who are suspected to have tuberculosis are referred to this centre where they also undergo some laboratory investigations to confirm this condition. Some of the results turn out to be negative for tuberculosis and such patients were then investigated for paragonimiasis.

This study was conducted between January 2010 and August 2014.

#### TARGET POPULATION

The target population included children and adults in Lokpanta, Oduma and Amagunze who have been eating crabs in the past one year and who have also been living in these communities for the past one year. Subjects who presented with cough and haemoptysis in the chest clinic of University of Nigeria teaching hospital and who were positive for paragonimiasis were also targeted.

People living in these communities who were negative for paragonimiasis were also targeted and used as the control group for this study.

#### SAMPLING SIZE

A convenience sample size was used for this study. Sample size was determined by using the equation for determining the minimum sample size.

The equation is given by n= Z2P(1-p)

d2

This is according to (Lwanga and Tyre, 1986) for a finite population. Where;n = minimum sample size.

Z = 1.96 at 95% confidence interval. P = estimated population proportion.

d = absolute precision required on either side of the proportion =5%(0.05).

Because the proportion for the population under study is not known, a value of 50% (0.5) is assigned to obtain the maximum value for p.

Substituting the values of Z, P and d from the above equation, 384 is obtained. A sample size of 1125 subjects was then chosen. Out of this, 304 subjects tested positive for paragonimus infection. These subjects were then scanned. A total number of 456 normal subjects was used as controls.

#### INCLUSION CRITERIA

Subjects were selected for the study based on the following;

1. Individuals must have been living in the communities for the past one year.
2. Subjects must have bean eating crabs in the past one year.
3. Individuals must have presented with one or more of the following clinical conditions;
   1. Abdominal pain.
   2. Chest pain.
   3. Fever.
   4. Urticaria.
   5. Cough.
   6. Haemoptysis.
   7. Dyspnoea
   8. Diarrhoea
   9. Malaise.
   10. Sweats.
4. The sputum or stool test done on the individual must have tested positive for paragonimiasis.

#### EXCLUSION CRITERIA

This was done based on physical examination and history taking. Subjects were also excluded on observation of certain disease conditions that were incidental findings during scan.

Subjects with the following conditions were excluded;

* 1. Anaemia.
  2. Sickle cell disease.
  3. Tropical splenomegaly syndrome.
  4. Hepatoma.
  5. Hepatitis.
  6. History of liver, kidney or spleen disease.

#### ETHICAL APPROVAL

Ethical approval was obtained from the ethical committee of the Enugu State Ministry of Health.

#### RECRUITMENT OF SUBJECTS

Subjects were recruited based on having one or more symptoms of paragonimiasis (cough, haemoptysis, abdominal pain, fever, headache, sweats and chest pain). Those who were asymptomatic but their sputum or stool samples were positive for paragonimiasis were also included. Informed consents were obtained from the head teachers of the schools used for this study. The procedure was then explained to the children before the investigation was carried out. The community leaders of each of the communities also gave their consent before the examination was done on the members of the community. The community health workers assisted in the collection of samples from the subjects. Teachers of the various schools visited also assisted in the data collection.

#### CLINICAL AND PARASITOLOGICAL INVESTIGATIONS

A total of 300 crabs were collected and dissected for the presence of paragonimus metacercariae. One hundred and fifty five (155) crabs were collected from Lokpanta, sixty (60) were collected from Amagunze while eighty five (85) were collected from Oduma. The difference in the number of crabs obtained from the communities was as a result of the availability of the crabs. More crabs were collected from Lokpanta because the community had more streams than the other communities. Crab hunting is a common practice in Lokpanta among children and young adults who sell them for income. The crabs were collected from the neighbouring streams in each of the communities with the assistance of the children. Some of the crabs were dug out of small burrows along the stream beds or picked under some stones in the streams. Crabs were also bought along the road where they were sold. This collection and dissection of crabs was done to determine whether crabs in these areas haboured paragonimus metercecariae which causes infection in human when consumed raw or improperly cooked and also to determine the load/intensity of infection on these crabs.

The crabs were taken to the microbiology department of the University of Nigeria teaching hospital, Enugu where they were examined for the presence of paragonimus infection.The hard shell of each crab was removed and the muscle tissues beneath extracted and put into a petri- dish. The obtained sample was then examined under a microscope at a magnification of 10\* and 25\* by a microbiologist.The number of paragonimus seen in each crab was then recorded to determine the load/intensity of infection per crab.

After dissecting the crabs for the presence of paragonimus, the individuals who gave consent for the study were also examined for the presence of paragonimus.The participants first provided a brief medical history and underwent a clinical examination for signs and symptoms of paragonimiasis under a qualified medical doctor. Thereafter, they were given two plastic containers and some toilet paper. They were instructed to transfer a small quantity of sputum into one container and stool into the other and return to the research team. A small quantity of sodium azide was added to the specimens collected and were transported to the chest clinic of University of Nigeria Teaching Hospital Enugu for the laboratory investigation. To each of the specimen was added twice its volume of 4% caustic soda followed by adequate mixing and centrifugation at 1500rpm for 5 minutes as described by Moyou-Somou et al (2003). The resulting pellet was transferred unto a microscope slide and observed under a light microscope at 10x and 40x magnification for the presence of paragonimus eggs. The presence of paragonimus in sputum was seen as a typical golden yellow operculate egg. The stool samples were treated and analyzed using a standard Rhitie concentration technique to detect paragonimus eggs (Moyou-somo et al, 2003). These laboratory investigations were done by a microbiologist.

The photomicrograph was obtained when the slide has been prepared and cleaned well. Digital camera Nokia E5 mega pixel was hooked up to the micrograph at 10x14 magnification and the image was captured.

Ultrasound scan of the liver, spleen, kidney and pleurae were then done to check for changes in echotexture, size, the presence of fluid or any other feature that will suggest the prsesence of paragonimiasis in the infected subjects. Those who were used as controls were also scanned for comparison.

#### EQUIPMENT

A portable ultrasound equipment with high resolution real time scanner (DP-1100, Shenzen Mindray Biomedical Electronics Co. Ltd, China) with 3.5 MHz frequency transducer was used to examine and characterise the echotexture of the abdominal organs studied by the adequate setting of the time gain compensator (TGC). Sonographic measurements were done with the curvilinear probe using electronic callipers.

A digital camera Nokia E5 mega pixel made in China was used to capture images on the screen of the ultrasound equipment and also the micrograph from laboratory investigation.

The anthropometric measurements were obtained by the subjects wearing light clothes and their shoes removed. Weight was then measured using a calibrated potable bathroom scale (HAMSON Co, China) to the nearest 0.1kg. Height was measured with a metal tape measured to the nearest 0.5cm with the subject standing upright with the head in the Frankfort position (Norton and Olds, 1996).

#### SCANNING TECHNIQUES

The mobile equipment used for this study was taken to the schools and communities where the ultrasound scan was performed. Some of the scans were done in the health centres close to the communities with the assistance of the nurses and some health officers. Others were scanned in their schools using the long benches available as an improvised examination couch. A generating set was also used to generate power in these centres because there was no constant supply of electricity in these communities.

To ensure good transmission of the ultrasound beam into the subjects, a coupling agent was first applied to the area being scanned.

Many sonographic features are not specific for a particular disease. In order to ensure that the cause of echotexture change in the organs examined was due to paragonimiasis and not due to another disease condition, other laboratory tests were performed. Liver function tests were done to ensure that changes observed in the liver was not as a result of hepatitis, cirrhosis or other liver diseases. Subjects were also tested for malaria and typhoid fever where increase in organ size were detected to exclude these conditions as the cause of enlarged organs.

**LIVER:** The liver was scanned with the subjects in supine position in two anatomical planes to ensure that the entire volume of the liver tissue and structures has been imaged. This involved scanning in longitudinal and transverse planes. The longitudinal scan included sections through

the midline, lateral lobe, aorta and the inferior vena cava. This procedure started in the subziphoid area. Transducer was angled superiorly and inferiorly to see both margins of the liver.

Transverse view also started at the subziphoid area and included left lobe of liver, hepatic veins, the spleen, pancreas, ligamentum teres, ligamentum venosum, right lobe and subhepatic space.

The normal liver parenchyma is of medium homogeneous echogenicity, usually slightly darker than the spleen and slightly brighter than the renal cortex independent of the age except in childhood (Dietrich et al 1999). Characterisation of the echotexture was done using this technique. A data sheet was used to record the observed echotexture of the organs and classified as being normal, echopoor or coarse and echogenic. The texture was described as echopoor when the texture appeared darker than the normal homogeneous texture.The value of 0 was assigned to liver that appeared normal in texture, 1 was used to depict dark (echopoortexture) liver appearance, while 2 was used to represent coarse and echogenic appearance. The echoteture appeared brighter than normal in subjects with coarse echogenic appearance. Those that had cyst were scored 3. The data sheet is shown in the result and data presentation section. The organ size was recorded as either normal or enlarged based on comparison with previous established values. Validation of the scoring pattern was carried out by three independent experts to avoid bias.

The liver size was measured with the subjects in supine position and their hands raised behind the head. This helps to increase the distance between the intercostal spaces and the distance from the lower costal margin to the iliac crest.Measurements were then made in the right midclavicular line (MCL) where the greatest length of the right kidney was seen as described by Sarac et al (2000) and Safak et al (2005).



Fig. 3.3: Sonogram showing the measurement of the length of the liver in the MCL.

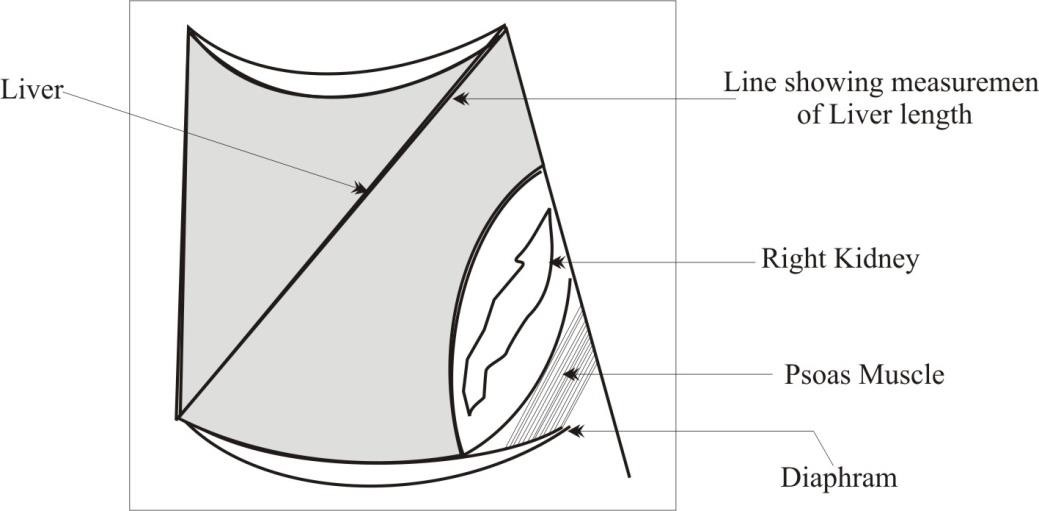


Fig.3.4: Diagram of liver length

**SPLEEN**: The spleen was scanned with the subject in supine and lateral decubitus positions. The right decubitus position was used to improve the visualisation of the spleen. The borders of the spleen were appropriately checked for any abnormality.

The echotexture was characterised using the homogeneity of the organ. The echotexture is known to be more echogenic than the liver echotexture and also that of the renal cortex. The left kidney was used as an acoustic window for this organ. The recording of observations was also done as that of the liver.

Splenic length was measured in the right lateral decubitus position in the coronal plane because of the superior advantage of obtaining easily the longest dimension and reproducibility of measurement (Konus et al., 1998; Al Imam et al., 2000; Megremis et al., 2004; Safak et al., 2005). The length of the spleen was measured in the longitudinal coronal orientation using the hilum of the spleen as a reference point.

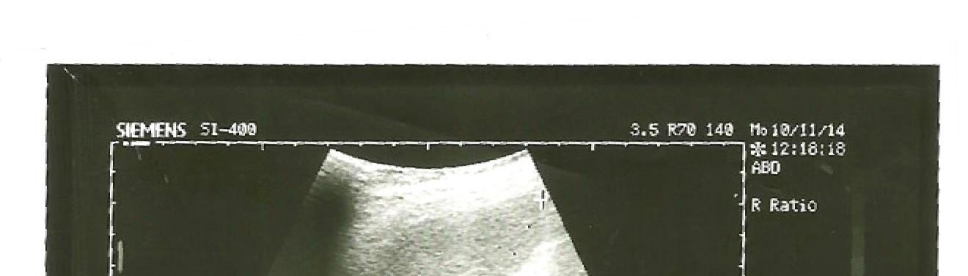


Fig. 3.5: Sonogram showing the measurement of the splenic length

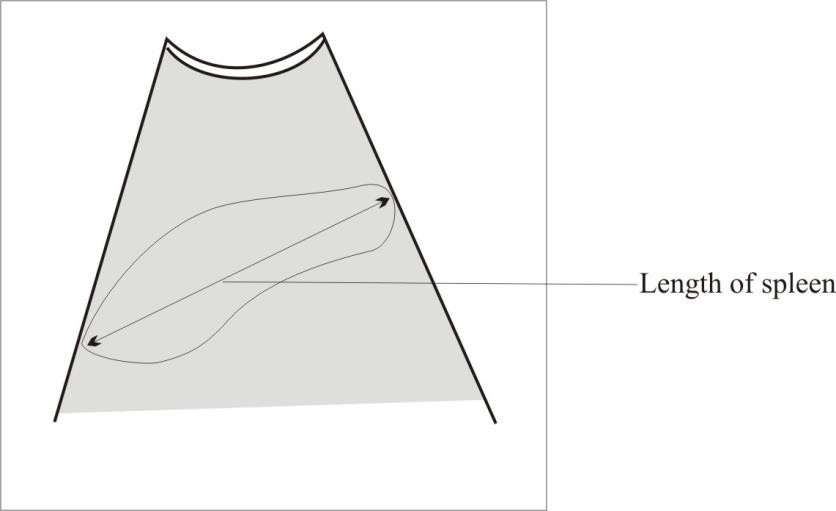


Fig. 3.6 : Diagramatic representation of measurement of splenic length

**KIDNEYS:** The kidneys were scanned in the supine position. The liver formed an acoustic window for the right kidney while the spleen acted as an acoustic window for the left kidney. The normal echotexture of the kidneys are darker than that of the liver and spleen. Scan was done in both longitudinal and transverse planes. Longitudinal scan was performed at the subcostal margins. Transverse scan was obtained by placing the probe between the lower costal margin and the iliac crest. The kidneys were examined from edge to edge to

assess the echotexture and the size. To measure the entire length of the kidney the longest cranio caudal length was found by rotating the probe around its vertical axis. The anterior posterior dimension represented the width of the kidneys. The parenchymal thickness was also measured as the distance between the capsule and margin of the sinus echo (Alev, 2010).



Fig.3.7: Sonogram showing measurements taken in the left kidney.

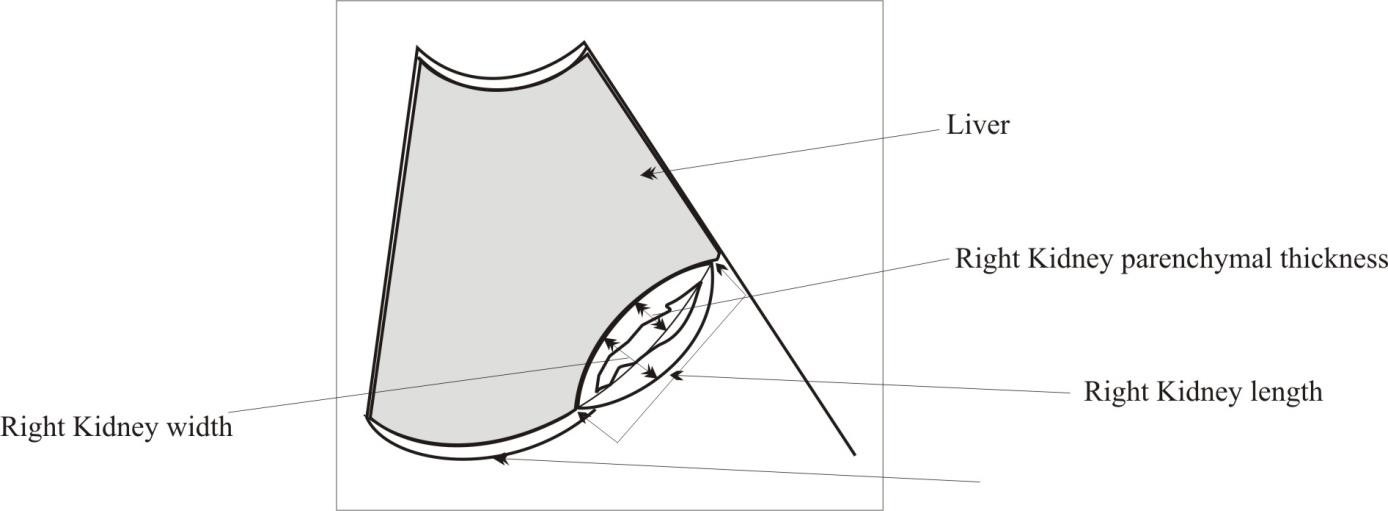


Fig. 3.8: Diagram showing kidney measurements.

PLEURA

Initially it was believed that ultrasound cannot be used to assess the chest region because the ribs block the view. However ultrasound has become an invaluable resource in the assessment of abnormal chest in which liquid and solid densities are interspaced between the chest wall and the lungs allowing excellent propagation of sound waves making it possible to extend the use of ultrasound in the diagnosis of morbidities (Seibert et al, 1998). When ultrasound is used for the analysis and quantification of fluids in pleural effusion, it is superior to x-rays, being capable of correlating the effusion thickness with the real volume. Pleura effusions usually pool above the diaphragm along the posterior chest wall. It is sometimes necessary to scan along the axillary line to check for fluid laterally. Loculated effusions can be found in any location. In cases of loculated pleural effusion, the patient is scanned upright, sitting on a stool without a back, or a stretcher with legs dangling from the sides thus affording ready access from all sides. Scanning in the supraclavicular fossa will allow access to the superior sulcus to look for loculated effusions or apical tumours. Right sided pleural effusions can be easily assessed on a supine view looking through the diaphragm and liver. Effusions on the left are more difficult to see in the supine position but can sometimes be seen with an oblique scan through the spleen.

#### DATA ANALYSIS

The data analysis was carried out using a computer software package for social sciences version 16 (SPSS V16.0). Various statistical tools were used for the analysis of results. The load of paragonimus among infected subjects was analysed using analysis of variance to determine the effect of age and sex on the load. Analysis of variance was done on the length of the liver and spleen in infected individuals using age and sex as factors. A regression analysis was also used to investigate the relationship between age and sex as they affect the size of the organs. The students t-test was also used to compare the values obtained between the infected and normal subjects. Similarly a paired samples pearson’s correlation analysis was used to determine the

relationship between the anthropometric variables of the organ dimensions in infected and normal subjects. Descriptive and inferential statistics were used for the characterization of the echotexture and also to describe the relationship between echotexture in normal and infected subjects. The values obtained were considered statisticaly significant at (p < 0.05).

#### CHAPTER FOUR RESULTS

**TABLE 1.0: AGE AND SEX DISTRIBUTION OF PARAGONIMUS IN INFECTED SUBJECTS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Age Range (Yrs)** | **Males** | **Females** | **Total** |
| 5-12 | 66 (21.7%) | 68 (22.4%) | 134 (44.1%) |
| 13-20 | 32 (10.5%) | 36 (8.6%) | 58 (19.1%) |
| 21-28 | 20 (6.6%) | 12 (3.9%) | 32 (10.5%) |
| 29-36 | 4(1.3%) | 2(0.7%) | 6 (2.0%) |
| 37-44 | 16 (5.3%) | 12 (3.9%) | 28 (9.2%) |
| 45-52 | 14(4.6%) | 6 (2.0%) | 20 (6.6%) |
| 53-60 | 8(2.6%) | 6 (2.0%) | 14 (4.6%) |
| 61-68 | 6 (2.0%) | 2 (0.7%) | 8 (2.7%) |
| 69 and above | 2 (0.7%) | (0.7%) | 4 (1.4%) |
| Total | 168 (55.3%) | 136 (44.7%) | 304 (100%) |

Table 1.0 shows that males, n=168(55.3%) were more infected than the females, n=136 (44.7%).

#### TABLE 1.1: AGE AND SEX DISTRIBUTION IN NORMAL SUBJECTS

|  |  |  |  |
| --- | --- | --- | --- |
| **Age Range (yrs)** | **Males** | **Females** | **Total** |
| 5-12 | 120 (26.3%) | 84 (18.4%) | 204 (44.7%) |
| 13-20 | 48 (10.5%) | 30 (6.6%) | 78 (17.1%) |
| 21-28 | 36 (7.9%) | 21 (4.6%) | 57 (12.5%) |
| 29-36 | 6 (1.3%) | 6 (1.3%) | 12 (2.6%) |
| 37-44 | 12 (2.6%) | 9 (2.0%) | 21 (4.6%) |
| 45-52 | 30 (6.6%) | 12 (2.6%) | 42 (9.2%) |
| 53-60 | 12(2.6%) | 9 (2.0%) | 21 (4.6%) |
| 61-68 | 9 (2.0%) | 3 (0.7%) | 12 (2.7%) |
| 69 and above | 6 (1.3%) | 3 (0.7%) | 9 (2.0%) |
| Total | 279 (61%) | 177 (39%) | 456 (100%) |

The age sex distribution of normal subjects is shown in table 1.1. Males, n=279 (61%) were more than females, n=177 (39%).

#### 1.2: DISTRIBUTION OF PARAGONIMUS INFECTION IN COMMUNITIES

|  |  |  |  |
| --- | --- | --- | --- |
| **Community** | **Number Examined** | **Number Infected** | **Prevalence of Inf. %** |
| Lokpanta | 500 | 164 | 14.6% |
| Amagunze | 245 | 34 | 3.0% |
| Oduma | 330 | 90 | 8.0% |
| UNTH Enugu | 50 | 16 | 1.4% |
| TOTAL | 1125 | 304 | 27.0% |

Table 1.2 shows the relationship between paragonimus infection according to the communities. More subjects were infected in Lokpanta.

#### TABLE 1.3: CRABS INFESTATION BY PARAGONIMUS ACCORDING TO COMMUNITIES

|  |  |  |
| --- | --- | --- |
| **Communities** | **Number of crabs collected** | **Number infected with paragonimus** |
| Lokpanta | 155 | 18 (11.6%) |
| Amagunze | 60 | 2 (3.3%) |
| Oduma | 85 | 5 (5.9%) |
| **TOTAL** | **300** | **25** |

Table 1.3 shows the number of crabs collected in each of the communities studied and their infestation with paragonimus.

#### TABLE 1.4: SEX DISTRIBUTION OF SIGNS AND SYMPTOMS PRESENTED BY SUBJECTS.

|  |  |  |  |
| --- | --- | --- | --- |
| **SIGNS/SYMPTOMS** | **FREQUENCY** | **MALE** | **FEMALE** |
| Abdominal pain | 78 | 50 | 128 |
| Chest pain | 82 | 60 | 142 |
| Fever | 74 | 24 | 98 |
| Headache | 14 | 8 | 22 |
| Malaise | 10 | 6 | 16 |
| Cough | 168 | 100 | 268 |
| Dyspnoea | 32 | 18 | 50 |
| Diarrhoea | 2 | - | 2 |
| Haemoptysis | 16 | 12 | 28 |
| Sweats | 4 | 4 | - |

Table 1.4 shows the various signs and symptoms observed in subjects infected with the paragonimus according to sex. Cough (168) occurred more than others while diarrhoea (2) was the least occurring.

**1.5: RELATIONSHIP BETWEEN INFECTION AND OCCUPATION OF THE SUBJECTS**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LOCATION** | **NE** | **NI** | **Farmers** | **Fishermen** | **Students** | **Civil**  **Servants** | **Traders** | **Total** |
| Lokpanta | 550 | 164 | 40 (24.4%) | 6 (3.7%) | 100 (61%) | 6 (3.7%) | 12(7.3%) | 164  (100%) |
| Amagunze | 235 | 34 | 10 (29.4%) | 4 (11.8%) | 12(35.3%) | 2 (5.9%) | 6 (17.7%) | 34  (100%) |
| Oduma | 330 | 90 | 20(22.2%) | 4 (4.4%) | 58  (64.4%) | - | 8 (8.9%) | 90  (100%) |
| UNTH  Enugu | 50 | 16 | 8 (50%) | 2 (12.5%) | - | 4 (25%) | 2(12.5%) | 16  (100%) |
| TOTAL | 1125 | 304 | 78 (25.7%) | 16 (5.3%) | 170  (55.9%) | 12  (3.9%) | 28 (9.2%) | 304  (100% |

Table 1.5 shows the relationship between infection and occupation of the subjects. The rate of infection was higher among the students n=170 (55.9%) and was least among civil servants n=12 (3.9%). NE= number examined and NI= number infected.

#### TABLE 1.6: MEAN LOAD OF PARAGONIMUS IN CRABS AND HUMANS.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **INTENSITY** |  |  |
| **Subject** | **Low** | **Moderate** | **High** |
| CRABS | 5.1 (28%) | 18.8 (60%) | 64.3 (12%) |
| HUMANS | 23.52 (44.07%) | 71.11 (47.36%) | 107.5 (8.55%) |

Table 1.6 shows the mean yield (load) of the paragonimus specie in crabs and human hosts. Intensity of infection in both subjects were moderate

#### TABLE 1.7: PRESENCE OF PARAGONIMUS IN THE SPUTUM OF INFECTED SUBJECTS.

|  |  |  |  |
| --- | --- | --- | --- |
| **Parasite** | **Positive** | **Negative** | **Total** |
| P. uterobilateralis | 224 | 80 | 304 |
| P. africanus | - | - | - |
| **Total** | **224** | **80** | **304** |

The presence of infecting organisms in sputum is shown in table 1.7. P. uterobilateralis was responsible for all the infections (224).



#### Fig. 4.0: Micrograph showing the presence of a single paragonimus egg



**Fig. 4.1: The micrograph shows multiple paragonimus eggs**

#### 1.8: DISTRIBUTION OF THE PRESENCE OF PARAGONIMUS IN SPUTUM ACCORDING TO COMMUNITY

|  |  |  |  |
| --- | --- | --- | --- |
| **Community** | **Number Examined** | **Number Infected** | **Prevalence of Inf. %** |
| Lokpanta | 164 | 120 | 39.5% |
| Amagunze | 34 | 28 | 9.2% |
| Oduma | 90 | 40 | 13.2% |
| UNTH Enugu | 16 | 36 | 11.8% |
| TOTAL | 304 | 224 | 73.7% |
|  |  |  |  |

Table 1.8 shows sputum positive samples in each of the locations. Lokpanta recorded the highest number of sputum positive subjects.

#### TABLE 1.9: PRESENCE OF PARAGONIMUS IN THE STOOL OF INFECTED SUBJECTS.

|  |  |  |  |
| --- | --- | --- | --- |
| **Organism** | **Positive** | **Negative** | **Total** |
| P. uterobilateralis | 80 | 224 | 304 |
| P. africanus | - | - | - |
| Total | 80 | 224 | 304 |

Table 1.9 shows that 80 samples of stool were positive for the infecting organisms.

#### : DISTRIBUTION OF THE PRESENCE OF PARAGONIMUS IN STOOL ACCORDING TO COMMUNITY

|  |  |  |  |
| --- | --- | --- | --- |
| **Community** | **Number Examined** | **Number Infected** | **Prevalence of Inf. %** |
| Lokpanta | 164 | 44 | 14.5% |
| Amagunze | 34 | 11 | 3.6% |
| Oduma | 90 | 25 | 8.2% |
| UNTH Enugu | 16 | - | - |
| TOTAL | 304 | 80 | 26.3% |

Infection of subjects in relation to the stool is shown in this table 1.10. Lokpanta also recorded the highest number of infection detected in the stool.

#### : MEAN YIELD OF PARAGONIMUS EGG ACCORDING TO AGE

|  |  |  |  |
| --- | --- | --- | --- |
| **S/N** | **Age range (Yrs)** | **N** | **Mean egg yield** |
| 1 | 5-12 | 134 | 378 |
| 2 | 13-20 | 58 | 313 |
| 3 | 21-28 | 32 | 362 |
| 4 | 29-36 | 6 | 67 |
| 5 | 37-44 | 28 | 285 |
| 6 | 45-52 | 20 | 158 |
| 7 | 53-60 | 14 | 124 |
| 8 | 61-68 | 8 | 154 |
| 9 | 69 and above | 4 | 56 |
| TOTAL |  | 304 | 1897 |

Table 1.11 shows that more eggs were detected at the age range of 5-12 years.





Fig. 4.2: Graph showing the mean yield of paragonimus eggs according to age. More eggs were produced within the age range of 5-12years.



400

350

300

250

200

Series1

150

100

50

0

1

2

3

4

5

6

7

8

9

* 1. : AGE DISTRIBUTION OF MEAN PARAGONIMUS EGG IN SPUTUM AND STOOL

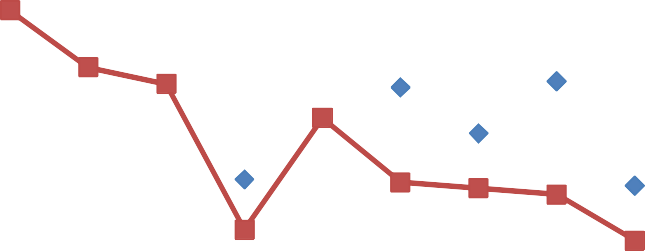
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S/N | Age(yrs) | Frequency | Sputum | Stool |
| 1 | 5-12 | 134 | 218 | 160 |
| 2 | 13-20 | 58 | 190 | 123 |
| 3 | 21-28 | 32 | 250 | 112 |
| 4 | 28-36 | 6 | 50 | 17 |
| 5 | 37-44 | 28 | 195 | 90 |
| 6 | 45-52 | 20 | 110 | 48 |
| 7 | 53-60 | 14 | 80 | 44 |
| 8 | 61-68 | 8 | 114 | 40 |
| 9 | 69 and  above | 4 | 46 | 10 |
| TOTAL |  | 304 | 1253 | 644 |

The above table shows the age distribution of mean paragonimus yield in sputum and stool.





Fig. 4.3: Graph shows the mean paraginimus egg detected in sputum and stool. Series1 represents eggs in sputum and series2 is for stool. More eggs were seen in sputum but age had no effect on the number of eggs produced.



300

250

200

150

Series1

Series2

100

50

0

1

2

3

4

5

6

7

8

9

#### TABLE 1.13: CHARACTERIZATION OF ECHOTEXTURE OF THE ORGANS IN INFECTED SUBJECTS

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S/n** | **Age** | **No frequency** | **Normal liver** | **echo poor liver** | **Echo genic liver** | **Liver cyst** | **Normal spleen** | **echo poor spleen** | **Echogenic spleen** | **Normal kidney** | **Echo poor kidney** | **Echogenic kidney** |
| 1 | 5 | 10 | 10 | - | - | \_ | 10 | - | - | 10 | - | - |
| 2 | 6 | 14 | 14 | - | - | \_ | 14 | - | - | 14 | - | - |
| 3 | 7 | 14 | 14 | - | - | \_ | 14 | - | - | 14 | - | - |
| 4 | 8 | 22 | 40 | - | - | \_ | 44 | - | - | 44 | - | - |
| 5 | 9 | 16 | 16 | - | 2 | \_ | 16 | - | - | 16 | - | - |
| 6 | 10 | 12 | 12 | - | - | \_ | 12 | - | - | 12 | - | - |
| 7 | 11 | 14 | 14 | - | - | \_ | 14 | - | - | 14 | - | - |
| 8 | 12 | 10 | 10 | - | - | \_ | 10 | - | - | 10 | - | - |
| 9 | 13 | 12 | 10 | - | 1 | \_ | 12 | - | - | 12 | - | - |
| 10 | 14 | 6 | 4 | - | 1 | \_ | 6 | - | - | 6 | - | - |
| 11 | 15 | 6 | 6 | - | - | \_ | 6 | - | - | 6 | - | - |
| 12 | 17 | 10 | 10 | - | - | \_ | 10 | - | - | 8 | - | - |
| 13 | 18 | 8 | 8 | 1 | - | \_ | 8 | - | - | 8 | - | - |
| 14 | 19 | 8 | 8 | - | - | \_ | 8 | - | - | 8 | - | - |
| 15 | 20 | 8 | 8 | - | - | \_ | 8 | - | - | 8 | - | - |
| 16 | 22 | 8 | 6 | 1 | - | 1 | 8 | - | - | 8 | - | - |
| 17 | 23 | 8 | 8 | - | - | 2 | 8 | - | - | 8 | - | - |
| 18 | 24 | 2 | - | \_ |  | \_ | 1 | - | - | 2 | - | - |
| 19 | 25 | 8 | 6 | 2 | - | 2 | 1 | - | - | 8 | - | - |
| 20 | 27 | 6 | 4 | 2 | 1 | 2 | 4 | - | - | 8 | - | - |
| 21 | 35 | 6 | 4 | \_ | - | 1 | 6 | - | - | - | - | - |
| 22 | 38 | 6 | 6 | - | - | 2 | 6 | - | - | 6 | - | - |
| 23 | 39 | 6 | 4 | \_ | - | - | 6 | - | - | 6 | - | - |
| 24 | 40 | 4 | 2 | 3 | 1 | 2 | 4 | - | - | 4 | - | - |
| 25 | 4 | 6 | 6 | - | - | 1 | 6 | - | - | 6 | - | - |
| 26 | 42 | 6 | 4 | 2 | - | \_ | 6 | - | - | 6 | - | - |
| 27 | 48 | 6 | 4 | 2 | - | \_ | 6 | - | - | 6 | - | - |
| 28 | 50 | 8 | 8 | - | - | 1 | 8 | - | - | 8 | - | - |
| 29 | 52 | 6 | 2 | 4 | - | 1 | 6 | - | - | 6 | - | - |
| 30 | 54 | 4 | 4 | - | - | \_ | 4 | - | - | 4 | - | - |
| 31 | 56 | 6 | 4 | - | - | 2 | 6 | - | - | 6 | - | - |
| 32 | 60 | 4 | 4 | 1 | - | \_ | 4 | - | - | 6 | - | - |
| 33 | 62 | 4 | 2 | 1 | - | 1 | 4 | - | - | 4 | - | - |
| 34 | 68 | 4 | 2 | 2 | - | 1 | 4 | - | - | 4 | - | - |
| 35 | 70 | 4 | - | 2 | 1 | 1 | 4 | - | - | 4 | - | - |
| **Total** | | **304** | **264** | **25** | **7** | **20** | **304** | **-** | **-** | **304** | **-** | **-** |

The observed echotexture in the various organs is shown in table 1.13. No echotextural change was seen in the spleen and kidneys. There was the presence of cyst in the liver.

**TABLE 1.14: SONOGRAPHIC FINDINGS AND THE DEGREE OF INFESTATION**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S/N** | **AGE**  **(Years**  **)** | **N** | **Organ enlargement** | **P. Effusion** | **Echo Poor** | **Echo Genic** | **Liver Cyst** | **Normal texture** | **Mean egg Yield** | **Normal sizes** |
| 1 | 5 | 10 | 10 | 2 | - | - | - | 10 | 53 | - |
| 2 | 6 | 14 | 12 | 2 | - | - | - | 14 | 31 | 2 |
| 3 | 7 | 14 | 10 | 2 | - | - | - | 14 | 31 | 4 |
| 4 | 8 | 44 | 16 | 2 | - | 2 | - | 40 | 45 | 28 |
| 5 | 9 | 16 | 4 | 8 | - | - | - | 16 | 39 | 6 |
| 6 | 10 | 12 | 2 | 6 | - | - | - | 12 | 62 | 10 |
| 7 | 11 | 14 | 4 | 2 | - | - | - | 14 | 59 | 10 |
| 8 | 12 | 10 | 2 | 2 | - | - | - | 10 | 58 | 10 |
| 9 | 13 | 12 | 2 | 10 | - | 1 | - | 10 | 79 | 12 |
| 10 | 14 | 6 | - | 4 | - | 1 | - | 4 | 39 | 6 |
| 11 | 15 | 6 | - | - | - | - | - | 6 | 31 | 6 |
| 12 | 17 | 10 | 2 | - | - | - | - | 10 | 37 | 8 |
| 13 | 18 | 14 | - | 6 | 1 | - | - | 8 | 52 | 8 |
| 14 | 19 | 8 | 2 | - | - | - | - | 8 | 32 | 8 |
| 15 | 20 | 8 | - | 4 | - | - | - | 8 | 43 | 8 |
| 16 | 22 | 8 | - | 2 | 1 | - | 1 | 4 | 75 | 8 |
| 17 | 23 | 8 | - | 2 | - | - | 2 | 8 | 91 | 8 |
| 18 | 24 | 2 | - | - | - | - | - | 2 | 80 | 2 |
| 19 | 25 | 8 | 2 |  | 2 |  | 2 | 6 | 53 | 6 |
| 20 | 27 | 6 | - | - | 2 | 1 | 2 | 2 | 63 | 6 |
| 21 | 35 | 6 | - | 2 | - | - | 1 | 4 | 67 | 6 |
| 22 | 38 | 6 | - | - | - | - | 2 | 6 | 62 | 6 |
| 23 | 39 | 6 | - | - |  | - | - | 4 | 71 | 6 |
| 24 | 40 | 4 | - | - | 3 | 1 | 2 | 2 | 57 | 4 |
| 25 | 41 | 6 | - | 2 | - | - | 1 | 6 | 57 | 6 |
| 26 | 42 | 6 | 2 | - | 2 | - | - | 4 | 38 | 6 |
| 27 | 48 | 6 | 2 | - | 2 | - | - | 4 | 48 | 4 |
| 28 | 50 | 8 | 4 | 2 | - | - | 1 | 8 | 42 | 8 |
| 29 | 52 | 6 |  |  | 4 |  | 1 | 2 | 68 | 6 |
| 30 | 54 | 4 | - | - | - | - | - | 4 | 30 | 4 |
| 31 | 56 | 6 | - | - |  | - | 2 | 4 | 77 | 6 |
| 32 | 69 | 4 | - | - | 1 | - | - | 4 | 17 | 4 |
| 33 | 62 | 4 | - | 2 | 1 | - | 1 | 4 | 100 | 4 |
| 34 | 68 | 4 | - | - | 2 | - | 1 | 2 | 54 | 14 |
| 35 | 70 | 4 | - | - | 2 | 1 | 1 | 2 | 56 | 4 |
| **Total** | | 304 | 76 | 50 | 25 | 7 | 20 | 286 | 1897 | 244 |

Table 1.14 shows the sonographic findings and the degree of infestation. Mean yield of paragonimus ranged from 17-100.

#### TABLE 1.15: DISTRIBUTTION OF SONOGRAPHIC FINDINGS OF LIVER IN INFECTED SUBJECTS

|  |  |
| --- | --- |
| Sonographic Findings | Frequency |
| Normal Echotexture | 190 |
| Coarse Echotexture | 14 |
| Echopoor texture | 20 |
| Liver cyst | 40 |
| Total | 304 |

The echotexture was normal in most of the subjects infected (190) as shown in table 1.15.

**TABLE 1.16: VARIATION OF ORGAN DIMENSIONS WITH AGE IN PARAGONIMUS INFECTED SUBJECTS**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S/ N** | **AGE YEAR S** | **Freque ncy (N)** | **Liver length mean + SD**  **(cm)** | **Spleen length mean + SD (cm)** | **Right kidney length mean +**  **SD (cm)** | **Right Kidney width mean +**  **SD (cm)** | **Left kidney length mean +**  **SD (cm)** | **Left Kidney width mean +**  **SD (cm)** | **Left kidney thicknes s + SD**  **(cm)** |
| 1 | 5-12 | 134 | 13.8809 | 9.6910 | 10.0312 | 4.0125 | 10.1938 | 3.4970 | 1.3970 |
|  |  |  | +1.5461 | + . 88467 | + . 66304 | + . | + .65368 | + | +.19538 |
|  |  |  |  |  |  | 28255 |  | .144175 |  |
| 2 | 13-20 | 58 | 13.0621 | 11.8621 | 9.8241 | 3.9759 | 10.0379 | 4.1207 | 1.6241 |
|  |  |  | + .88456 | + | +. 80163 | + .29478 | + .65542 | + .3371 | +.10231 |
|  |  |  |  | 1.27038 |  |  |  |  |  |
| 3 | 21-28 | 32 | 13.6938 | 12.7438 | 10.8250 | 3.9437 | 11.2667 | 3.9333 | 1.7333 |
|  |  |  | +1.0272 | +. 26458 | + . 36788 | + .32449 | +28128 | +.35201 | +.09750 |
| 4 | 29-36 | 6 | 14.3000 | 12.8000 | 10.6667 | 3.8000 | 11.2667 | 3.93333 | 1.7333 |
|  |  |  | +.34641 | +. 26458 | + . 11547 | + .11547 | + .46188 | +11547 | + . |
|  |  |  |  |  |  |  |  |  | 05744 |
| 5 | 37-44 | 28 | 14.2571 | 13.6143 | 61.0714 | 4.0571 | 11.1286 | 4.3000 | 1.8786 |
|  |  |  | + .57474 | + .71129 | + .30991 | 1.39752 | + . 28128 | +. 35301 | + .09750 |
| 6 | 45-52 | 20 | 14.9800 | 14.7300 | 11.3400 | 4.4400 | 11.4600 | 4.1400 | 1.8400 |
|  |  |  | + . | + . 93933 | + . 40879 | +.54610 | + .36878 | + .59479 | + .16465 |
|  |  |  | 102285 |  |  |  |  |  |  |
| 7 | 53-60 | 14 | 14.5714 | 14.9000 | 11.1714 | 4.1429 | 11.1571 | 4.1429 | 1.8286 |
|  |  |  | +1.16149 | + | + .64734 | + . | + . 57982 | +.24398 | + . |
|  |  |  |  | 1.66633 |  | 33594 |  |  | 12536 |
| 8 | 61-68 | 8 | 13.9500 | 13.7000 | 10.7000 | 3.4500 | 10.7500 | 3.800 | 1.6500 |
|  |  |  | + 66081 | + .70028 | + .11547 | + .17321 | + .05774 | + .34641 | + . |
|  |  |  |  |  |  |  |  |  | 17321 |
| 9 | 69-76 | 4 | 12.900 | 13.25000 | 8.8500 | 3.2000 | 8.8500 | 3.3000 | 1.4000 |
|  |  |  | + .14142 | + .77782 | + . 35355 | + . 0000 | +35355 | + . 43426 | + . 0000 |

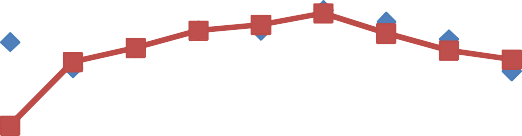
Table 1.16 shows age variation among organ dimensions in infected subjects. The longest length of the liver was recorded in the age range of 45-52 (14.9800) and was least at the range of 69-76 (12.9000). Spleen was highest at the age range of 53-60 (14.7300) and least at 5-12years (9.6910). The length of the right kidney was highest at the age range of 45-52 years (11.4600). Left kidney length was highest at the age range of 45-52 (11.4600). The width of the kidneys were highest at the age range of 45-52 (4.4400) and at 37-44 years (4.3000) for the right and left kidneys respectively.

#### TABLE 1.17: ORGAN DIMENSIONS IN NORMAL SUBJECTS ACCORDING TO AGE

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S/N** | **AGE**  **(Years)** | **Frequency (N)** | **Liver length mean + SD (cm)** | **Spleen length mean + SD (cm)** | **Right kidney length mean**  **+ SD (cm)** | **Right Kidney meant + SD (cm)** | **Left kidney mean + SD (cm)** | **Left Kidney mean + SD (cm)** |
| 1 | 5-12 | 204 | 10.9559 | 9.0132 | 8.5575 | 3.4838 | 8.7235 | 3.6632 |
|  |  |  | + . 92871 | +.97445 | + .70510 | +. 43180 | + 69198 | + .43910 |
| 2 | 13-20 | 78 | 13.2385 | 11.2462 | 9.8346 | 4.1231 | 9.9769 | 4.2385 |
|  |  |  | + .34068 | + .61724 | + . 57615 | + . 25816 | + . 62052 | + . 25152 |
| 3 | 21-28 | 57 | 13.6684 | 12.2316 | 10.7316 | 4.0579 | 10.8368 | 4.0421 |
|  |  |  | + . 50006 | + . 24279 | + . 36523 | + . 39765 | + . 38037 | + . 43117 |
| 4 | 29-36 | 12 | 14.3000 | 12.5750 | 11.0500 | 4.2500 | 11.1500 | 4.1000 |
|  |  |  | + . 37417 | + .47170 | + .25166 | + . 20817 | + . 07071 | + . 1412 |
| 5 | 37 - | 21 | 14.4714 | 12.7286 | 11.1143 | 4.3000 | 11.3000 | 4.3143 |
|  | 44 |  | + .39036 | + . 36384 | + . 25448 | + . 22361 | + . 16330 | + . 14639 |
| 6 | 45-52 | 42 | 14.8857 | 13.7000 | 11.5000 | 4.1500 | 11.4786 | 4. 3071 |
|  |  |  | + . 27416 | + . 48038 | + . 29357 | + . 29807 | + . 32389 | + . 27586 |
| 7 | 53-60 | 21 | 14.1714 | 13.8429 | 11.1571 | 4.0571 | 11.3000 | 4.4429 |
|  |  |  | + . 66762 | + . 35989 | + . 40356 | + . 45040 | + . 48990 | + . 25071 |
| 8 | 61-68 | 12 | 13.6250 | 13.2000 | 9.5250 | 3. 6500 | 9.400 | 3.8000 |
|  |  |  | + . 09574 | + . 28284 | + . 09574 | + . 12910 | + . 18257 | + . 16330 |
| 9 | 69 – | 9 | 13.3333 | 12.3667 | 9.0333 | 3.4333 | 9.1667 | 3.8667 |
|  | 76 |  | + . 15275 | + . 32146 | + . 25166 | + . 25166 | + . 28868 | + . 11547 |

The variation of age with organ dimensions in normal subjects is shown in table 1.17. The longest length of the liver was obtained at age range 45-52 years (14.88) and the least was obtained at the range of 5-12 years (10.955). Spleen length was highest at the age range of 53-60 years (13.8429) and lowest at the range of 5-12 years (8.5575). The longest of the right kidney was obtained at the age range of 45- 52 years (11.5000) and that of the left was also at 45-52 years (11.4786). The organ dimensions increased with respect to the age up to stage and then decreased with increase in age.

Fig. 4.4: Graph shows the organ dimension of the liver in infected and normal subjects. Series1 represents the infected subjects while series2 represents the normal.



16

14

12

10

8

6

Series1

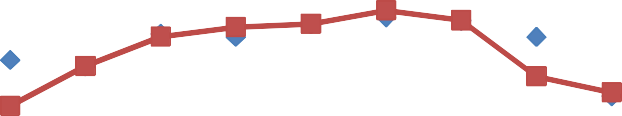
Series2

4

2

0

1 2 3 4 5 6 7 8 9



14

12

10

8

6

Series1

Series2

4

2

0

1

2

3

4

5

6

7

8

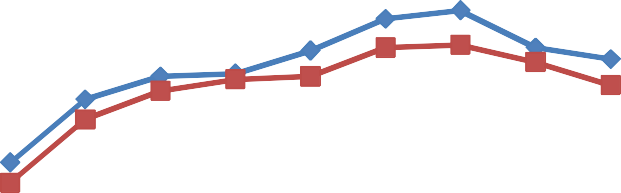
9

Fig. 4.5: The graphical reprsentation of the relationship between the right kidney size in infected and normal subjects. Series1 is for the infected and series2 is for the normal.

#### TABLE 1.18: COMPARISON BETWEEN ORGAN SIZE IN INFECTED AND NORMAL SUBJECTS

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Subjects** | **Liver (cm)** | **Spleen (cm)** | **RKL (cm)** | **RKW (cm)** | **LKL (cm)** | **LKW (cm)** |
| Infected | 13.84+1.02 | 11.57+2.11 | 9.67+1.28 | 3.70+1.52 | 9.80+1.28 | 3.83+0.52 |
| Normal | 12.56+1.67 | 10.82+2.05 | 9.65+1.26 | 3.8+0.48 | 9.70+1.23 | 3.96+0.46 |

Mean organ size variation among infected and normal subjects is shown in table 1.18. The mean organ dimensions were higher in infected than normal subjects except for the width of the left kidney where that of the normal was higher.



16

14

12

10

8

6

Series1

Series2

4

2

0

1

2

3

4

5

6

7

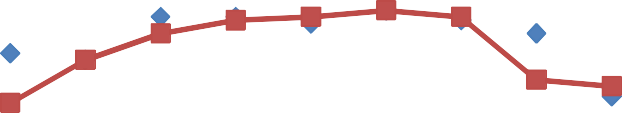
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Fig. 4.6: Graph showing the relationship between the spleen size in infected and normal subjects. Series1 represents the infected while series2 represents the normal.



Relationship between the left kidney size in infected and normal subjects is shown in fig.4.7. Series1 depicts infected and series2 normal subjects.



14

12

10

8

6

Series1

Series2

4

2

0

1

2

3

4

5

6

7

8

9

#### TABLE 1.19: SEX VARIATION OF ORGAN SIZES IN INFECTED SUBJECTS

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S/N** | **Sex** | **No frequen cy** | **Liver lenght (mm) mean ± SD (cm)** | **Spleen length mean ± SD (cm)** | **Right kidney length mean**  **±SD(cm**  **)** | **Right kidney width mean ± SD(cm**  **)** | **Right kidney thickness mean ± SD(cm)** | **Left kidney length mean ± SD(cm)** | **Left kidney width mean ± SD(cm**  **)** | **Left kidney thickne ss mean**  **±**  **SD(cm)** |
| 1 | Male | 170 | 14.5847  ± 1.363 | 11.8918  ±2.0809  9 | 9.8882  ±1.2569  2 | 3.7647  ±.5463  5 | 1.4659  ±23276 | 10.0341  1  ±1.2856  9 | 3.5682  ±.5212  6 | 1.6059  ±.25183 |
| 2 | Femal e | 134 | 12.8973  ±1.5843  5 | 11.1687  ±2.0938  0 | 9.3955  ±1.2646  0 | 3.6493  ±.4723  8 | 1.4149  ±.23629 | 9.6015  ±1.2383  4 | 3.8000  ±51728 | 1.6059  ±25183 |
|  | Total | 304 | 13.84  ±1.03 | 11.57  ±1.2 | 9.6711  ±1.2798  8 | 3.7138  ±.5166  2 | 1.4434  ±23492 | 9.8434  ±1.2791  6 | 3.8382  ±51891 | 1.5882  ±24574 |

Table 1.19 shows variation of sex with organ dimensions in infected subjects. The length of the spleen, liver and kidneys were higher among males than females. Left renal width was higher in females than in males.

#### TABLE 1.20: ORGAN DIMENSION IN NORMAL SUBJECTS ACCORDING TO SEX

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S/n | Sex | N(frequency) | Liver lenght (mm) mean ±  SD (cm) | Spleen length mean ± SD (cm) | Right kidney length mean  ±SD(cm) | Right kidney width mean ±  SD(cm) | Right kidney thickness mean ±  SD (cm) | Left kidney length mean  ± SD (cm) | Left kidney width mean ±  SD (cm) | Left kidney thickness mean ± SD (cm) |
| 1 | Male | 273 | 12.7154 | 11.0527 | 9.7626 | 3.8462 | 1.4451 | 9.8736 | 3.9989 | 1.6549 |
|  |  |  | ±1.60989 | ±2.01645 | ±1.25609 | ±.46603 | ±.22174 | ±1.23692 | ±.46392 | ±.23724 |
| 2 | Female | 183 | 12.3344 | 10.4754 | 9.4754 | 3.7656 | 1.4098 | 9.6492 | 3.8902 | 1.8508 |
|  |  |  | ±1.73156 | ±2.096451 | ±1.25967 | ±.51926 | ±.20713 | ±1.21197 | ±.45779 | ````±1.85649 |
|  | Total | 456 | 12.5625 | 10.8211 | 9.6539 | 3.8138 | 1.4309 | 9.7836 | 3.9553 | 1.7336 |
|  |  | ±1.66470 | ±2.04883 | ±1.26039 | ±.48801 | ±.21599 | ±1.22790 | ±.46304 | ±1.18841 |

The variation of sex with organ dimensions in normal subjects is shown in table 1.20. The organ dimensions were higher in males than females.

**TABLE 1.21: MEAN ANTHROPOMETRIC VARIABLES IN INFECTED AND**

#### NORMAL SUBJECTS

|  |  |  |  |
| --- | --- | --- | --- |
| Subjects | Weight(kg) | Height(m) | BMI |
| Infected | 46.9+2.17 | 1.50+0.22 | 19.33+4.45 |
| Normal | 47.5+2.19 | 1.50+0.22 | 19.33+4.45 |

Mean anthropometric variables in infected and normal subjects is shown in table 1.21.The weight was higher in normal than infected subjects. Height and BMI were the same in both subjects.

#### CHAPTER FIVE

**DISCUSSION, CONCLUSION AND RECOMMENDATIONS.**

#### DISCUSSION.

**EPIDEMIOLOGY**

This study was carried out in Lokpanta, Amagunze and Oduma which are rural communities in South east Nigeria. The chest clinic of the university of Nigeria teaching hospital, Enugu was also used as a study centre. In this study, Lokpanta recorded the highest number of individuals with paragonimiasis among the other communities. One hundred and sixty four (164) subjects were positive in Lokpanta, 90 were positive in Oduma while 34 subjects were positive in Amagunze. The remaining 16 cases were identified at University of Nigeria teaching hospital Enugu among patients who attended the chest clinic and who were negative for acid fast bacilli. They constituted 5.3% of the total cases observed during this study. The high number of cases seen in Lokpanta may be attributed to the fact that the number of crabs that were positive for paragonimus metacercariae in this area was also high. More subjects were selected from this area than others. Crab hunting is also a common practice among young adults in this area who sell these crabs along the road in this locality as a source of income. As a result of this more people have access to eating crabs even if they cannot hunt for them. This community is also closer to Okigwe where previous studies showed the presence of this parasite (Nwokolo, 1972; Nwokolo, 1973; Voelker, 1975). The presence of paragonimus infection among the inhabitants of this part of Southeast Nigeria is in agreement with the study done by some previous authors who had noted that South east Nigeria is endemic for this infection. They include Aka et al, (2008) who observed that the highest prevalence of the disease in Africa over the past years was noted mainly in eastern Nigeria. They recorded that 45.7% cases were listed during the Biafran civil war and in the years following it, the other patients were recorded during the past 25 years with low infection rates from 8.6 to 16.8%. The other authors that had reported several cases of this parasitic infection in eastern Nigeria are; Nwokolo, (1972); Udonsi, (1987); Ibanga, (2007); Chukwunye, (2012). It is therefore expected that studies on this infection will be carried out more in Nigeria especially in the South eastern part than any other country in Africa because of this high rate of infection noted in this area. The high rate of infection may be as a result of ingestion of contaminated water or raw crab or crayfish infected with metacercariae. Other cultural habits like the use of crabs in treating cough and consumption of crabs by pregnant women in order to have vibrant foetuses as reported by the inhabitants may also be the reason for the presence of this infection in these communities.

The number of male subjects that were infected with this parasite is 168 (55.3%) while females were 136 (44.7%) in this study. Present study therefore shows that more males were infected than females. This is in line with the works done by Moyou et al, (2003); Ochigbo (2007); Singh et al, (2009) and Uttah, (2013), but disagrees with the works of Ibanga et al, (1997) and Asor et

al, (2003), who reported that more females were infected than males. There is sex related difference in prevalence of this disease in this study. Many other researchers had reported no sex related difference in prevalence (Uchiyama et al, 1999; Ashitani et al, 2000). It is pertinent to note that although both sexes can acquire the infection through food or by wrong sense of remedy to certain ailments, the males encounter crabs more than females (Nworie et al, 2013). The involvement of males in crab hunting, fishing and other related activities which bring them close to crabs more than their female counterparts and the possibility of eating raw crab limbs may be one of the reasons why more males are infected. Roasting of crabs is also common and both habits of eating crabs predispose the males to being infected more than the females. The possibility of limited access to health care for women as an explanation for the observed difference needs to be explored.

The mean age of individuals that were infected is 15.2 years and the range is between 5-70years. The age range that was mostly affected was 5-12 years and followed by 13-20 years. This age range in present study could also be said to be in agreement with the work done by Ibanga et al (1997); Arene et al (1998); Uttah et al, (2013) and Nworie et al, (2013) who independently reported prevalence rate in 11-16 years of age. This is because they appear to be within the same age range. Ochigbo et al (2007) in his study observed that the most affected age range was 6-10 years and this age range is also close to that of this study. Children were therefore more infected than the adults. Some of the children admitted eating the crab limbs while hunting and also roasted crabs and related the colour of the crab with its readiness for consumption. It could therefore be said that the implication of this is that children consumed improperly cooked crabs more than the adults.

There is increased level of poverty in the country especially among rural dwellers who do not have western education and as a result are predominantly farmers. In this study, a total of 78 (25.7%) farmers were involved. Fourty (40) of them were from Lokpanta, 10 from Amagunze, 20 from Oduma and 8 in university of Nigeria teaching hospital, Enugu. The number of students that were positive in this study was 170 (55.9%). Fishermen were 16 (5.3%), civil servants were 12 (3.9) and traders were 28 (9.2%). This classification according to occupation is as described by Nworie et al, (2013). Present study therefore revealed that students constituted the largest number of participants infected with paragonimus while the civil servants were the least. This finding is in agreement with the work of Nworie, et al (2013). This pattern of infection may be because students formed the larger part of the study and also because the most affected age group was 5-12 years and followed by 13-20 years which is the school age range. These age groups are more usually involved in the hunting of crabs and other activities like swimming and fishing which may bring them closer to crustaceans (crabs and crayfishes) and snails that are predisposing factors to paragonimus infection. There is every possibility of eating the crab limbs and crayfishes raw while hunting by the subjects.

The nature of the work of the farmers and fishermen may be a predisposing factor to their being infected with this parasite. In the course of their work, these people could catch crabs or

crayfishes and eat them raw. The inhabitants of these communities reported that the use of fertilizer for cultivation has reduced the population of crabs in their areas and this may have also affected the prevalence of the infection among the farmers as they rarely encounter crabs during farming.The civil servants recorded the least number and this may be attributed to the fact that they are enlightened and would have less contact with crabs.There are also educational campaigns about this disease and this may also be the reason for the low prevalent rate among the civil servants.

Paragonimiasis presents with various signs and symptoms. Infection can either be acute or chronic. The various signs and symptoms observed in this study were, abdominal pain, fever, headache, malaise, chest pain, cough, dyspnoea, diarrhoea, haemoptysis and sweats. The present study reveals that the common symptoms observed are similar to those reported by Razaque et al (1991).

The symptom that occurred most was cough (168) followed by chest pain (82). The least occurring was diarrhoea which was seen in only two patients. The implication of this is that most patients presented with cough. This finding is in line with the study done by (Moyou et al, 2003 and Devis et al, 2007, who noted that cough was the most occurring sign of this infection. Other researchers had reported cough and haemoptysis as the major cause of this infection (Nagakawa et al, 2002; Strobe et al, 2005; Chukwuka et al, 2010 and Eke et al, 2010). Haemoptysis was observed as one of the symptoms in this study but it was not a major cause of infection. Haemoptysis is a classical sign of paragonimiasis but it may be absent if there is a low worm burden and limited pulmonary distinction and bleeding. Absence of the disease may also be as a result of parasitic migration to an ectopic location or if the patient has solely based pleural disease. The fact that most of our subjects were children and the disease may not have advanced to the pulmonary stage may be the reason for the low prevalence of this condition as a sign of the disease in our study. Haemoptysis was noted mainly in the age group of 38 and above which represents the adult age. This our finding is in agreement with that of Jeon et al, (2003), Devi et al (2007) and Ibrahim et al (2008) who observed that haemoptysis was commonly seen in adults.

The study recorded eighteen subjects who were asymptomatic. The clinical findings for individual patient reflects the stage and type of disease. However many patients who come for medical attention at the chronic pulmonary stage of the disease may not remember or were not aware of the disappearing symptoms present during the early stage of the infection (i.e, they were asymptomatic or had subclinical acute paragonimiasis). In one review that involved serologic studies to determine if patients were infected, as many as 20% of patient with paragonimiasis were reportedly asymptomatic (Uchiyama et al, 1999). Asymptomatic subjects in our study constituted 5.2% of the infection. This is low compared to the work of Uchiyama (1999), probably because detection of the parasite in our study was based on the laboratory investigation of sputum and stool samples instead of serology which is more sensitive in detection of paragonimiasis.

#### LOAD OF PARAGONIMUS IN CRABS

In this study, a total of 300 crabs were collected to isolate the presence of paragonimus metacercariae. Out of these, 25 crabs were found to harbour the metacercariae giving a prevalence rate of 8.3%. This finding may be said to be high compared to other studies done elsewhere. The overall crab infestation rate in Cameroon as calculated by Moyou et al (2003) is 6.02%. This is lower than the value observed in this study. Following this higher rate it is expected that more subjects will be infected in this area more than the neighbouring Cameroon. This is in agreement with (Aka et al, 2008) who recorded infection in Cameroon and Nigeria with Nigeria having a higher rate of infection than Cameroon. However, this finding is close to the value observed in South east Nigeria by Uttah (2013) who recorded 6.9% but differs from that of Sugimaya et al (2004) who recorded 19% in a study they conducted in Japan. This goes to show that the rate of infection will be higher in Japan than in Nigeria where the present study was carried out.

The number of metacercariae per crab observed in this study ranged from 1-75. It is the number of this metacercariae that determines the load or intensity of paragonimus in crabs. Kim et al (2009) in their study observed that the metacercariae per crab ranged from 8-59 with a mean range of 28.4. Sachs and Cumberlidge (1991) recorded a range of 1-100. The range recorded in this study is in agreement with these other previous studies even though there is a slight variation. The intensity of infection is usually classified as light, moderate or medium and heavy. The infection status of the crabs in this study was of the moderate type because majority of the observed metacercariae were within the range of 1-50. This is in line with the study of (Sachs and Cumberlidge, 1991) who also observed in their study that most of the crabs had moderate infection. The intensity or density of crab infections (i.e the metacercarial load) of single individual crabs expressed in the number of paragonimus metacercariae per crab is of considerable medical importance (Sachs and Cumberldge, 1991). The level of crab infection is an important epidemiological factor in paragonimus transmission (Hosseni et al, 2011). This is because it will help to determine human infection in endemic areas.

#### LOAD OF PARAGONIMUS IN INFECTED SUBJECTS

Definitive diagnosis of paragonimiasis requires detection of eggs in sputum, faeces, pleural fluid, cerebrospinal fluid or pus (Tsang et al, 2005). The process of detecting paragonimus ova in sputum or stool is difficult and negative results are often unreliable especially in the case of ectopic paragonimiasis. Morning sputum samples were used for a direct wet smear of the examination for the parasite ova.The number of paragonimus egg yielded in sputum or stool sample determines the load or the intensity of infection in such individual. In present study, out of 304 positive cases, the parasite was detected in the sputum of 224 of them accounting for 73.7% of the total. This high percentage observed in this study is close to that reported by Nworie et al (2013) who observed 99.22% in their own study. Earlier studies showed paragonimus ova in 55.6% to 92% of sputum of pulmonary paragonimiasis cases (Singh et al,

1986). Devi et al, (2007) found ova positive sputum in 20.9% and 4.1% of pleuropulmonary paragoniniasis in children and adults respectively but this finding is however unusual because sensitivity of specimen examination is expected to be higher in adults than in children (Singh et al, 2012). Ova positive sputum samples were more in adults than in children as observed in this work. This finding is in agreement with the study of Sing et al, (2012).The population of this study constituted children and adults that are not elderly and this may explain the reason why ova positive sputum samples were more in adults.

Direct sputum examination is known to have a low sensitivity. In particular in children and elderly, sputum examinations are often negative or irrelevant due to the fact that good quality sputum samples are almost impossible to obtain (Haswell et al, 2003). Relatively good sputum samples were obtained from both children and adults in present study and this is the reason for the high percentage of sputum positive samples.

Stool examination for paragonimus ova is recommended in children who usually swallow sputum and in patients whose sputum samples are apparently negative for ova. In this study, we recorded paragonimus ova in 26.3% (80) in the faecal samples of 304 subjects who were positive for paragonimiasis. Nworie et al (2013) observed low prevalence (0.78%) of paragonimus infections with stool samples. The prevalence of infections with stool samples in this study could be said to be high compared to that of Nworie et al (2013).This high ova in stool samples may also be due to the fact that children constituted a large proportion of the population that were positive for paragonimiasis. However the prevalence in sputum is higher than that of stool sample and this could be attributed to the fact that paragonimiasis is a lung infection and eggs are expected to occur higher in sputum samples than stool samples.

This study identified paragonimus uterobilateralis as being responsible for the infections. Paragonimus uterobilateralis and paragonimus africanus are the two species of paragonimus that had been identified in Africa (Choi, 1990; and Moyou et al, 2003). This prevalence of P.uterobilateralis in this study agrees with other studies done previously that identified P. uterobilateralis as the parasite responsible for paragonimiasis in Southeast Nigeria (Udonsi 1987; Arene et al, 1998; Ochigbo et al, 2007).

The intensity of infection was based on the number of eggs yielded on the examined samples of sputum or stool. The intensity could either be light, moderate or heavy. Light infections are those that yielded eggs ranging from 1-50, moderate 51-100 and heavy infections are those that have eggs ranging from 101 and above. This was as described by (Sachs and Cumberlidge, 1991; Uttah, 2013). The number of paragonimus ova observed in this study ranged from 1-115. This is close to the study done by Arene (1998) who observed paragonimus ova ranging from 12-123 eggs. The intensity of infection in the present study was generally moderate. Out of the 304 positive individuals, 134 (44.1%) had between 1-50 ova of paragonimus in either the sputum or stool sample, 142 (46.7%) had between 51- 100 ova and 28 (9.2%) had above 100 ova. This finding is in agreement with the study done by Sachs and Cumberlidge (1991); Nworie et al,

(2003) who also noted moderate intensity in their studies. Uttah (2013) also observed that infection status was moderate in his study and it is in tandem with this study. However this study is in variance with that of Udonsi (1987) who observed a low intensity of infection in his study. The age and sex of individuals had no significant contribution to the load/intensity of paragonimus infection in this study. This goes to show that it is the load of metacercariae in the crab that is responsible for the intensity/load of the infection in humans.

The prevalence of infection in this study could be higher but for the suboptimal sensitivities of the use of eggs in the sputum or stool. Vidamaly et al, (2009), Nkouawa, et al (2009); Ikeda et al, (1996) in their various studies observed that there is good sensitivity and specificity of the ELISA method, especially ELISA using partially purified cysteine proteanases method in detecting presence of infection. Enzyme Linked Immunosrbent Assay (ELISA) kit was not used in this study because it was not available.

#### CHARACTERIZATION OF THE ECHOTEXTURE

Scanning of the viscera is carried out to identify the normal echo patterns and deviations from the normal have led to the diagnosis or prediction of pathological conditions (Marco, et al, 2002). Ultrasound can detect morphological changes in the liver and characterise focal lesions (cyst or solid) with high accuracy (Resende et al, 2011). Also ultrasonography allows assessment of changes in liver echogenicity which correlates with disease (Lessa et al, 2010), identifies focal vessels diffuse disease process (Lima et al, 2008). The parenchymal echoes of the liver are a mid grey and consist of a uniform, sponge like pattern interrupted by vessels. The normal liver parenchyma is of medium homogeneous echogenicity, usually slightly darker than the spleen and slightly brighter than the renal cortex independently of the age except in children (Deitrich, 1990). It is necessary that in comparing the liver with the spleen and renal cortex that the comparison should be done at the same depth. It is based on the aforementioned findings and principles that we characterised the echotexture and other features of the liver among people who were infected by paragonimiasis.

In present study, twenty cases presented with cysts in the liver constituting about 6.6% of the features observed. The demonstration of cysts in this study is in line with other previous studies that had observed cysts either in a single, clustered or disseminated pattern. Kim et al (2004) using computed tomography findings of hepatic paragonimiasis reported four cases; one report described the presence of hypodense cystic lesion with peripheral enhancement in the subcapsular area suggestive of capsular invasion of parasites. Yao et al (2011) described the presence of a low attenuation of tubular lesion in an unusual central hepatic location. No tubular lesion was seen in this study and therefore does not agree with the work of Yao et al (2011). The other reported cases described a multiseptated cystic lesion and multiple small cysts that represented eosinophilic abscesses. The cysts noted in this study were single and not septated. The appearance of cyst was also noticed from the age of 22 years. This finding may be associated with the length of time this condition has lasted without being noticed. The level or

degree of infestation/load of paragonimus may also be responsible for this because most of the subjects that had cyst in the liver also had high load of paragonimus. We also observed a hypoechoic texture (dark echo pattern) in 25 subjects while the echotexture was coarse and echogenic in 7 subjects. This finding of hypoechoic texture is in agreement with previous studies (Kim et al, 2004; Qiang et al, 2012). Out of the 304 subjects that were infected, 52 (17.1%) displayed abnormal features seen in the liver. This low number shows that ectopic paragonmiasis involving the liver is rare. There is coarse texture appearance observed in some subjects in this study. In our search of literature, none described the presence of coarse and echogenic texture as observed in this study. Coarse and echogenic texture was seen mainly among children and because of this it may be an early sign of the infection. It is possible that as the infection stays longer in the system the echopattern may become dark and this may be the reason it was not seen in previous studies. Dark echotexture was seen from the age of 22years. The implication of this may be that the appearance of dark echotexture is associated with the stage of the infection.

It has been observed that the radiological appearances on paragonimiasis may differ depending on the area (locality) where this infection was detected Kampitaya et al, (2010). This may also be the reason for the difference in echotexture observed in this work and that of others who noted only hypodense appearance in the liver.

Paragonimiasis involving the spleen is very rare and it is one form of ectopic infestation caused by paragonimus. In our search for literature, it was only Yang et al (2012) who reported a case of paragonimiasis involving the spleen. Using a dynamic contrast enhanced sonography, a hypoechoic mass consisting of multiple clustered cysts with persistently minimal enhancement of the wall in the spleen was demonstrated by the authors. We did not encounter any case that altered the normal echotexture of the spleen in our study.

The echotexture of the kidneys were characterised by comparing it with that of the liver and the spleen to check for any abnormalities. There was no observed echotexture changes in subjects who were infected by this parasite. Infestation of the kidney with paragonimus is also a very rare form of paragonimiasis. Subsequently reports on this are rare. Infection in the kidney can cause haematuria and eggs are sometimes found in the urine. In our literature search, Wright (2010) reported an intra renal lesion involvement in this infection. He described it as ill-defined low attenuating nodules with increased fat strands. Seong et al (1996) using ultrasound showed a dumb bell hyperechoic mass saddling in the top of the right kidney. The rarity of renal paragonimiasis may have affected our inability to detect any change in the echotexture of kidneys in infected subjects. The study of Wright (2010) and Seong (1996) described one case of involvement each. This goes to prove that renal paragonimiasis is not a common finding.

The use of ultrasound for the analysis and quantification of fluids in pleural effusion is superior to x-rays and can be used to correlate the effusion thickness with the real volume. In present study, pleural effusion was seen in 50 (16.4%) of the infected subjects. Pleural effusion can be regarded as a common finding among patients infested with paragonimiasis. Several authors had

reported pleural effusion in their studies. Yumine et al (2003), Iwahashi et al (1991), Mukae et al (2001), Cho et al (2011), Danichi et al (2003), Vidamaly et al (2009), Singh et al (2012) observed pleural effusion in their studies. Some other authors had dissociated pleural effusion from paragonimiasis. Moyou and Tagni (2003) observed that absence of pleural effusion and high incidence of perihilar shadows may be specific features of paragonimiasis in central Africa where the incidence of concomitant parasitic fungal and microbial disease is high. There were floating particles observed in most of this pleural fluid. This finding is in tandem with the work of Uchida et al (1995).

It may be argued that there are other disease conditions that may present with these same features observed in this study including malformation during birth; however in any clinical set up there is the need to take a proper history. Therefore the presence of any of these features in a person from an endemic area may be due to paragonimiasis and not any other disease.

#### ORGAN SIZE DIMENSION AMONG SUBJECTS

Increased liver size was noted in some of the subjects that enrolled for this study. In present study, hepatomegaly was seen in eight subjects (8) while fourty eight (48) had hepatosplenomegaly. Paragonimiasis has been known to cause hepatomegaly/hepatosplenomegaly usually at the acute stage. In these observed cases of hepatomegaly/hepatosplenomegaly their range of liver size were higher than those recorded by some authors among normal subjects. Kaya et al (2000) recorded 11.8cm and 11.3cm as the normal liver size in males and females respectively at age seven. In a study done among Indian children Singh et al (2009), recorded a normal value of 10.8cm and 10.9cm for males and females between the age range of 6-8years. Our values for the subjects at this age who presented with hepatomegaly/hepatosplenomegaly were higher than these values. These were subjects that were infected and we recorded 14.0cm for females and 12.0cm for males. In the normal subjects the values obtained in this study were 10.4cm and 10.3cm respectively for females and males.

Liver and spleen size vary widely according to age. Age had no significant difference in the length of the liver among infected subjects. There was also no significant difference between the sex and length of the liver in those who were infected (P < 0.05). There is however a significant difference (p < 0.05) between the length of liver in normal subjects and age. Liver size increased with age among normal subjects. The implication of this finding shows that paragonimus infection had an effect on the length of the liver. Many diseases can affect their size ranging from infective processes to malignant disorders (Zhang et al 2006; Joshi et al, 2004) and this may be the reason for the findings in this study. The cause of hepatomegaly varies from fever, to malaria and other clinical conditions and it may be argued that the cause of hepatomegaly is actually not paragonimiasis. However, in any clinical setting the need to take a proper history cannot be overemphasised. In endemic areas where this infection exist the presence of hepatomegaly may just be due to paragonimiasis and not due to any other condition.

The spleen is the largest organ in the reticuloendothelial system. There are so many infections which usually affect the spleen resulting in splenomegaly and children tend to be more susceptible to those infections due to their care free mode of living (Kinderknecht, 2000). Eight subjects presented with splenomegaly alone, while fourty eight cases presented with hepatosplenomegaly. It has been standard practice for many years to use splenic size as an indicator of disease activity in a variety of disorders of the reticuloendothelial system. Ultrasound is an important imaging method in the evaluation of spleen. In many cases, determination of splenomegaly is necessary and sonography is performed for this purpose. Increase in size of the spleen otherwise known as splenomegaly is a well known manifestation of several diseases that may involve the liver and haemopoeitic system. Splenic length measured by ultrasonography provides an objective and reliable way to assess the spleen size (Konus, 1998; Megrims et al, 2004). The spleen size increased with age in both the infected and normal subjects and also decreased from age 61. This agrees with other studies that had earlier shown that spleen size increases with age and also decreases at old age (Bhavna et al, 2009). Though spleen length increased with age in both normal and infected subjects the value recorded among those infected were higher than the normals.

Kaya et al (2000) observed that the normal splenic size at age of 8 years are 8.3cm and 7.9cm for males and females respectively. At 10 years they recorded 9.3cm and 8.5cm for males and females respectively. Our values at 8 and 10 years were higher than this for the subjects that presented with splenomegaly. In this study we recorded 9.8cm and 10.8cm for males and females in those who have increased spleen size in this age bracket.

In the present study, the size of the right kidney increased with age and a significant difference existed between the age and length (p < 0.05). The width of the kidney was also influenced by the age. As the age increased the width also increased and there was a significant difference between age and width of the right kidney (p < 0.05). There was also a significant difference between sex and the length of the right kidney (p < 0.05), but no significant difference existed between sex and width of the right kidney (p > 0.05) among the infected subjects. Considering the left kidney there was also a significant difference between the age and length of the left kidney. Age also affected the width of this kidney among the infected individuals. Sex also affected the length of the left kidney but did not affect the width. This same pattern was also seen in the normal subjects. There was therefore no significant difference between the kidney size in the infected and normal subjects. This finding is due to the fact that no observed infection was seen in the kidneys of the infected organs.

The usefulness of this research in sonography as alternate way of diagnosis include;

* + 1. Sonography is cheap, readily available, non invasive and does not involve the use of radiation.
    2. The change in organ size which is usually an indication of disease condition is better assessed with sonography.
    3. The use of sonography will provide assessment of the echotexture of the organs but cannot be done with ordinary x-ray.
    4. There is a diagnostic confusion between tuberculosis and paragonimiasis when x-ray is used for diagnosis. The use of sonography will help in resolving this problem.
    5. The distinction between cysts and solids is better with sonography.

#### : CONLUSION

The sonographic features observed in this study include, hepatosplenomegaly, pleural effusion, decreased echotexture, coarse and echogenic texture and liver cyst. Hepatosplenomegaly occurred at the early stage followed by pleural effusion and changes observed in the liver occurred during the chronic phase. The presence of any of the observed features in a patient coming from an endemic area may be considered to be due to paragonimiasis, however other laboratory investigations should also be done for confirmation and to exclude other conditions such as malaria that may have similar ultrasound appearance.

#### RECOMMENDATION

* + 1. Public health education programmes should be organized to advice people not to eat uncooked crabs or crayfish.
    2. All patients presenting with cough and haemoptysis and whose laboratory test is negative for acid fast bacilli should be tested for paragonimiasis.
    3. Paragonimiasis should come into focus in health policy thrusts in endemic areas.

#### : LIMITATIONS OF THE STUDY

* + 1. The parasitological method of egg detection on the sputum or stool samples cannot detect those in the latent period of infection or extrapulmonary paragonimiasis. Because of this, some cases that may have been positive were negative.
    2. Non-availability of the ELISA kit for the detection of paragonimiasis.
    3. The rare nature of paragonimiasis especially the ectopic/extrapulmonary type affected the total number of subjects that presented with paragonimus infection.

#### : AREAS FOR FURTHER RESEARCH

* + 1. The use of MRI for the assessment of paragonimiasis in our locality.
    2. The use of immunodiagnosis in the detection of paragonimiasis and subsequent assessment using ultrasound.

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**APPENDICES**

### APPENDIX 1

#### APPENDIX II

**SCORE SHEET FOR ECHOTEXTURE IN INFECTED SUBJECTS**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | L  I | VE | R | SP | LE | E | N | KI | DN | E | Y |
| S/N | Age | Sex | Norm | p o o  r | echo | cyst | norm | poor | echo | cyst | Nor m | poor | Ech o | Cyst |
| 1 | 5 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 2 | 5 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 3 | 5 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 4 | 5 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 5 | 5 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 6 | 6 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 7 | 6 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 8 | 6 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 9 | 6 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 10 | 6 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 11 | 6 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 12 | 6 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 13 | 7 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 14 | 7 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 15 | 7 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 16 | 7 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 17 | 7 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 18 | 7 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 19 | 7 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 20 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 21 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 22 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 23 | 8 | F | \_ | \_ | 2 | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 24 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 25 | 8 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 26 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 27 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 28 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 29 | 8 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 30 | 8 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 31 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 32 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 33 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 34 | 8 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 35 | 8 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 36 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 37 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 38 | 8 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 39 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 40 | 8 | F | 0 | \_ | 2 | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 41 | 8 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 42 | 9 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 43 | 9 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 44 | 9 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 45 | 9 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 46 | 9 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 47 | 9 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 48 | 9 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 49 | 9 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 50 | 10 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 51 | 10 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 52 | 10 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 53 | 10 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 54 | 10 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 55 | 10 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 56 | 11 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 57 | 11 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 58 | 11 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 59 | 11 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 60 | 11 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 61 | 11 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 62 | 11 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 63 | 12 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 64 | 12 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 65 | 12 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 66 | 12 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 67 | 12 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 68 | 13 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 69 | 13 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 70 | 13 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 71 | 13 | M | 0 | \_ | 2 | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 72 | 13 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 73 | 13 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 74 | 14 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 75 | 14 | F | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 76 | 14 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 77 | 15 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 78 | 15 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 79 | 15 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 80 | 17 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 81 | 17 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 82 | 17 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 83 | 17 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 84 | 17 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 85 | 18 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 86 | 18 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 87 | 18 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 88 | 18 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 89 | 19 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 90 | 19 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 91 | 19 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 92 | 19 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 93 | 20 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 94 | 20 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 95 | 20 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 96 | 20 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 97 | 22 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 98 | 22 | M | 0 | 1 | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 99 | 22 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 100 | 22 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 101 | 23 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 102 | 23 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 103 | 23 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 104 | 23 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 105 | 24 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 106 | 25 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 107 | 25 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 108 | 25 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 109 | 25 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 110 | 27 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 111 | 27 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 112 | 27 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 113 | 35 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 114 | 35 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 115 | 35 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 116 | 38 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 117 | 38 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 118 | 38 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 119 | 39 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 120 | 39 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 121 | 39 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 122 | 40 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 123 | 40 | M | 0 | \_ | 2 | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 124 | 41  41 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 125 | 41 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 126 | 41 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 127 | 42 | F | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 128 | 42 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 129 | 42 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 130 | 48 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 131 | 48 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 132 | 48 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 133 | 50 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 134 | 50 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 135 | 50 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 136 | 50 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 137 | 52 | F | 0 | 1 | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 138 | 52 | M | 0 | 1 | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 139 | 52 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 140 | 54 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 141 | 54 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 142 | 56 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 143 | 56 | M | 0 | \_ | 2 | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 144 | 56 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 145 | 60 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 146 | 60 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 147 | 62 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 148 | 62 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 149 | 68 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 150 | 68 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 151 | 70 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 152 | 70 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 153 | 56 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 154 | 56 | M | 0 | \_ | 2 | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 155 | 54 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 156 | 56 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 157 | 50 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 158 | 50 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 159 | 52 | F | 0 | 1 | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 160 | 52 | M | 0 | 1 | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 161 | 52 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 161 | 62 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 162 | 62 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 163 | 68 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 164 | 68 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 165 | 70 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 166 | 70 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 167 | 41 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 168 | 5 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 169 | 5 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 170 | 5 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 171 | 5 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 172 | 5 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 173 | 6 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 174 | 6 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 175 | 6 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 176 | 6 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 177 | 6 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 178 | 6 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 179 | 6 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 180 | 7 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 181 | 7 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 182 | 7 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 183 | 7 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 184 | 7 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 185 | 7 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 186 | 7 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 187 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 188 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 189 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 190 | 8 | F | \_ | \_ | 2 | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 191 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 192 | 8 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 193 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 194 | 6 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 195 | 6 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 196 | 9 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 197 | 9 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 198 | 10 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 199 | 10 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 200 | 10 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 204 | 10 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 205 | 10 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 206 | 10 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 207 | 11 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 208 | 11 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 209 | 11 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 210 | 11 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 212 | 11 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 213 | 11 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 214 | 11 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 215 | 12 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 216 | 12 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 217 | 12 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 218 | 12 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 219 | 12 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 220 | 12 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 221 | 12 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 222 | 13 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 223 | 13 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 224 | 13 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 225 | 13 | M | 0 | \_ | 2 | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 226 | 13 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 227 | 13 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 228 | 22 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 229 | 22 | M | 0 | 1 | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 230 | 22 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 231 | 22 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 232 | 23 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 233 | 23 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 234 | 23 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 235 | 23 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 236 | 24 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 237 | 25 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 238 | 25 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 239 | 25 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 240 | 25 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 241 | 27 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 242 | 27 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 243 | 27 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 244 | 35 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 245 | 35 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 246 | 35 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 247 | 18 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ |  |
| 248 | 18 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ |  |
| 249 | 18 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ |  |
| 250 | 18 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ |  |
| 251 | 19 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ |  |
| 252 | 19 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ |  |
| 253 | 19 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ |  |
| 254 | 19 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ |  |
| 256 | 14 | F | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 257 | 14 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 258 | 15 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 259 | 15 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 260 | 15 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 261 | 17 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 262 | 17 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 263 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 264 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 265 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 266 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 267 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 268 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 269 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 270 | F | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 271 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 272 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 273 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 274 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 275 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 276 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 278 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |  |
| 279 | 35 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 280 | 35 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 281 | 35 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 282 | 38 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 283 | 38 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 284 | 38 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 285 | 39 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 286 | 39 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 287 | 39 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 288 | 40 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 289 | 40 | M | 0 | \_ | 2 | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 290 | 41 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 291 | 35 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 292 | 35 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 293 | 35 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 294 | 38 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 295 | 38 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 296 | 38 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 297 | 39 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 298 | 39 | M | 0 | 1 | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 299 | 39 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 300 | 40 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 301 | 40 | M | 0 | \_ | 2 | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 302 | 41  41 | M | 0 | \_ | \_ | 3 | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 303 | 7 | M | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |
| 304 | 8 | F | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ | 0 | \_ | \_ | \_ |

#### APPENDIX III

**LOAD OF PARAGONIMUS IN CRABS**

|  |  |
| --- | --- |
| S/N | No of Metercariae |
| 1 | 10 |
| 2 | 1 |
| 3 | 25 |
| 4 | 12 |
| 5 | 18 |
| 6 | 35 |
| 7 | 9 |
| 8 | 6 |
| 9 | 3 |
| 10 | 11 |
| 11 | 17 |
| 12 | 13 |
| 13 | 8 |
| 14 | 62 |
| 15 | 7 |
| 16 | 20 |
| 17 | 2 |
| 18 | 22 |
| 19 | 15 |
| 20 | 13 |
| 21 | 75 |
| 22 | 56 |
| 23 | 42 |
| 24 | 18 |
| 25 | 11 |

#### APPENDIX IV

**Table 4: RESULT OF LABORATORY INVESTIGATION**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S/N | Age(yrs) | Sex | Weight(Kg) | Height(Cm) | BMI | Sputum | Stool | Specie | No 0f Eggs  Yielded |
| 1 | 5 | M | 24 | 1.17 | 17.53 | -ve | +ve | P.utero | 52 |
| 2 | 5 | M | 20 | 1.15 | 15.12 | -ve | +ve | P.utero | 48 |
| 3 | 5 | F | 18 | 1.11 | 14.61 | -ve | +ve | P.utero | 55 |
| 4 | 5 | M | 20 | 1.11 | 16.23 | +ve | -ve | P.utero | 70 |
| 5 | 5 | M | 21 | 1.10 | 17.36 | +ve | -ve | P.utero | 38 |
| 6 | 6 | F | 20 | 1.12 | 15.94 | +ve | +ve | P.utero | 62 |
| 7 | 6 | F | 20 | 1.16 | 14.86 | -ve | +ve | P.utro | 55 |
| 8 | 6 | F | 21 | 1.19 | 14.83 | -ve | +ve | P.utero | 50 |
| 9 | 6 | M | 20 | 1.18 | 14.36 | -ve | +ve | P.utero | 12 |
| 10 | 6 | M | 20 | 1.15 | 15.12 | -ve | +ve | P.utero | 10 |
| 11 | 6 | F | 24 | 1.15 | 16.23 | -ve | +ve | P.utero | 20 |
| 12 | 6 | M | 21 | 1.10 | 17.36 | +ve | -ve | P.utero | 6 |
| 13 | 7 | F | 24 | 1.21 | 16.40 | +ve | -ve | P.utero | 13 |
| 14 | 7 | F | 21 | 1.26 | 13.23 | +ve | -ve | P.utero | 15 |
| 15 | 7 | F | 20 | 1.24 | 13.01 | -ve | +ve | P.utero | 20 |
| 16 | 7 | F | 21 | 1.17 | 15.34 | -ve | +ve | P.utero | 18 |
| 17 | 7 | M | 21 | 1.18 | 15.08 | +ve | -ve | P.utero | 56 |
| 18 | 7 | M | 24 | 1.25 | 15.36 | +ve | -ve | P.utero | 50 |
| 19 | 7 | M | 17 | 1.15 | 12.85 | +ve | -ve | P.utero | 45 |
| 20 | 8 | M | 21 | 1.22 | 14.11 | +ve | -ve | P.utero | 56 |
| 21 | 8 | F | 21 | 1.23 | 13.88 | -ve | +ve | P.utero | 71 |
| 22 | 8 | F | 24 | 1.21 | 16.64 | -ve | +ve | P.utero | 30 |
| 23 | 8 | F | 20 | 1.21 | 13.66 | +ve | -ve | P.utero | 50 |
| 24 | 8 | F | 25 | 1.27 | 15.50 | +ve | -ve | P.utreo | 65 |
| 25 | 8 | M | 26 | 1.32 | 14.92 | +ve | -ve | P.utero | 25 |
| 26 | 8 | F | 22 | 1.21 | 15.03 | -ve | +ve | P.utero | 18 |
| 27 | 8 | F | 20 | 1.21 | 13.66 | -ve | +ve | P.utero | 20 |
| 28 | 8 | F | 24 | 1.27 | 14.88 | -ve | +ve | P.utero | 48 |
| 29 | 8 | M | 22 | 1.30 | 13.01 | -ve | +ve | p.utero | 55 |
| 30 | 8 | M | 27 | 1.3 | 14.81 | -ve | +ve | p.utero | 62 |
| 31 | 8 | F | 24 | 1.29 | 14.42 | -ve | +ve | p.utero | 19 |
| 32 | 8 | F | 24 | 1.28 | 14.65 | +ve | -ve | p.utero | 45 |
| 33 | 8 | F | 22 | 1.24 | 14.31 | -ve | +ve | P.utero | 63 |
| 34 | 8 | M | 25 | 1.26 | 15.75 | +ve | -ve | p.utero | 60 |
| 35 | 8 | M | 28 | 1.30 | 16.57 | -ve | +ve | p.utero | 74 |
| 36 | 8 | F | 20 | 1.20 | 13.89 | -ve | +ve | p.utero | 57 |
| 37 | 8 | F | 30 | 1.30 | 17.75 | +ve | -ve | p.utero | 83 |
| 38 | 8 | M | 23 | 1.22 | 15.54 | +ve | -ve | p.utero | 16 |

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| 39 | 8 | F | 23 | 1.33 | 13.00 | +ve | -ve | p.utero | 19 |
| 40 | 8 | F | 22 | 1.29 | 13.22 | -ve | +ve | p.utero | 37 |
| 41 | 8 | M | 22 | 1.24 | 14.31 | +ve | -ve | p.utero | 6 |
| 42 | 9 | M | 29 | 1.36 | 15.68 | +ve | -ve | p.utero | 78 |
| 43 | 9 | M | 25 | 1.31 | 14.57 | -ve | +ve | p.utero | 20 |
| 44 | 9 | M | 25 | 1.26 | 15.75 | +ve | -ve | p.utero | 52 |
| 45 | 9 | F | 30 | 1.36 | 16.22 | +ve | -ve | p.utero | 18 |
| 46 | 9 | F | 29 | 1.23 | 19.17 | +ve | -ve | p.utero | 65 |
| 47 | 9 | M | 25 | 1.31 | 14.57 | -ve | +ve | p.utero | 54 |
| 48 | 9 | M | 30 | 1.37 | 16.22 | +ve | -ve | p.utero | 70 |
| 49 | 9 | F | 29 | 1.36 | 15.68 | +ve | -ve | p.utero | 53 |
| 50 | 10 | M | 24 | 1.25 | 15.36 | -ve | +ve | p.utero | 62 |
| 51 | 10 | F | 25 | 1.38 | 15.21 | -ve | +ve | p.utero | 28 |
| 52 | 10 | F | 35 | 1.41 | 17.60 | +ve | -ve | p.utero | 76 |
| 53 | 10 | F | 24 | 1.30 | 14.20 | +ve | -ve | p.utero | 91 |
| 54 | 10 | F | 30 | 1.42 | 14.38 | +ve | -ve | p.utero | 82 |
| 55 | 10 | M | 32 | 1.40 | 16.32 | +ve | -ve | p.utero | 35 |
| 56 | 11 | M | 36 | 1.46 | 16.89 | -ve | +ve | p.utero | 30 |
| 57 | 11 | F | 33 | 1.40 | 16.84 | -ve | +ve | p.utero | 28 |
| 58 | 11 | M | 31 | 1.38 | 16.23 | -ve | +ve | p.utero | 40 |
| 59 | 11 | M | 31 | 1.43 | 15.16 | -ve | +ve | p.utero | 85 |
| 60 | 11 | M | 31 | 1.40 | 15.31 | -ve | +ve | p.utero | 80 |
| 61 | 11 | M | 36 | 1.51 | 15.79 | -ve | +ve | p.utero | 96 |
| 62 | 11 | M | 29 | 1.24 | 18.36 | +ve | -ve | p.utero | 52 |
| 63 | 12 | M | 34 | 1.45 | 16.17 | -ve | +ve | p.utero | 69 |
| 64 | 12 | F | 38 | 1.55 | 15.82 | +ve | -ve | p.utero | 55 |
| 65 | 12 | F | 27 | 1.39 | 13.97 | +ve | -ve | p.utero | 48 |
| 66 | 12 | F | 35 | 1.51 | 15.79 | +ve | -ve | p.utero | 60 |
| 67 | 12 | F | 34 | 1.45 | 16.17 | -ve | +ve | p.utero | 58 |
| 68 | 13 | F | 34 | 1.41 | 17.10 | +ve | -ve | p.utero | 97 |
| 69 | 13 | M | 29 | 1.44 | 13.13 | +ve | -ve | p.utero | 72 |
| 70 | 13 | F | 42 | 1.48 | 19.17 | +ve | -ve | p.utero | 83 |
| 71 | 13 | M | 46 | 1.65 | 16.90 | +ve | -ve | p.utero | 56 |
| 72 | 13 | F | 40 | 1.47 | 18.51 | +ve | -ve | p.utero | 79 |
| 73 | 13 | F | 47 | 1.54 | 19.82 | +ve | -ve | p.utero | 86 |
| 74 | 14 | F | 50 | 1.59 | 19.78 | +ve | -ve | p.utero | 86 |
| 75 | 14 | F | 32 | 1.62 | 12.19 | +ve | -ve | p.utero | 52 |
| 76 | 14 | M | 32 | 1.62 | 12.19 | +ve | -ve | p.utero | 98 |
| 77 | 15 | F | 33 | 1.60 | 13.67 | +ve | -ve | p.utero | 39 |
| 78 | 15 | M | 35 | 1.55 | 13.74 | +ve | -ve | p.utero | 12 |
| 79 | 15 | M | 35 | 1.60 | 13.67 | +ve | -ve | p.utero | 43 |
| 80 | 17 | M | 50 | 1.68 | 17.67 | +ve | -ve | p.utero | 52 |
| 81 | 17 | M | 62 | 1.66 | 22.47 | +ve | -ve | p.utero | 36 |
| 82 | 17 | F | 50 | 1.56 | 20.55 | +ve | -ve | p.utero | 36 |
| 83 | 17 | M | 51 | 1.63 | 19.20 | +ve | -ve | p.utero | 43 |

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| 84 | 17 | F | 52 | 1.60 | 20.30 | +ve | -ve | p.utero | 18 |
| 85 | 18 | F | 62 | 1.70 | 21.45 | +ve | -ve | p.utero | 12 |
| 86 | 18 | M | 68 | 1.67 | 24.32 | -ve | +ve | p.utero | 61 |
| 87 | 18 | M | 65 | 1.62 | 24.72 | +ve | -ve | p.utero | 85 |
| 88 | 18 | F | 56 | 1.60 | 21.88 | +ve | -ve | p.utero | 50 |
| 89 | 19 | M | 60 | 1.67 | 21.51 | -ve | +ve | p.utero | 32 |
| 90 | 19 | M | 60 | 1.58 | 24.05 | +ve | -ve | p.utero | 50 |
| 91 | 19 | F | 62 | 1.58 | 24.84 | +ve | -ve | p.utero | 19 |
| 92 | 19 | F | 56 | 1.54 | 23.61 | +ve | -ve | p.utero | 25 |
| 93 | 20 | M | 60 | 1.72 | 20.28 | +ve | -ve | p.utero | 21 |
| 94 | 20 | M | 62 | 1.70 | 21.45 | +ve | -ve | p.utero | 33 |
| 95 | 20 | M | 64 | 1.69 | 22.15 | +ve | -ve | p.utero | 54 |
| 96 | 20 | M | 62 | 1.68 | 21.91 | +ve | -ve | p.utero | 63 |
| 97 | 22 | F | 66 | 1.68 | 23.33 | +ve | -ve | p.utero | 74 |
| 98 | 22 | M | 66 | 1.70 | 22.84 | +ve | -ve | p.utero | 102 |
| 99 | 22 | M | 65 | 1.70 | 22.49 | +ve | -ve | p.utero | 115 |
| 100 | 22 | F | 64 | 1.66 | 23.23 | +ve | -ve | p.utero | 8 |
| 101 | 23 | F | 65 | 1.65 | 24.38 | +ve | -ve | P.utero | 88 |
| 102 | 23 | M | 65 | 1.52 | 28.13 | -ve | +ve | p.utero | 54 |
| 103 | 23 | F | 67 | 1.74 | 22.73 | +ve | -ve | p.utero | 107 |
| 104 | 23 | M | 66 | 1.70 | 22.83 | +ve | -ve | p.utero | 113 |
| 105 | 24 | M | 68 | 1.71 | 23.26 | -ve | +ve | p.utero | 80 |
| 106 | 25 | F | 70 | 1.70 | 24.23 | +ve | -ve | p.utero | 27 |
| 107 | 25 | F | 65 | 1.66 | 23.59 | +ve | -ve | p.utero | 51 |
| 108 | 25 | M | 68 | 1.69 | 23.81 | +ve | -ve | p.utero | 29 |
| 109 | 25 | M | 65 | 1.73 | 21.72 | +ve | -ve | p.utero | 105 |
| 110 | 27 | M | 70 | 1.74 | 23.11 | +ve | -ve | p.utero | 52 |
| 111 | 27 | M | 68 | 1.70 | 23.53 | +ve | -ve | p.utero | 37 |
| 112 | 27 | F | 70 | 1.70 | 24.22 | +ve | -ve | p.utero | 100 |
| 113 | 35 | M | 75 | 1.72 | 25.34 | +ve | -ve | p.utero | 96 |
| 114 | 35 | M | 70 | 1.70 | 24.22 | +ve | -ve | p.utero | 23 |
| 115 | 35 | F | 67 | 1.68 | 23.74 | +ve | -ve | p.utero | 81 |
| 116 | 38 | F | 68 | 1.62 | 25.90 | +ve | -ve | p.utero | 45 |
| 117 | 38 | M | 70 | 1.70 | 24.22 | +ve | -ve | p.utero | 115 |
| 118 | 38 | M | 70 | 1.70 | 24.22 | +ve | -ve | p.utero | 25 |
| 119 | 39 | M | 73 | 1.72 | 24.67 | +ve | -ve | p.utero | 104 |
| 120 | 39 | M | 72 | 1.76 | 23.24 | -ve | +ve | p.utero | 77 |
| 121 | 39 | F | 70 | 1.73 | 23.39 | +ve | -ve | p.utero | 32 |
| 122 | 40 | F | 72 | 1.62 | 27.43 | +ve | -ve | p.utero | 19 |
| 123 | 40 | M | 75 | 1.77 | 23.94 | +ve | -ve | p.utero | 95 |
| 124 | 41 | M | 75 | 1.80 | 23.20 | +ve | -ve | p.utero | 101 |
| 125 | 41 | M | 73 | 1.80 | 22.53 | +ve | -ve | P.utero | 52 |
| 126 | 41 | F | 70 | 1.75 | 22.86 | +ve | -ve | p.utero | 18 |
| 127 | 42 | F | 79 | 1.76 | 25.49 | +ve | -ve | p.utero | 30 |
| 128 | 42 | F | 64 | 1.68 | 22.68 | +ve | -ve | p.utero | 75 |

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| 129 | 42 | M | 79 | 1.70 | 27.33 | +ve | -ve | p.utero | 9 |
| 130 | 48 | M | 80 | 1.80 | 24.70 | +ve | -ve | p.utero | 21 |
| 131 | 48 | F | 78 | 1.76 | 25.18 | +ve | -ve | p.utero | 100 |
| 132 | 48 | M | 80 | 1.76 | 25.83 | +ve | -ve | p.utero | 23 |
| 133 | 50 | M | 78 | 1.72 | 26.36 | +ve | -ve | p.utero | 56 |
| 134 | 50 | F | 72 | 1.70 | 24.91 | -ve | +ve | p.utero | 12 |
| 135 | 50 | M | 75 | 1.73 | 25.06 | +ve | -ve | p.utero | 92 |
| 136 | 50 | M | 80 | 1.80 | 24.69 | +ve | -ve | p.utero | 6 |
| 137 | 52 | F | 75 | 1.65 | 27.48 | +ve | -ve | p.utero | 89 |
| 138 | 52 | M | 76 | 1.82 | 22.94 | +ve | -ve | p.utero | 110 |
| 139 | 52 | F | 80 | 1.80 | 24.69 | +ve | -ve | p.utero | 6 |
| 140 | 54 | M | 80 | 1.82 | 22.60 | +ve | -ve | p.utero | 15 |
| 141 | 54 | F | 80 | 1.82 | 22.60 | +ve | -ve | p.utero | 45 |
| 142 | 56 | M | 65 | 1.65 | 23.81 | +ve | -ve | p.utero | 96 |
| 143 | 56 | M | 75 | 1.70 | 25.95 | +ve | -ve | p.utero | 22 |
| 144 | 56 | F | 70 | 1.68 | 24.80 | +ve | -ve | p.utero | 112 |
| 145 | 60 | M | 72 | 1.74 | 24.33 | +ve | -ve | p.utero | 10 |
| 146 | 60 | M | 75 | 1.76 | 24.20 | +ve | -ve | p.utero | 23 |
| 147 | 62 | F | 70 | 1.69 | 24.51 | +ve | -ve | p.utero | 96 |
| 148 | 62 | M | 65 | 1.68 | 23.03 | +ve | -ve | p.utero | 103 |
| 149 | 68 | M | 60 | 1.70 | 20.76 | +ve | -ve | p.utero | 8 |
| 150 | 68 | M | 65 | 1.67 | 23.31 | +ve | -ve | p.utero | 99 |
| 151 | 70 | M | 60 | 1.60 | 23.44 | +ve | -ve | p.utero | 97 |
| 152 | 70 | F | 62 | 1.68 | 21.97 | +ve | -ve | p.utero | 14 |
| 153 | 5 | M | 24 | 1.17 | 17.53 | -ve | +ve | P.utero | 52 |
| 154 | 5 | M | 20 | 1.15 | 15.12 | -ve | +ve | P.utero | 48 |
| 155 | 5 | F | 18 | 1.11 | 14.61 | -ve | +ve | P.utero | 55 |
| 156 | 5 | M | 20 | 1.11 | 16.23 | +ve | -ve | P.utero | 70 |
| 157 | 5 | M | 21 | 1.10 | 17.36 | +ve | -ve | P.utero | 38 |
| 158 | 6 | F | 20 | 1.12 | 15.94 | +ve | +ve | P.utero | 62 |
| 159 | 6 | F | 20 | 1.16 | 14.86 | -ve | +ve | P.utro | 55 |
| 160 | 6 | F | 21 | 1.19 | 14.83 | -ve | +ve | P.utero | 50 |
| 161 | 6 | M | 20 | 1.18 | 14.36 | -ve | +ve | P.utero | 12 |
| 162 | 6 | M | 20 | 1.15 | 15.12 | -ve | +ve | P.utero | 10 |
| 163 | 6 | F | 24 | 1.15 | 16.23 | -ve | +ve | P.utero | 20 |
| 164 | 6 | M | 21 | 1.10 | 17.36 | +ve | -ve | P.utero | 6 |
| 165 | 7 | F | 24 | 1.21 | 16.40 | +ve | -ve | P.utero | 13 |
| 166 | 7 | F | 21 | 1.26 | 13.23 | +ve | -ve | P.utero | 15 |
| 167 | 7 | F | 20 | 1.24 | 13.01 | -ve | +ve | P.utero | 20 |
| 168 | 7 | F | 21 | 1.17 | 15.34 | -ve | +ve | P.utero | 18 |
| 169 | 7 | M | 21 | 1.18 | 15.08 | +ve | -ve | P.utero | 56 |
| 170 | 7 | M | 24 | 1.25 | 15.36 | +ve | -ve | P.utero | 50 |
| 171 | 7 | M | 17 | 1.15 | 12.85 | +ve | -ve | P.utero | 45 |
| 172 | 8 | M | 21 | 1.22 | 14.11 | +ve | -ve | P.utero | 56 |
| 173 | 8 | F | 21 | 1.23 | 13.88 | -ve | +ve | P.utero | 71 |

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| 174 | 8 | F | 24 | 1.21 | 16.64 | -ve | +ve | P.utero | 30 |
| 175 | 8 | F | 20 | 1.21 | 13.66 | +ve | -ve | P.utero | 50 |
| 176 | 8 | F | 25 | 1.27 | 15.50 | +ve | -ve | P.utreo | 65 |
| 177 | 8 | M | 26 | 1.32 | 14.92 | +ve | -ve | P.utero | 25 |
| 178 | 8 | F | 22 | 1.21 | 15.03 | -ve | +ve | P.utero | 18 |
| 179 | 8 | F | 20 | 1.21 | 13.66 | -ve | +ve | P.utero | 20 |
| 180 | 8 | F | 24 | 1.27 | 14.88 | -ve | +ve | P.utero | 48 |
| 181 | 8 | M | 22 | 1.30 | 13.01 | -ve | +ve | p.utero | 55 |
| 182 | 8 | M | 27 | 1.3 | 14.81 | -ve | +ve | p.utero | 62 |
| 183 | 8 | F | 24 | 1.29 | 14.42 | -ve | +ve | p.utero | 19 |
| 184 | 8 | F | 24 | 1.28 | 14.65 | +ve | -ve | p.utero | 45 |
| 188 | 8 | F | 22 | 1.24 | 14.31 | -ve | +ve | P.utero | 63 |
| 189 | 8 | M | 25 | 1.26 | 15.75 | +ve | -ve | p.utero | 60 |
| 190 | 8 | M | 28 | 1.30 | 16.57 | -ve | +ve | p.utero | 74 |
| 191 | 8 | F | 20 | 1.20 | 13.89 | -ve | +ve | p.utero | 57 |
| 192 | 8 | F | 30 | 1.30 | 17.75 | +ve | -ve | p.utero | 83 |
| 193 | 8 | M | 23 | 1.22 | 15.54 | +ve | -ve | p.utero | 16 |
| 194 | 8 | F | 23 | 1.33 | 13.00 | +ve | -ve | p.utero | 19 |
| 195 | 8 | M | 22 | 1.24 | 14.31 | +ve | -ve | p.utero | 6 |
| 196 | 9 | M | 29 | 1.36 | 15.68 | +ve | -ve | p.utero | 78 |
| 197 | 9 | M | 25 | 1.31 | 14.57 | -ve | +ve | p.utero | 20 |
| 198 | 9 | M | 25 | 1.26 | 15.75 | +ve | -ve | p.utero | 52 |
| 199 | 9 | F | 30 | 1.36 | 16.22 | +ve | -ve | p.utero | 18 |
| 200 | 9 | F | 29 | 1.23 | 19.17 | +ve | -ve | p.utero | 65 |
| 201 | 9 | M | 25 | 1.31 | 14.57 | -ve | +ve | p.utero | 54 |
| 202 | 9 | M | 30 | 1.37 | 16.22 | +ve | -ve | p.utero | 70 |
| 203 | 9 | F | 29 | 1.36 | 15.68 | +ve | -ve | p.utero | 53 |
| 204 | 10 | M | 24 | 1.25 | 15.36 | -ve | +ve | p.utero | 62 |
| 205 | 10 | F | 25 | 1.38 | 15.21 | -ve | +ve | p.utero | 28 |
| 206 | 10 | F | 35 | 1.41 | 17.60 | +ve | -ve | p.utero | 76 |
| 207 | 10 | F | 24 | 1.30 | 14.20 | +ve | -ve | p.utero | 91 |
| 208 | 10 | F | 30 | 1.42 | 14.38 | +ve | -ve | p.utero | 82 |
| 209 | 10 | M | 32 | 1.40 | 16.32 | +ve | -ve | p.utero | 35 |
| 210 | 11 | M | 36 | 1.46 | 16.89 | -ve | +ve | p.utero | 30 |
| 211 | 11 | F | 33 | 1.40 | 16.84 | -ve | +ve | p.utero | 28 |
| 212 | 11 | M | 31 | 1.38 | 16.23 | -ve | +ve | p.utero | 40 |
| 213 | 11 | M | 31 | 1.43 | 15.16 | -ve | +ve | p.utero | 85 |
| 214 | 11 | M | 31 | 1.40 | 15.31 | -ve | +ve | p.utero | 80 |
| 215 | 11 | M | 36 | 1.51 | 15.79 | -ve | +ve | p.utero | 96 |
| 216 | 11 | M | 29 | 1.24 | 18.36 | +ve | -ve | p.utero | 52 |
| 217 | 12 | M | 34 | 1.45 | 16.17 | -ve | +ve | p.utero | 69 |
| 218 | 12 | F | 38 | 1.55 | 15.82 | +ve | -ve | p.utero | 55 |
| 219 | 12 | F | 27 | 1.39 | 13.97 | +ve | -ve | p.utero | 48 |
| 220 | 12 | F | 35 | 1.51 | 15.79 | +ve | -ve | p.utero | 60 |
| 221 | 12 | F | 34 | 1.45 | 16.17 | -ve | +ve | p.utero | 58 |

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| 222 | 13 | F | 34 | 1.41 | 17.10 | +ve | -ve | p.utero | 97 |
| 223 | 17 | F | 52 | 1.60 | 20.30 | +ve | -ve | p.utero | 18 |
| 224 | 18 | F | 62 | 1.70 | 21.45 | +ve | -ve | p.utero | 12 |
| 225 | 18 | M | 68 | 1.67 | 24.32 | -ve | +ve | p.utero | 61 |
| 226 | 18 | M | 65 | 1.62 | 24.72 | +ve | -ve | p.utero | 85 |
| 227 | 18 | F | 56 | 1.60 | 21.88 | +ve | -ve | p.utero | 50 |
| 228 | 19 | M | 60 | 1.67 | 21.51 | -ve | +ve | p.utero | 32 |
| 229 | 19 | M | 60 | 1.58 | 24.05 | +ve | -ve | p.utero | 50 |
| 230 | 19 | F | 62 | 1.58 | 24.84 | +ve | -ve | p.utero | 19 |
| 231 | 19 | F | 56 | 1.54 | 23.61 | +ve | -ve | p.utero | 25 |
| 232 | 20 | M | 60 | 1.72 | 20.28 | +ve | -ve | p.utero | 21 |
| 233 | 20 | M | 62 | 1.70 | 21.45 | +ve | -ve | p.utero | 33 |
| 234 | 13 | F | 34 | 1.41 | 17.10 | +ve | -ve | p.utero | 97 |
| 235 | 17 | F | 52 | 1.60 | 20.30 | +ve | -ve | p.utero | 18 |
| 236 | 18 | F | 62 | 1.70 | 21.45 | +ve | -ve | p.utero | 12 |
| 237 | 27 | M | 70 | 1.74 | 23.11 | +ve | -ve | p.utero | 52 |
| 238 | 27 | M | 68 | 1.70 | 23.53 | +ve | -ve | p.utero | 37 |
| 239 | 27 | F | 70 | 1.70 | 24.22 | +ve | -ve | p.utero | 100 |
| 240 | 35 | M | 75 | 1.72 | 25.34 | +ve | -ve | p.utero | 96 |
| 241 | 35 | M | 70 | 1.70 | 24.22 | +ve | -ve | p.utero | 23 |
| 242 | 35 | F | 67 | 1.68 | 23.74 | +ve | -ve | p.utero | 81 |
| 243 | 38 | F | 68 | 1.62 | 25.90 | +ve | -ve | p.utero | 45 |
| 244 | 38 | M | 70 | 1.70 | 24.22 | +ve | -ve | p.utero | 115 |
| 245 | 38 | M | 70 | 1.70 | 24.22 | +ve | -ve | p.utero | 25 |
| 246 | 39 | M | 73 | 1.72 | 24.67 | +ve | -ve | p.utero | 104 |
| 247 | 39 | M | 72 | 1.76 | 23.24 | -ve | +ve | p.utero | 77 |
| 248 | 39 | F | 70 | 1.73 | 23.39 | +ve | -ve | p.utero | 32 |
| 249 | 40 | F | 72 | 1.62 | 27.43 | +ve | -ve | p.utero | 19 |
| 250 | 40 | M | 75 | 1.77 | 23.94 | +ve | -ve | p.utero | 95 |
| 251 | 41 | M | 75 | 1.80 | 23.20 | +ve | -ve | p.utero | 101 |
| 252 | 41 | M | 73 | 1.80 | 22.53 | +ve | -ve | P.utero | 52 |
| 253 | 41 | F | 70 | 1.75 | 22.86 | +ve | -ve | p.utero | 18 |
| 254 | 42 | F | 79 | 1.76 | 25.49 | +ve | -ve | p.utero | 30 |
| 255 | 42 | F | 64 | 1.68 | 22.68 | +ve | -ve | p.utero | 75 |
| 256 | 27 | M | 70 | 1.74 | 23.11 | +ve | -ve | p.utero | 52 |
| 257 | 27 | M | 68 | 1.70 | 23.53 | +ve | -ve | p.utero | 37 |
| 258 | 27 | F | 70 | 1.70 | 24.22 | +ve | -ve | p.utero | 100 |
| 259 | 35 | M | 75 | 1.72 | 25.34 | +ve | -ve | p.utero | 96 |
| 260 | 35 | M | 70 | 1.70 | 24.22 | +ve | -ve | p.utero | 23 |
| 261 | 35 | F | 67 | 1.68 | 23.74 | +ve | -ve | p.utero | 81 |
| 262 | 38 | F | 68 | 1.62 | 25.90 | +ve | -ve | p.utero | 45 |
| 263 | 38 | M | 70 | 1.70 | 24.22 | +ve | -ve | p.utero | 115 |
| 264 | 38 | M | 70 | 1.70 | 24.22 | +ve | -ve | p.utero | 25 |
| 265 | 39 | M | 73 | 1.72 | 24.67 | +ve | -ve | p.utero | 104 |
| 266 | 39 | M | 72 | 1.76 | 23.24 | -ve | +ve | p.utero | 77 |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 267 | 39 | F | 70 | 1.73 | 23.39 | +ve | -ve | p.utero | 32 |
| 268 | 40 | F | 72 | 1.62 | 27.43 | +ve | -ve | p.utero | 19 |
| 269 | 40 | M | 75 | 1.77 | 23.94 | +ve | -ve | p.utero | 95 |
| 270 | 41 | M | 75 | 1.80 | 23.20 | +ve | -ve | p.utero | 101 |
| 271 | 41 | M | 73 | 1.80 | 22.53 | +ve | -ve | P.utero | 52 |
| 272 | 41 | F | 70 | 1.75 | 22.86 | +ve | -ve | p.utero | 18 |
| 273 | 42 | F | 79 | 1.76 | 25.49 | +ve | -ve | p.utero | 30 |
| 274 | 42 | F | 64 | 1.68 | 22.68 | +ve | -ve | p.utero | 75 |

#### APPENDIX V SONOGRAPHIC FINDINGS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| S/N | Age | Sex | Wt(Kg) | Ht(Cm) | BMI | Echotexture | Other Findings |
| 1 | 5 | M | 24 | 1.17 | 17.53 | Normal | Hepatosplenomegaly |
| 2 | 5 | M | 20 | 1.15 | 15.12 | Normal | Hepatosplenomegaly |
| 3 | 5 | F | 18 | 1.11 | 14.61 | Normal | Splenomegaly |
| 4 | 5 | M | 20 | 1.11 | 16.23 | Normal | Pleural effusion+  Splenomegaly |
| 5 | 5 | M | 21 | 1.10 | 17.36 | Normal | Hepatosplenomegaly |
| 6 | 6 | F | 20 | 1.12 | 15.94 | Normal | Hepatosplenomegaly+  pleural effusion |
| 7 | 6 | F | 20 | 1.16 | 14.86 | Normal | Hepatosplenomegaly |
| 8 | 6 | F | 21 | 1.19 | 14.83 | Normal | No enlarged organ |
| 9 | 6 | M | 20 | 1.18 | 14.36 | Normal | Hepatosplenomegaly |
| 10 | 6 | M | 20 | 1.15 | 15.12 | Normal | Splenomegaly |
| 11 | 6 | F | 24 | 1.15 | 16.23 | Normal | Hepatomegaly |
| 12 | 6 | M | 21 | 1.10 | 17.36 | Normal | Hepatosplenomegaly |
| 13 | 7 | F | 24 | 1.21 | 16.40 | Normal | Hepatosplenomegaly |
| 14 | 7 | F | 21 | 1.26 | 13.23 | Normal | Hepatosplenomegaly |
| 15 | 7 | F | 20 | 1.24 | 13.01 | Normal | Hepatosplenomegaly |
| 16 | 7 | F | 21 | 1.17 | 15.34 | Normal | Splenomegaly |
| 17 | 7 | M | 21 | 1.18 | 15.08 | Normal | RT.Pleural effusion |
| 18 | 7 | M | 24 | 1.25 | 15.36 | Normal | Hepatosplenomegaly |
| 19 | 7 | M | 17 | 1.15 | 12.85 | Normal | No enlarged organ |
| 20 | 8 | M | 21 | 1.22 | 14.11 | Normal | Hepatosplenomegaly |
| 21 | 8 | F | 21 | 1.23 | 13.88 | Normal | Hepatosplenomegaly |
| 22 | 8 | F | 24 | 1.21 | 16.64 | Normal | None |
| 23 | 8 | F | 20 | 1.21 | 13.66 | Coarse,echogenic | Coarse, echogenic |
| 24 | 8 | F | 25 | 1.27 | 15.50 | Coarse,echogenic | Coarse, echogenic |
| 25 | 8 | M | 26 | 1.32 | 14.92 | Normal | None |
| 26 | 8 | F | 22 | 1.21 | 15.03 | Noemal | None |
| 27 | 8 | F | 20 | 1.21 | 13.66 | Normal | None |
| 28 | 8 | F | 24 | 1.27 | 14.88 | Normal | None |
| 29 | 8 | M | 22 | 1.30 | 13.01 | Normal | None |
| 30 | 8 | M | 27 | 1.35 | 14.81 | Normal | Hepatomegaly |
| 31 | 8 | F | 24 | 1.29 | 14.42 | Normal | None |
| 32 | 8 | F | 24 | 1.28 | 14.65 | Normal | Hepatomegaly |
| 33 | 8 | F | 22 | 1.24 | 14.31 | Normal | Hepatosplenomegaly |
| 34 | 8 | M | 25 | 1.26 | 15.75 | Normal | Hepatosplenomegaly |
| 35 | 8 | M | 28 | 1.30 | 16.57 | Normal | Hepatosplenomegaly |
| 36 | 8 | F | 20 | 1.20 | 13.89 | Normal | Hepatosplenomegaly |
| 37 | 8 | F | 30 | 1.30 | 17.75 | Normal | Rt. Pleural effusion |
| 38 | 8 | M | 23 | 1.22 | 15.54 | Normal | None |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 38 | 8 | F | 23 | 1.33 | 13.00 | Normal | None |
| 40 | 8 | F | 22 | 1.29 | 13.22 | Normal | Hepatosplenomegaly |
| 41 | 8 | M | 22 | 1.24 | 14.31 | Normal | None |
| 42 | 9 | M | 29 | 1.36 | 15.68 | Normal | Rt. Pleural effusion |
| 43 | 9 | M | 25 | 1.31 | 14.57 | Normal | None |
| 44 | 9 | M | 25 | 1.26 | 15.75 | Normal | Rt. Pleural effusion |
| 45 | 9 | F | 30 | 1.36 | 16.22 | Normal | None |
| 46 | 9 | F | 29 | 1.23 | 19.17 | Normal | Bilateral pleural  effusion |
| 47 | 9 | M | 25 | 1.31 | 14.57 | Normal | Hepatosplenomegaly |
| 48 | 9 | M | 30 | 1.37 | 16.22 | Normal | Rt. Pleural effusion |
| 49 | 9 | F | 29 | 1.36 | 15.68 | Normal | Splenomegaly |
| 50 | 10 | F | 24 | 1.25 | 15.36 | Normal | Hepatosplenomegaly |
| 51 | 10 | M | 25 | 1.38 | 15.21 | Normal | None |
| 52 | 10 | F | 35 | 1.41 | 17.60 | Normal | Lt. Pieural effusion |
| 53 | 10 | F | 24 | 1.30 | 14.20 | Normal | Bilateral pleural  effusion |
| 54 | 10 | F | 30 | 1.42 | 14.38 | Normal | Lt. Pleural effusion |
| 55 | 10 | M | 32 | 1.46 | 16.89 | Normal | None |
| 56 | 11 | M | 36 | 1.46 | 16.89 | Normal | None |
| 57 | 11 | F | 33 | 1.40 | 16.84 | Normal | None |
| 58 | 11 | M | 31 | 1.38 | 16.23 | Normal | None |
| 59 | 11 | M | 31 | 1.43 | 15.16 | Normal | None |
| 60 | 11 | M | 31 | 1.40 | 15.31 | Normal | Hepatosplenomegaly |
| 61 | 11 | M | 36 | 1.51 | 15.79 | Normal | Hepatosplenomegaly |
| 62 | 11 | M | 29 | 1.24 | 18.36 | Normal | Rt. Pleural effusion |
| 63 | 12 | M | 34 | 1.45 | 16.17 | Normal | None |
| 64 | 12 | F | 38 | 1.55 | 15.82 | Normal | Rt. Pleural effusion |
| 65 | 12 | F | 27 | 1.39 | 13.97 | Normal | None |
| 66 | 12 | F | 35 | 1.51 | 15.79 | Normal | None |
| 67 | 12 | M | 34 | 1.45 | 16.17 | Normal | None |
| 68 | 13 | F | 34 | 1.41 | 17.10 | Normal | Bilateral pleural  effusion |
| 69 | 13 | M | 29 | 1.44 | 13.13 | Coarse  ecchogenic | None |
| 70 | 13 | F | 42 | 1.48 | 19.17 | Normal | Bilateral pleural  effusion |
| 71 | 13 | M | 46 | 1.65 | 16.90 | Normal | Lt. Pleural effusion |
| 72 | 13 | F | 40 | 1.47 | 18.51 | Normal | Rt. Pleural effusion |
| 73 | 13 | F | 47 | 1.54 | 19.82 | Normal | Rt.pleural  effusion+Hepaosplen |
| 74 | 14 | F | 50 | 1.59 | 19.78 | Normal | Bilateral pleural  effusion |
| 75 | 14 | F | 32 | 1.62 | 12.19 | Normal | Rt. Pleural effusion |
| 76 | 14 | M | 32 | 1.62 | 12.19 | Coarse echogenic | None |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 77 | 15 | F | 33 | 1.65 | 13.74 | Normal | None |
| 78 | 15 | M | 35 | 1.60 | 13.67 | Normal | None |
| 79 | 15 | M | 35 | 1.60 | 13.67 | Normal | None |
| 80 | 17 | F | 50 | 1.68 | 17.67 | Normal | None |
| 81 | 17 | M | 62 | 1.66 | 24.47 | Normal | None |
| 82 | 17 | F | 50 | 1.56 | 20.55 | Normal | None |
| 83 | 17 | M | 50 | 1.68 | 17.67 | Normal | Hepatomegaly |
| 84 | 17 | M | 62 | 1.66 | 22.47 | Normal | None |
| 85 | 18 | M | 62 | 1.70 | 21.45 | Normal | None |
| 86 | 18 | F | 68 | 1.67 | 24.32 | Normal | None |
| 87 | 18 | M | 65 | 1.62 | 24.72 | Normal | Lt. Pleural effusion |
| 88 | 18 | F | 56 | 1.60 | 21.88 | Normal | Lt. Pleural effusion |
| 89 | 19 | M | 60 | 1.67 | 21.51 | Normal | Hepatosplenomegaly |
| 90 | 19 | M | 60 | 1.58 | 24.03 | Normal | None |
| 91 | 19 | F | 62 | 1.58 | 24.84 | Normal | None |
| 92 | 19 | F | 56 | 1.54 | 23.61 | Normal | None |
| 93 | 20 | M | 60 | 1.72 | 20.28 | Normal | None |
| 94 | 20 | M | 62 | 1.70 | 21.45 | Normal | None |
| 95 | 20 | M | 62 | 1.68 | 21.91 | Normal | Rt. Pleural effusion |
| 96 | 20 | M | 64 | 1.69 | 22.15 | Normal | Lt. Pleural effusion |
| 97 | 22 | F | 66 | 1.68 | 23.33 | Normal | Rt. Pleural effusion |
| 98 | 22 | M | 66 | 1.70 | 22.84 | Coarse echogenic | None |
| 99 | 22 | M | 65 | 1.70 | 22.49 |  | Liver cyst |
| 100 | 22 | F | 64 | 1.66 | 23.23 | Normal | None |
| 101 | 23 | M | 65 | 1.65 | 24.38 | Normal | Rt. Pleural effusion |
| 102 | 23 | m | 65 | 1.52 | 28.13 | Normal | None |
| 103 | 23 | F | 67 | 1.74 | 22.13 | Normal | Liver cyst |
| 104 | 23 | M | 66 | 1.70 | 22.83 | Normal | Liver cyst |
| 105 | 24 | M | 68 | 1.71 | 23.26 | Normal | None |
| 106 | 25 | F | 70 | 1.70 | 24.23 | Normal | Hepatosplenomegaly |
| 107 | 25 | F | 65 | 1.66 | 23.59 | Normal | None |
| 108 | 25 | M | 68 | 1.69 | 23.81 | Normal | None |
| 109 | 25 | M | 65 | 1.73 | 21.72 | Echogenic | Liver cyst |
| 110 | 27 | M | 70 | 1.74 | 23.11 | Coarse echog | None |
| 111 | 27 | M | 68 | 1.70 | 23.53 | Normal | None |
| 112 | 27 | F | 70 | 1.70 | 24.22 | Normal | Liver cyst |
| 113 | 35 | M | 75 | 1.72 | 25.34 | Normal | Rt. Pleural effusion |
| 114 | 35 | M | 70 | 1.70 | 24.22 | Normal | None |
| 115 | 35 | F | 67 | 1.68 | 23.74 | Normal | Liver cyst |
| 116 | 38 | F | 68 | 1.62 | 25.90 | Echogenic | Liver cyst |
| 117 | 38 | M | 70 | 1.70 | 24.22 | Normal | Liver cyst |
| 118 | 38 | M | 70 | 1.79 | 24.22 | Normal | None |
| 119 | 39 | M | 73 | 1.72 | 24.67 | Echogenic | Liver cyst |
| 120 | 39 | M | 72 | 1.76 | 23.24 | Normal | None |
| 121 | 39 | F | 70 | 1.73 | 23.37 | Normal | None |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 122 | 40 | F | 70 | 1.62 | 27.43 | Normal | None |
| 123 | 40 | M | 75 | 1.77 | 23.94 | Echogenic | Liver cyst |
| 124 | 41 | M | 75 | 1.80 | 23.20 | Normal | Pleural effusion/liver  cyst |
| 125 | 41 | M | 73 | 1.80 | 22.53 | Normal | None |
| 126 | 41 | F | 70 | 1.75 | 22.86 | Normal | None |
| 127 | 42 | F | 79 | 1.80 | 23.20 | Coarse echogenic | None |
| 128 | 42 | F | 64 | 1.68 | 22.65 | Normal | Splenomegaly |
| 129 | 42 | M | 79 | 1.70 | 27.33 | Normal | None |
| 130 | 48 | M | 80 | 1.80 | 24.70 | Normal | Hepatosplenomegaly |
| 131 | 48 | F | 78 | 1.76 | 25.18 | Echogenic | Liver cyst |
| 132 | 48 | M | 80 | 1.76 | 25.83 | Normal | None |
| 133 | 50 | M | 78 | 1.72 | 26.36 | Normal | Pleural effusion |
| 134 | 50 | F | 72 | 1.70 | 24.91 | Normal | None |
| 135 | 50 | M | 75 | 1.73 | 25.06 | Normal | Hepatomegaly+Liver  cyst |
| 136 | 50 | M | 80 | 1.80 | 24.69 | Normal | None |
| 137 | 52 | M | 75 | 1.65 | 27.48 | Echogenic | Liver cyst |
| 138 | 52 | M | 76 | 1.82 | 22.94 | Echogenic | Liver cyst |
| 139 | 52 | F | 80 | 1.80 | 24.69 | Normal | None |
| 140 | 54 | M | 80 | 1.82 | 22.60 | Normal | None |
| 141 | 54 | F | 80 | 1.82 | 22.60 | Normal | None |
| 142 | 56 | M | 65 | 1.65 | 23.81 | Echogenic | Liver cyst |
| 143 | 56 | M | 75 | 1.70 | 25.95 | Normal | None |
| 144 | 56 | F | 70 | 1.68 | 24.80 | Normal | Liver cyst |
| 145 | 60 | F | 75 | 1.68 | 24.80 | Normal | None |
| 146 | 60 | M | 75 | 1.76 | 24.20 | Normal | None |
| 147 | 62 | M | 75 | 1.76 | 24.20 | Normal | Rt. Pleural effusion |
| 148 | 62 | F | 65 | 1.68 | 23.03 | Normal | Liver cyst |
| 149 | 68 | M | 60 | 1.70 | 20.76 | Normal | None |
| 150 | 68 | M | 65 | 1.67 | 23.31 | Echogenic | Liver cyst |
| 151 | 70 | M | 60 | 1.60 | 23.44 | Echogenic | Liver cyst |
| 152 | 70 |  | 62 | 1.68 | 21.97 | Normal | None |
| 153 | 5 | M | 24 | 1.17 | 17.53 | Normal | Hepatosplenomegaly |
| 154 | 5 | M | 20 | 1.15 | 15.12 | Normal | Hepatosplenomegaly |
| 155 | 5 | F | 18 | 1.11 | 14.61 | Normal | Splenomegaly |
| 156 | 5 | M | 20 | 1.11 | 16.23 | Normal | Pleural effusion+  Splenomegaly |
| 157 | 5 | M | 21 | 1.10 | 17.36 | Normal | Hepatosplenomegaly |
| 158 | 6 | F | 20 | 1.12 | 15.94 | Normal | Hepatosplenomegaly+  pleural effusion |
| 159 | 6 | F | 20 | 1.16 | 14.86 | Normal | Hepatosplenomegaly |
| 160 | 6 | F | 21 | 1.19 | 14.83 | Normal | No enlarged organ |
| 161 | 6 | M | 20 | 1.18 | 14.36 | Normal | Hepatosplenomegaly |
| 162 | 6 | M | 20 | 1.15 | 15.12 | Normal | Splenomegaly |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 163 | 6 | F | 24 | 1.15 | 16.23 | Normal | Hepatomegaly |
| 164 | 7 | F | 24 | 1.21 | 16.40 | Normal | Hepatosplenomegaly |
| 165 | 7 | F | 21 | 1.26 | 13.23 | Normal | Hepatosplenomegaly |
| 166 | 7 | F | 20 | 1.24 | 13.01 | Normal | Hepatosplenomegaly |
| 167 | 7 | F | 21 | 1.17 | 15.34 | Normal | Splenomegaly |
| 168 | 7 | M | 21 | 1.18 | 15.08 | Normal | RT.Pleural effusion |
| 169 | 7 | M | 24 | 1.25 | 15.36 | Normal | Hepatosplenomegaly |
| 170 | 7 | M | 17 | 1.15 | 12.85 | Normal | No enlarged organ |
| 171 | 8 | M | 21 | 1.22 | 14.11 | Normal | Hepatosplenomegaly |
| 172 | 8 | F | 21 | 1.23 | 13.88 | Normal | Hepatosplenomegaly |
| 173 | 8 | F | 24 | 1.21 | 16.64 | Normal | None |
| 174 | 8 | F | 20 | 1.21 | 13.66 | Coarse,echogenic | Coarse, echogenic |
| 175 | 8 | F | 25 | 1.27 | 15.50 | Coarse,echogenic | Coarse, echogenic |
| 176 | 8 | M | 26 | 1.32 | 14.92 | Normal | None |
| 177 | 8 | F | 22 | 1.21 | 15.03 | Noemal | None |
| 178 | 8 | F | 20 | 1.21 | 13.66 | Normal | None |
| 179 | 8 | F | 24 | 1.27 | 14.88 | Normal | None |
| 180 | 8 | M | 22 | 1.30 | 13.01 | Normal | None |
| 181 | 8 | M | 27 | 1.35 | 14.81 | Normal | Hepatomegaly |
| 182 | 8 | F | 24 | 1.29 | 14.42 | Normal | None |
| 183 | 8 | F | 24 | 1.28 | 14.65 | Normal | Hepatomegaly |
| 184 | 9 | M | 29 | 1.36 | 15.68 | Normal | Rt. Pleural effusion |
| 185 | 9 | M | 25 | 1.31 | 14.57 | Normal | None |
| 186 | 9 | M | 25 | 1.26 | 15.75 | Normal | Rt. Pleural effusion |
| 187 | 9 | F | 30 | 1.36 | 16.22 | Normal | None |
| 188 | 9 | F | 29 | 1.23 | 19.17 | Normal | Bilateral pleural effusion |
| 189 | 9 | M | 25 | 1.31 | 14.57 | Normal | Hepatosplenomegaly |
| 190 | 9 | M | 30 | 1.37 | 16.22 | Normal | Rt. Pleural effusion |

**APPENDIX VI**

#### ORGAN SIZE IN INFECTED SUBJECTS

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S/N | Age | Sex | Wt | Ht(m) | BMI | Liver | spl | RKL | RKW | LKL | LKW |
| 1 | 5 | M | 24 | 1.17 | 17.53 | 12.8 | 10.2 | 8.0 | 2.5 | 8.0 | 2.6 |
| 2 | 5 | M | 20 | 1.15 | 15.12 | 12.6 | 9.8 | 8.1 | 2.5 | 8.3 | 2.6 |
| 3 | 5 | F | 18 | 1.11 | 14.61 | 12.4 | 10.0 | 7.8 | 3.0 | 8.1 | 3.0 |
| 4 | 5 | M | 20 | 1.11 | 16.23 | 10.0 | 9.0 | 7.9 | 3.1 | 8.0 | 2.8 |
| 5 | 5 | M | 21 | 1.10 | 17.36 | 10.0 | 10.5 | 8.0 | 3.0 | 7.8 | 2.9 |
| 6 | 6 | F | 20 | 1.12 | 15.94 | 12.6 | 10.2 | 7.6 | 2.8 | 7.9 | 2.9 |
| 7 | 6 | F | 20 | 1.16 | 14.86 | 11.0 | 10.3 | 7.8 | 2.9 | 8.0 | 3.0 |
| 8 | 6 | F | 21 | 1.19 | 14.83 | 9.8 | 8.6 | 8.0 | 3.0 | 8.1 | 3.0 |
| 9 | 6 | M | 20 | 1.18 | 14.36 | 12.6 | 10.5 | 8.2 | 3.0 | 8.0 | 3.1 |
| 10 | 6 | M | 20 | 1.15 | 15.12 | 12.0 | 10.2 | 7.9 | 2.8 | 7.9 | 2.8 |
| 11 | 6 | F | 24 | 1.15 | 16.23 | 13.0 | 9.8 | 7.8 | 2.9 | 7.8 | 2.7 |
| 12 | 6 | M | 21 | 1.10 | 17.36 | 13.2 | 10.3 | 8.0 | 3.1 | 8.3 | 3.2 |
| 13 | 7 | F | 24 | 1.21 | 16.40 | 10.7 | 10.6 | 8.2 | 3.0 | 8.3 | 3.0 |
| 14 | 7 | F | 21 | 1.26 | 13.23 | 12.7 | 10.3 | 7.9 | 3.0 | 8.0 | 3.2 |
| 15 | 7 | F | 20 | 1.24 | 13.01 | 13.0 | 10.5 | 7.6 | 2.8 | 7.9 | 3.0 |
| 16 | 7 | F | 21 | 1.17 | 15.34 | 10.5 | 10.4 | 8.0 | 3.0 | 8.3 | 3.1 |
| 17 | 7 | M | 21 | 1.18 | 15.08 | 10.8 | 7.2 | 8.3 | 3.2 | 8.4 | 3.2 |
| 18 | 7 | M | 24 | 1.25 | 15.36 | 13.2 | 10.2 | 8.3 | 3.2 | 8.4 | 3.2 |
| 19 | 7 | M | 17 | 1.15 | 12.85 | 10.9 | 9.6 | 8.2 | 3.1 | 8.5 | 3.3 |
| 20 | 8 | F | 21 | 1.22 | 14.11 | 10.0 | 10.2 | 8.9 | 3.2 | 8.9 | 3.8 |
| 21 | 8 | F | 21 | 1.23 | 13.88 | 13.6 | 10.4 | 8.3 | 3.2 | 8.9 | 3.9 |
| 22 | 8 | F | 24 | 1.21 | 16.64 | 11.3 | 8.6 | 8.2 | 3.6 | 8.5 | 3.6 |
| 23 | 8 | F | 20 | 1.21 | 13.66 | 10.6 | 8.0 | 8.0 | 3.1 | 8.0 | 3.1 |
| 24 | 8 | F | 25 | 1.27 | 15.50 | 9.8 | 10.0 | 7.9 | 3.0 | 8.2 | 3.3 |
| 25 | 8 | M | 26 | 1.32 | 14.92 | 10.2 | 9.2 | 8.5 | 3.5 | 8.6 | 3.6 |
| 26 | 8 | F | 22 | 1.21 | 15.03 | 11.0 | 8.9 | 8.0 | 3.1 | 8.1 | 3.2 |
| 27 | 8 | F | 20 | 1.21 | 13.66 | 18.0 | 8.1 | 7.9 | 3.0 | 8.0 | 3.2 |
| 28 | 8 | F | 24 | 1.27 | 14.88 | 10.5 | 7.3 | 8.3 | 3.2 | 8.9 | 3.7 |
| 29 | 8 | M | 22 | 1.30 | 13.01 | 9.8 | 9.2 | 8.5 | 3.4 | 8.7 | 3.6 |
| 30 | 8 | M | 27 | 1.35 | 14.81 | 13.0 | 9.3 | 8.8 | 3.6 | 8.9 | 3.8 |
| 31 | 8 | F | 24 | 1.29 | 14.42 | 10.5 | 8.6 | 8.0 | 3.8 | 8.2 | 3.6 |
| 32 | 8 | F | 24 | 1.28 | 14.65 | 13.2 | 9.6 | 8.1 | 3.1 | 8.2 | 3.4 |
| 33 | 8 | F | 22 | 1.24 | 14.31 | 13.4 | 10.5 | 8.0 | 3.1 | 8.1 | 3.2 |
| 34 | 8 | M | 25 | 1.26 | 15.75 | 14.0 | 10.8 | 9.0 | 3.5 | 9.1 | 3.7 |
| 35 | 8 | M | 28 | 1.30 | 16.57 | 13.8 | 10.6 | 8.9 | 3.6 | 8.9 | 3.6 |
| 36 | 8 | F | 20 | 1.20 | 13.89 | 13.1 | 10.3 | 8.4 | 3.7 | 8.6 | 3.8 |
| 37 | 8 | F | 30 | 1.30 | 17.75 | 10.6 | 8.9 | 8.5 | 3.5 | 8.6 | 3.6 |
| 38 | 8 | M | 23 | 1.22 | 15.54 | 11.1 | 9.4 | 8.7 | 3.5 | 9.0 | 3.8 |
| 39 | 8 | F | 23 | 1.33 | 13.00 | 10.8 | 9.6 | 8.6 | 3.2 | 8.8 | 3.4 |
| 40 | 8 | F | 22 | 1.29 | 13.22 | 12.8 | 10.8 | 8.8 | 3.6 | 9.0 | 3.7 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 41 | 8 | M | 22 | 1.24 | 14.31 | 11.5 | 9.6 | 9.2 | 3.4 | 9.2 | 3.8 |
| 42 | 9 | M | 29 | 1.36 | 15.68 | 10.8 | 8.4 | 8.6 | 3.5 | 9.6 | 3.9 |
| 43 | 9 | M | 25 | 1.31 | 14.57 | 11.0 | 9.0 | 8.4 | 3.4 | 8.4 | 3.3 |
| 44 | 9 | M | 25 | 1.26 | 15.75 | 10.8 | 9.2 | 8.3 | 3.6 | 8.2 | 3.4 |
| 45 | 9 | F | 30 | 1.36 | 16.22 | 11.0 | 8.8 | 7.5 | 3.2 | 8.1 | 3.3 |
| 46 | 9 | F | 29 | 1.23 | 19.17 | 10.9 | 8.9 | 8.3 | 3.6 | 8.2 | 3.4 |
| 47 | 9 | M | 25 | 1.31 | 14.57 | 14.2 | 10.8 | 8.0 | 3.2 | 8.3 | 4.0 |
| 48 | 9 | M | 30 | 1.37 | 16.22 | 11.5 | 9.2 | 9.1 | 3.6 | 8.8 | 3.7 |
| 49 | 9 | F | 29 | 1.36 | 15.68 | 13.0 | 10.7 | 9.4 | 3.8 | 9.6 | 3.8 |
| 50 | 10 | M | 24 | 1.25 | 15.36 | 10.9 | 10.8 | 8.3 | 3.2 | 8.5 | 3.7 |
| 51 | 10 | F | 25 | 1.38 | 15.21 | 12.3 | 9.0 | 8.8 | 3.5 | 9.0 | 3.8 |
| 52 | 10 | F | 35 | 1.41 | 17.60 | 12.0 | 9.3 | 9.7 | 3.5 | 10.2 | 3.8 |
| 53 | 10 | F | 24 | 1.30 | 14.20 | 13.6 | 10.8 | 7.3 | 3.0 | 7.6 | 3.0 |
| 54 | 10 | F | 30 | 1.42 | 14.38 | 11.8 | 9.2 | 9.2 | 3.7 | 9.4 | 4.0 |
| 55 | 10 | M | 32 | 1.40 | 16.32 | 11.8 | 9.9 | 8.9 | 3.7 | 9.2 | 4.0 |
| 56 | 11 | M | 36 | 1.46 | 16.88 | 13.9 | 9.8 | 8.9 | 3.9 | 9.2 | 4.0 |
| 57 | 11 | F | 33 | 1.40 | 16.84 | 12.4 | 8.7 | 9.2 | 4.0 | 9.4 | 4.0 |
| 58 | 11 | M | 31 | 1.38 | 16.23 | 12.3 | 9.3 | 9.5 | 4.2 | 9.6 | 4.2 |
| 59 | 11 | M | 31 | 1.43 | 15.16 | 11.8 | 10.0 | 9.8 | 3.8 | 10.0 | 4.2 |
| 60 | 11 | M | 31 | 1.40 | 15.31 | 14.0 | 11.0 | 9.3 | 4.0 | 9.6 | 4.0 |
| 61 | 11 | M | 36 | 1.51 | 15.79 | 13.8 | 10.9 | 8.9 | 3.9 | 9.1 | 4.0 |
| 62 | 11 | M | 29 | 1.24 | 18.36 | 14.0 | 11.2 | 10.0 | 3.5 | 10.1 | 3.8 |
| 63 | 12 | M | 34 | 1.45 | 16.17 | 12.5 | 8.7 | 9.1 | 3.1 | 8.9 | 3.7 |
| 64 | 12 | F | 38 | 1.55 | 15.82 | 12.22 | 9.8 | 9.5 | 3.5 | 9.8 | 4.0 |
| 65 | 12 | F | 27 | 1.39 | 13.97 | 12.4 | 10.0 | 10.5 | 4.2 | 10.6 | 4.3 |
| 66 | 12 | F | 35 | 1.51 | 15.79 | 12.5 | 10.0 | 10.4 | 3.9 | 10.6 | 4.2 |
| 67 | 12 | M | 34 | 1.45 | 16.17 | 12.0 | 9.8 | 10.8 | 4.0 | 10.8 | 4.2 |
| 68 | 13 | F | 34 | 1.41 | 17.10 | 12.1 | 10.2 | 7.5 | 3.4 | 8.8 | 3.0 |
| 69 | 13 | M | 29 | 1.44 | 13.13 | 12.6 | 10.6 | 9.0 | 3.8 | 9.2 | 4.1 |
| 70 | 13 | F | 42 | 1.48 | 19.17 | 12.5 | 9.9 | 9.5 | 4.0 | 9.6 | 4.2 |
| 71 | 13 | M | 46 | 1.65 | 16.90 | 12.8 | 10.5 | 10.0 | 3.8 | 10.2 | 4.4 |
| 72 | 13 | F | 40 | 1.47 | 18.51 | 12.6 | 10.2 | 8.9 | 3.6 | 9.6 | 3.9 |
| 73 | 13 | F | 47 | 1.54 | 19.82 | 12.8 | 10.3 | 9.0 | 3.9 | 9.5 | 4.3 |
| 74 | 14 | F | 50 | 1.59 | 19.78 | 13.0 | 10.5 | 9.2 | 4.2 | 9.0 | 3.8 |
| 75 | 14 | F | 32 | 1.62 | 12.19 | 13.2 | 10.3 | 10.1 | 4.6 | 10.3 | 4.3 |
| 76 | 14 | M | 32 | 1.62 | 12.19 | 12.9 | 11.0 | 10.3 | 3.7 | 10.0 | 4.2 |
| 77 | 15 | F | 33 | 1.55 | 13.74 | 11.8 | 10.8 | 8.9 | 3.7 | 9.3 | 3.8 |
| 78 | 15 | M | 35 | 1.60 | 13.67 | 11.5 | 11.5 | 9.0 | 3.6 | 9.2 | 3.7 |
| 79 | 15 | M | 35 | 1.60 | 13.67 | 13.0 | 12.2 | 9.2 | 4.0 | 9.0 | 4.2 |
| 80 | 17 | M | 50 | 1.68 | 17.67 | 15.5 | 11.9 | 9.7 | 3.9 | 10.3 | 4.0 |
| 81 | 17 | M | 62 | 1.66 | 22.47 | 13.6 | 13.0 | 9.0 | 3.8 | 9.6 | 4.2 |
| 82 | 17 | F | 50 | 1.56 | 20.55 | 13.5 | 12.6 | 9.5 | 4.0 | 9.5 | 4.6 |
| 83 | 17 | M | 51 | 1.63 | 19.20 | 13.5 | 13.2 | 9.7 | 3.8 | 10.1 | 4.0 |
| 84 | 17 | M | 52 | 1.60 | 20.80 | 13.6 | 12.0 | 10.2 | 4.5 | 10.3 | 4.6 |
| 85 | 18 | F | 62 | 1.70 | 21.45 | 12.6 | 12.1 | 10.3 | 3.9 | 10.2 | 4.2 |

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| 86 | 18 | M | 68 | 1.67 | 24.32 | 12.8 | 12.0 | 10.6 | 4.1 | 10.6 | 4.2 |
| 87 | 18 | M | 65 | 1.62 | 24.72 | 12.9 | 12.2 | 10.5 | 4.3 | 10.7 | 4.3 |
| 88 | 18 | F | 56 | 1.60 | 21.88 | 12.7 | 11.8 | 10.1 | 3.9 | 10.5 | 4.2 |
| 89 | 19 | M | 60 | 1.67 | 21.51 | 15.8 | 14.0 | 10.6 | 4.5 | 10.6 | 4.5 |
| 90 | 19 | M | 60 | 1.58 | 24.03 | 12.6 | 14.0 | 10.6 | 4.3 | 10.8 | 3.6 |
| 91 | 19 | F | 62 | 1.58 | 24.84 | 13.0 | 12.5 | 10.8 | 3.6 | 10.4 | 4.2 |
| 92 | 19 | F | 56 | 1.54 | 23.61 | 12.4 | 14.8 | 10.6 | 4.2 | 10.6 | 4.3 |
| 93 | 20 | M | 60 | 1.72 | 20.28 | 13.2 | 12.3 | 11.0 | 4.1 | 10.9 | 3.8 |
| 94 | 20 | M | 62 | 1.70 | 21.45 | 13.5 | 12.6 | 10.2 | 3.8 | 10.3 | 4.0 |
| 95 | 20 | M | 64 | 1.69 | 22.15 | 13.6 | 12.2 | 10.1 | 4.1 | 11.0 | 4.4 |
| 96 | 20 | M | 62 | 1.68 | 21.91 | 13.2 | 12.6 | 10.8 | 4.2 | 11.0 | 4.5 |
| 97 | 22 | F | 66 | 1.68 | 23.33 | 12.8 | 12.0 | 10.6 | 4.5 | 11.2 | 4.6 |
| 98 | 22 | M | 66 | 1.70 | 22.84 | 13.0 | 12.5 | 11.0 | 4.3 | 11.2 | 4.5 |
| 99 | 22 | M | 65 | 1.70 | 22.49 | 13.0 | 12.4 | 10.5 | 4.2 | 10.8 | 4.0 |
| 100 | 22 | F | 64 | 1.66 | 23.23 | 12.8 | 12.2 | 10.3 | 4.0 | 10.3 | 4.0 |
| 101 | 23 | F | 65 | 1.65 | 24.38 | 14.0 | 11.9 | 10.9 | 3.8 | 11.1 | 4.0 |
| 102 | 23 | M | 65 | 1.52 | 28.13 | 13.2 | 11.8 | 11.0 | 3.8 | 11.2 | 3.9 |
| 103 | 23 | F | 67 | 1.74 | 22.13 | 12.6 | 11.8 | 9.8 | 3.2 | 10.0 | 4.0 |
| 104 | 23 | M | 66 | 1.70 | 22.83 | 13.4 | 12.4 | 10.7 | 4.0 | 11.0 | 3.8 |
| 105 | 24 | M | 68 | 1.71 | 23.26 | 13.4 | 12.3 | 11.0 | 3.8 | 11.5 | 4.6 |
| 106 | 25 | F | 70 | 1.70 | 24.23 | 17.0 | 16.0 | 11.1 | 4.2 | 11.5 | 4.5 |
| 107 | 25 | F | 65 | 1.66 | 23.59 | 14.0 | 13.6 | 11.2 | 3.6 | 11.6 | 3.4 |
| 108 | 25 | M | 68 | 1.69 | 23.81 | 13.8 | 12.0 | 11.0 | 3.6 | 11.4 | 3.2 |
| 109 | 25 | M | 65 | 1.73 | 21.72 | 14.2 | 13.2 | 10.9 | 3.8 | 10.9 | 3.8 |
| 110 | 27 | M | 70 | 1.74 | 23.11 | 14.1 | 13.2 | 11.0 | 4.0 | 11.2 | 4.3 |
| 111 | 27 | M | 68 | 1.70 | 23.53 | 13.8 | 13.2 | 11.1 | 4.0 | 11.2 | 4.4 |
| 112 | 27 | F | 70 | 1.70 | 24.22 | 14.0 | 13.4 | 11.1 | 4.3 | 11.4 | 4.4 |
| 113 | 35 | M | 75 | 1.72 | 25.34 | 14.5 | 12.9 | 10.6 | 3.8 | 10.8 | 3.8 |
| 114 | 35 | M | 70 | 1.70 | 24.22 | 14.5 | 13.0 | 10.8 | 3.8 | 11.0 | 4.0 |
| 115 | 35 | F | 67 | 1.68 | 23.74 | 13.9 | 12.5 | 10.6 | 3.8 | 11.0 | 4.0 |
| 116 | 38 | F | 68 | 1.62 | 25.90 | 13.7 | 13.2 | 10.5 | 3.7 | 10.7 | 4.2 |
| 117 | 38 | M | 70 | 1.70 | 24.22 | 13.5 | 13.4 | 10.6 | 3.8 | 11.0 | 4.0 |
| 118 | 38 | M | 70 | 1.70 | 24.22 | 13.8 | 13.4 | 10.8 | 4.0 | 10.9 | 3.9 |
| 119 | 39 | M | 73 | 1.72 | 24.67 | 14.0 | 13.2 | 11.2 | 4.6 | 11.4 | 4.6 |
| 120 | 39 | M | 72 | 1.76 | 23.24 | 14.0 | 13.6 | 11.0 | 4.5 | 10.9 | 3.8 |
| 121 | 39 | F | 70 | 1.73 | 23.39 | 14.6 | 13.2 | 11.3 | 4.6 | 11.2 | 4.9 |
| 122 | 40 | F | 72 | 1.62 | 27.43 | 14.4 | 13.5 | 11.1 | 3.8 | 11.1 | 4.0 |
| 123 | 40 | M | 75 | 1.77 | 23.94 | 14.8 | 13.6 | 11.2 | 3.6 | 10.8 | 4.0 |
| 124 | 41 | M | 75 | 1.80 | 23.20 | 15.0 | 13.8 | 11.3 | 4.8 | 11.6 | 4.8 |
| 125 | 41 | M | 73 | 1.80 | 22.53 | 15.0 | 13.6 | 11.6 | 4.1 | 11.6 | 4.7 |
| 126 | 41 | F | 70 | 1.75 | 22.56 | 15.2 | 13.2 | 11.4 | 3.9 | 11.2 | 4.5 |
| 127 | 42 | F | 68 | 1.76 | 25.49 | 13.8 | 13.5 | 11.0 | 3.9 | 11.3 | 4.2 |
| 128 | 42 | F | 64 | 1.68 | 22.68 | 13.6 | 16.0 | 10.8 | 3.7 | 11.2 | 4.4 |
| 129 | 42 | M | 79 | 1.70 | 27.33 | 14.2 | 13.4 | 11.2 | 3.8 | 10.9 | 4.2 |

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| 130 | 48 | M | 80 | 1.80 | 24.70 | 17.0 | 16.5 | 11.6 | 4.8 | 11.8 | 4.9 |
| 131 | 48 | F | 78 | 1.76 | 25.18 | 15.2 | 14.5 | 11.4 | 4.0 | 11.4 | 4.6 |
| 132 | 48 | M | 80 | 1.76 | 25.83 | 15.0 | 14.8 | 11.6 | 4.2 | 11.6 | 4.8 |
| 133 | 50 | M | 78 | 1.72 | 26.36 | 14.0 | 14.0 | 11.8 | 4.9 | 11.8 | 4.8 |
| 134 | 50 | F | 72 | 1.70 | 24.91 | 16.2 | 16.2 | 10.9 | 4.8 | 11.4 | 3.9 |
| 135 | 50 | M | 75 | 1.73 | 25.06 | 14.5 | 15.0 | 11.2 | 4.6 | 11.6 | 3.7 |
| 136 | 50 | M | 80 | 1.80 | 24.69 | 15.0 | 14.0 | 12.0 | 4.9 | 12.0 | 3.7 |
| 137 | 52 | F | 75 | 1.65 | 27.48 | 13.8 | 13.8 | 10.9 | 3.2 | 10.9 | 3.2 |
| 138 | 52 | M | 76 | 1.82 | 22.94 | 14.2 | 14.0 | 10.8 | 4.8 | 11.1 | 3.7 |
| 139 | 52 | F | 80 | 1.80 | 24.69 | 14.6 | 14.5 | 11.2 | 4.2 | 11.0 | 4.1 |
| 140 | 54 | M | 80 | 1.82 | 22.60 | 17.0 | 17.0 | 12.0 | 4.8 | 12.0 | 4.6 |
| 141 | 54 | F | 80 | 1.82 | 22.60 | 14.8 | 13.8 | 10.9 | 3.8 | 11.2 | 4.0 |
| 142 | 56 | M | 65 | 1.65 | 23.81 | 14.6 | 14.6 | 11.8 | 4.3 | 11.9 | 4.3 |
| 143 | 56 | M | 75 | 1.70 | 25.95 | 14.3 | 17.5 | 11.6 | 4.0 | 10.8 | 3.9 |
| 144 | 56 | F | 70 | 1.68 | 24.80 | 14.0 | 14.2 | 10.5 | 3.9 | 10.5 | 4.0 |
| 145 | 60 | M | 72 | 1.74 | 24.33 | 13.8 | 14.0 | 10.6 | 4.0 | 10.9 | 4.2 |
| 146 | 60 | M | 75 | 1.76 | 24.20 | 13.5 | 13.2 | 10.7 | 4.2 | 10.8 | 4.0 |
| 147 | 62 | F | 65 | 1.69 | 24.51 | 14.8 | 13.5 | 10.8 | 3.6 | 10.8 | 4.1 |
| 148 | 62 | M | 70 | 1.68 | 23.03 | 13.8 | 13.0 | 10.8 | 3.6 | 10.8 | 4.1 |
| 149 | 68 | M | 60 | 1.70 | 20.76 | 13.2 | 14.8 | 10.6 | 3.3 | 10.7 | 3.5 |
| 150 | 68 | M | 65 | 1.67 | 23.31 | 14.0 | 13.5 | 10.6 | 3.3 | 10.7 | 3.5 |
| 151 | 70 | F | 60 | 1.65 | 23.34 | 12.8 | 13.8 | 9.1 | 3.2 | 9.1 | 3.0 |
| 152 | 70 | M | 62 | 1.68 | 21.92 | 13.0 | 12.7 | 8.6 | 3.2 | 8.6 | 3.6 |
| 153 | 5 | M | 24 | 1.17 | 17.53 | 12.8 | 10.2 | 8.0 | 2.5 | 8.0 | 2.6 |
| 154 | 5 | M | 20 | 1.15 | 15.12 | 12.6 | 9.8 | 8.1 | 2.5 | 8.3 | 2.6 |
| 155 | 5 | F | 18 | 1.11 | 14.61 | 12.4 | 10.0 | 7.8 | 3.0 | 8.1 | 3.0 |
| 156 | 5 | M | 20 | 1.11 | 16.23 | 10.0 | 9.0 | 7.9 | 3.1 | 8.0 | 2.8 |
| 157 | 5 | M | 21 | 1.10 | 17.36 | 10.0 | 10.5 | 8.0 | 3.0 | 7.8 | 2.9 |
| 158 | 6 | F | 20 | 1.12 | 15.94 | 12.6 | 10.2 | 7.6 | 2.8 | 7.9 | 2.9 |
| 159 | 6 | F | 20 | 1.16 | 14.86 | 11.0 | 10.3 | 7.8 | 2.9 | 8.0 | 3.0 |
| 160 | 6 | F | 21 | 1.19 | 14.83 | 9.8 | 8.6 | 8.0 | 3.0 | 8.1 | 3.0 |
| 161 | 6 | M | 20 | 1.18 | 14.36 | 12.6 | 10.5 | 8.2 | 3.0 | 8.0 | 3.1 |
| 162 | 6 | M | 20 | 1.15 | 15.12 | 12.0 | 10.2 | 7.9 | 2.8 | 7.9 | 2.8 |
| 163 | 6 | F | 24 | 1.15 | 16.23 | 13.0 | 9.8 | 7.8 | 2.9 | 7.8 | 2.7 |
| 164 | 6 | M | 21 | 1.10 | 17.36 | 13.2 | 10.3 | 8.0 | 3.1 | 8.3 | 3.2 |
| 165 | 7 | F | 24 | 1.21 | 16.40 | 10.7 | 10.6 | 8.2 | 3.0 | 8.3 | 3.0 |
| 166 | 7 | F | 21 | 1.26 | 13.23 | 12.7 | 10.3 | 7.9 | 3.0 | 8.0 | 3.2 |
| 167 | 7 | F | 20 | 1.24 | 13.01 | 13.0 | 10.5 | 7.6 | 2.8 | 7.9 | 3.0 |
| 168 | 7 | F | 21 | 1.17 | 15.34 | 10.5 | 10.4 | 8.0 | 3.0 | 8.3 | 3.1 |
| 169 | 7 | M | 21 | 1.18 | 15.08 | 10.8 | 7.2 | 8.3 | 3.2 | 8.4 | 3.2 |
| 170 | 7 | M | 24 | 1.25 | 15.36 | 13.2 | 10.2 | 8.3 | 3.2 | 8.4 | 3.2 |
| 171 | 7 | M | 17 | 1.15 | 12.85 | 10.9 | 9.6 | 8.2 | 3.1 | 8.5 | 3.3 |
| 172 | 8 | F | 21 | 1.22 | 14.11 | 10.0 | 10.2 | 8.9 | 3.2 | 8.9 | 3.8 |
| 173 | 8 | F | 21 | 1.23 | 13.88 | 13.6 | 10.4 | 8.3 | 3.2 | 8.9 | 3.9 |
| 174 | 8 | F | 24 | 1.21 | 16.64 | 11.3 | 8.6 | 8.2 | 3.6 | 8.5 | 3.6 |

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| 175 | 8 | F | 20 | 1.21 | 13.66 | 10.6 | 8.0 | 8.0 | 3.1 | 8.0 | 3.1 |
| 176 | 8 | F | 25 | 1.27 | 15.50 | 9.8 | 10.0 | 7.9 | 3.0 | 8.2 | 3.3 |
| 177 | 8 | M | 26 | 1.32 | 14.92 | 10.2 | 9.2 | 8.5 | 3.5 | 8.6 | 3.6 |
| 178 | 8 | F | 22 | 1.21 | 15.03 | 11.0 | 8.9 | 8.0 | 3.1 | 8.1 | 3.2 |
| 179 | 8 | F | 20 | 1.21 | 13.66 | 18.0 | 8.1 | 7.9 | 3.0 | 8.0 | 3.2 |
| 180 | 8 | F | 24 | 1.27 | 14.88 | 10.5 | 7.3 | 8.3 | 3.2 | 8.9 | 3.7 |
| 181 | 8 | M | 22 | 1.30 | 13.01 | 9.8 | 9.2 | 8.5 | 3.4 | 8.7 | 3.6 |
| 182 | 8 | M | 27 | 1.35 | 14.81 | 13.0 | 9.3 | 8.8 | 3.6 | 8.9 | 3.8 |
| 183 | 8 | F | 24 | 1.29 | 14.42 | 10.5 | 8.6 | 8.0 | 3.8 | 8.2 | 3.6 |
| 184 | 8 | F | 24 | 1.28 | 14.65 | 13.2 | 9.6 | 8.1 | 3.1 | 8.2 | 3.4 |
| 185 | 8 | F | 22 | 1.24 | 14.31 | 13.4 | 10.5 | 8.0 | 3.1 | 8.1 | 3.2 |
| 186 | 8 | M | 25 | 1.26 | 15.75 | 14.0 | 10.8 | 9.0 | 3.5 | 9.1 | 3.7 |
| 187 | 8 | M | 28 | 1.30 | 16.57 | 13.8 | 10.6 | 8.9 | 3.6 | 8.9 | 3.6 |
| 188 | 8 | F | 20 | 1.20 | 13.89 | 13.1 | 10.3 | 8.4 | 3.7 | 8.6 | 3.8 |
| 189 | 8 | F | 30 | 1.30 | 17.75 | 10.6 | 8.9 | 8.5 | 3.5 | 8.6 | 3.6 |
| 190 | 8 | M | 23 | 1.22 | 15.54 | 11.1 | 9.4 | 8.7 | 3.5 | 9.0 | 3.8 |
| 191 | 8 | F | 23 | 1.33 | 13.00 | 10.8 | 9.6 | 8.6 | 3.2 | 8.8 | 3.4 |
| 192 | 8 | F | 22 | 1.29 | 13.22 | 12.8 | 10.8 | 8.8 | 3.6 | 9.0 | 3.7 |

**APPENDIX VII**

#### ORGAN SIZE IN NORMAL SUBJECTS

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S/N | Age(yrs  ) | Se  x | Wt(Kg  ) | Ht(Cm  ) | BMI | Lth | SL | KL | KW | KLL | Width(C  m) |
| 1 | 5 | M | 24 | 1.16 | 17.83 | 10.2 | 7.6 | 8.2 | 2.6 | 8.2 | 2.8 |
| 2 | 5 | F | 19 | 1.10 | 15.70 | 9.8 | 7.3 | 8.1 | 2.8 | 8.3 | 3.0 |
| 3 | 5 | F | 20 | 1.15 | 15.12 | 10.0 | 7.2 | 8.0 | 2.7 | 8.0 | 2.7 |
| 4 | 5 | M | 20 | 1.12 | 15.90 | 10.0 | 8.1 | 7.9 | 3.1 | 8.2 | 3.2 |
| 5 | 5 | F | 17 | 1.11 | 13.70 | 9.6 | 7.4 | 8.0 | 3.2 | 8.1 | 3.1 |
| 6 | 5 | M | 18 | 1.13 | 19.01 | 9.5 | 7.8 | 7.8 | 3.0 | 8.0 | 3.0 |
| 7 | 6 | F | 20 | 1.14 | 15.38 | 9.6 | 7.5 | 8.0 | 3.2 | 8.3 | 3.5 |
| 8 | 6 | F | 24 | 1.17 | 17.53 | 10.1 | 8.2 | 8.0 | 3.1 | 8.2 | 3.0 |
| 9 | 6 | F | 21 | 1.18 | 15.01 | 9.7 | 7.7 | 8.1 | 3.3 | 8.3 | 3.5 |
| 10 | 6 | M | 20 | 1.15 | 15.12 | 9.8 | 7.8 | 7.9 | 2.8 | 7.9 | 2.8 |
| 11 | 6 | F | 23 | 1.12 | 18.33 | 9.9 | 8.3 | 7.6 | 2.9 | 7.8 | 3.0 |
| 12 | 6 | M | 22 | 1.14 | 16.93 | 10.4 | 9.0 | 8.2 | 3.4 | 8.3 | 3.6 |
| 13 | 7 | M | 26 | 1.20 | 18.05 | 10.6 | 7.3 | 8.0 | 3.1 | 8.3 | 3.2 |
| 14 | 7 | M | 20 | 1.21 | 13.60 | 10.1 | 9.4 | 7.9 | 3.0 | 8.0 | 3.4 |
| 15 | 7 | M | 21 | 1.26 | 13.22 | 9.8 | 7.9 | 7.8 | 2.9 | 8.2 | 3.2 |
| 16 | 7 | M | 22 | 1.16 | 15.01 | 9.6 | 9.1 | 8.0 | 3.1 | 8.0 | 3.2 |
| 17 | 7 | M | 21 | 1.18 | 15.01 | 10.5 | 9.1 | 8.2 | 3.3 | 8.3 | 3.2 |
| 18 | 7 | F | 26 | 1.26 | 16.31 | 10.7 | 8.0 | 7.9 | 3.0 | 8.2 | 3.3 |
| 19 | 7 | F | 18 | 1.17 | 13.11 | 10.0 | 8.6 | 8.0 | 3.1 | 8.4 | 3.2 |
| 20 | 7 | M | 21 | 1.22 | 14.01 | 10.3 | 10.0 | 9.0 | 3.5 | 8.9 | 3.8 |
| 21 | 7 | M | 23 | 1.24 | 14.91 | 10.5 | 8.7 | 8.1 | 3.3 | 8.6 | 3.6 |
| 22 | 7 | F | 21 | 1.16 | 15.01 | 9.5 | 8.5 | 8.4 | 3.6 | 8.4 | 3.8 |
| 23 | 8 | F | 22 | 1.23 | 14.50 | 10.2 | 8.2 | 8.0 | 3.2 | 8.2 | 3.5 |
| 24 | 8 | F | 25 | 1.17 | 18.20 | 10.2 | 9.8 | 7.9 | 3.0 | 8.0 | 3.3 |
| 25 | 8 | M | 24 | 1.28 | 14.61 | 10.3 | 7.9 | 8.3 | 3.5 | 8.2 | 3.5 |
| 26 | 8 | M | 23 | 1.25 | 14.72 | 10.4 | 8.4 | 8.0 | 3.1 | 8.0 | 3.4 |
| 27 | 8 | M | 19 | 1.22 | 12.72 | 9.6 | 8.0 | 7.8 | 3.2 | 8.1 | 3.5 |
| 28 | 8 | M | 26 | 1.30 | 15.30 | 10.8 | 9.3 | 8.0 | 3.3 | 8.4 | 3.8 |
| 29 | 8 | M | 23 | 1.28 | 14.01 | 10.6 | 8.2 | 8.5 | 3.8 | 8.4 | 3.6 |
| 30 | 8 | F | 26 | 1.27 | 16.12 | 10.8 | 8.4 | 8.4 | 3.6 | 8.6 | 3.8 |
| 31 | 8 | F | 23 | 1.29 | 13.82 | 10.5 | 8.2 | 8.1 | 3.1 | 8.2 | 3.3 |
| 32 | 8 | M | 25 | 1.30 | 14.70 | 10.9 | 9.1 | 8.1 | 3.4 | 8.3 | 3.4 |
| 33 | 8 | F | 22 | 1.26 | 13.82 | 11.2 | 7.3 | 8.0 | 3.2 | 8.2 | 3.6 |
| 34 | 8 | M | 24 | 1.26 | 15.12 | 11.4 | 7.8 | 8.6 | 3.4 | 8.4 | 3.6 |
| 35 | 8 | F | 26 | 1.32 | 14.92 | 10.9 | 7.7 | 8.8 | 3.6 | 8.9 | 3.8 |
| 36 | 8 | M | 21 | 1.22 | 14.10 | 10.6 | 7.9 | 8.5 | 3.7 | 8.8 | 3.9 |
| 37 | 8 | M | 23 | 1.31 | 13.40 | 11.0 | 8.2 | 8.7 | 3.9 | 9.0 | 4.0 |
| 38 | 9 | M | 24 | 1.28 | 14.61 | 11.5 | 8.2 | 8.6 | 3.6 | 9.0 | 4.2 |
| 39 | 9 | F | 24 | 1.26 | 15.12 | 11.1 | 8.0 | 8.4 | 3.2 | 8.8 | 4.0 |

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| 40 | 9 | F | 27 | 1.30 | 15.91 | 10.8 | 9.8 | 8.7 | 3.8 | 9.1 | 4.3 |
| 41 | 9 | M | 25 | 1.32 | 14.31 | 11.0 | 10.1 | 8.6 | 3.7 | 8.6 | 3.2 |
| 42 | 9 | F | 29 | 1.34 | 16.15 | 11.3 | 10.0 | 8.9 | 3.8 | 9.2 | 4.0 |
| 43 | 9 | M | 26 | 1.32 | 14.92 | 11.7 | 9.8 | 8.3 | 3.6 | 8.3 | 3.6 |
| 44 | 9 | M | 25 | 1.26 | 15.70 | 11.7 | 9.9 | 8.0 | 3.1 | 8.5 | 3.8 |
| 45 | 9 | M | 28 | 1.34 | 15.50 | 11.8 | 10.0 | 8.2 | 3.4 | 8.3 | 3.7 |
| 46 | 9 | M | 27 | 1.28 | 16.41 | 11.6 | 10.2 | 8.4 | 3.9 | 8.2 | 3.6 |
| 47 | 9 | F | 25 | 1.36 | 15.41 | 10.5 | 8.9 | 9.0 | 3.6 | 9.2 | 4.1 |
| 48 | 9 | M | 30 | 1.35 | 16.40 | 11.6 | 10.5 | 9.5 | 4.2 | 9.6 | 4.2 |
| 49 | 9 | M | 28 | 1.33 | 15.83 | 11.4 | 10.3 | 8.6 | 3.5 | 8.9 | 3.8 |
| 50 | 10 | M | 25 | 1.27 | 15.50 | 11.3 | 10.1 | 8.8 | 3.5 | 9.0 | 3.9 |
| 51 | 10 | M | 27 | 1.36 | 14.09 | 11.8 | 9.9 | 9.4 | 3.6 | 9.4 | 3.8 |
| 52 | 10 | F | 35 | 1.40 | 17.81 | 11.6 | 10.0 | 8.0 | 3.8 | 8.6 | 3.5 |
| 53 | 10 | F | 24 | 1.30 | 14.20 | 11.2 | 8.2 | 9.0 | 3.9 | 9.3 | 4.3 |
| 54 | 10 | M | 32 | 1.45 | 15.20 | 11.9 | 8.8 | 8.9 | 4.2 | 9.2 | 4.0 |
| 55 | 10 | M | 31 | 1.45 | 14.74 | 11.8 | 8.6 | 8.9 | 4.2 | 9.2 | 4.2 |
| 56 | 11 | M | 34 | 1.46 | 15.92 | 12.2 | 10.3 | 9.0 | 4.1 | 9.3 | 4.2 |
| 57 | 11 | M | 31 | 1.38 | 16.20 | 12.0 | 9.9 | 9.4 | 4.2 | 9.8 | 4.2 |
| 58 | 11 | F | 33 | 1.40 | 15.82 | 12.1 | 9.6 | 9.8 | 3.9 | 9.8 | 4.0 |
| 59 | 11 | F | 31 | 1.42 | 15.30 | 12.0 | 9.4 | 9.2 | 4.1 | 9.4 | 4.2 |
| 60 | 11 | M | 30 | 1.40 | 15.31 | 12.5 | 8.9 | 9.0 | 4.1 | 9.2 | 4.3 |
| 61 | 11 | M | 34 | 1.48 | 15.52 | 12.3 | 10.1 | 9.8 | 3.8 | 10.0 | 4.2 |
| 62 | 11 | F | 27 | 1.39 | 16.50 | 11.9 | 10.2 | 9.1 | 3.1 | 8.9 | 3.8 |
| 63 | 12 | F | 34 | 1.50 | 15.11 | 12.0 | 10.2 | 9.6 | 4.0 | 9.8 | 4.2 |
| 64 | 12 | F | 38 | 1.56 | 15.61 | 12.4 | 9.8 | 10.3 | 4.4 | 10.4 | 4.5 |
| 65 | 12 | M | 36 | 1.54 | 15.12 | 12.8 | 10.0 | 10.5 | 4.0 | 10.6 | 4.4 |
| 66 | 12 | M | 37 | 1.56 | 15.20 | 12.8 | 9.9 | 10.2 | 3.8 | 10.0 | 3.8 |
| 67 | 12 | M | 36 | 1.47 | 16.62 | 12.3 | 8.5 | 10.6 | 4.2 | 10.8 | 4.2 |
| 68 | 12 | F | 34 | 1.41 | 17.10 | 12.5 | 9.2 | 8.0 | 3.6 | 8.2 | 3.8 |
| 69 | 13 | M | 28 | 1.42 | 13.81 | 12.7 | 10.6 | 9.0 | 3.8 | 9.2 | 4.1 |
| 70 | 13 | F | 43 | 1.46 | 20.17 | 13.0 | 11.0 | 9.2 | 4.0 | 9.4 | 4.2 |
| 71 | 13 | M | 44 | 1.63 | 16.50 | 13.2 | 11.2 | 9.9 | 4.2 | 10.1 | 4.3 |
| 72 | 13 | M | 38 | 1.45 | 18.00 | 12.8 | 10.6 | 9.0 | 3.8 | 9.5 | 4.0 |
| 73 | 13 | M | 46 | 1.56 | 18.90 | 12.9 | 10.2 | 9.0 | 3.9 | 9.6 | 4.2 |
| 74 | 13 | M | 38 | 1.45 | 18.00 | 12.8 | 11.4 | 9.2 | 4.0 | 9.2 | 4.0 |
| 75 | 14 | F | 50 | 1.58 | 20.02 | 12.6 | 11.0 | 9.2 | 4.5 | 9.2 | 4.2 |
| 76 | 14 | F | 33 | 1.60 | 12.80 | 13.0 | 10.5 | 10.0 | 4.3 | 10.2 | 4.6 |
| 77 | 14 | F | 32 | 1.62 | 12.19 | 13.2 | 10.5 | 10.2 | 4.3 | 10.4 | 4.2 |
| 78 | 16 | M | 50 | 1.68 | 17.71 | 13.5 | 10.8 | 9.5 | 3.9 | 9.9 | 4.3 |
| 79 | 16 | F | 47 | 1.60 | 18.35 | 13.5 | 10.3 | 9.4 | 4.0 | 9.4 | 4.0 |
| 80 | 16 | M | 45 | 1.60 | 17.58 | 13.2 | 11.3 | 9.4 | 4.0 | 9.4 | 3.8 |
| 81 | 16 | M | 48 | 1.65 | 17.63 | 13.4 | 10.9 | 9.6 | 3.8 | 9.6 | 4.0 |
| 82 | 17 | M | 60 | 1.64 | 22.30 | 13.8 | 11.7 | 10.1 | 4.6 | 10.3 | 4.6 |
| 83 | 17 | F | 60 | 1.64 | 22.30 | 13.5 | 11.5 | 10.1 | 4.6 | 10.3 | 4.6 |
| 84 | 17 | M | 65 | 1.68 | 23.59 | 13.6 | 11.2 | 10.0 | 4.3 | 10.2 | 4.5 |

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| 85 | 17 | F | 62 | 1.62 | 23.62 | 13.4 | 10.8 | 10.0 | 3.8 | 10.0 | 3.8 |
| 86 | 17 | M | 65 | 1.68 | 23.03 | 13.6 | 11.0 | 9.8 | 4.0 | 9.9 | 4.0 |
| 87 | 18 | M | 66 | 1.62 | 25.10 | 13.8 | 12.2 | 10.7 | 4.3 | 10.7 | 4.6 |
| 88 | 18 | F | 58 | 1.64 | 21.50 | 13.5 | 11.7 | 10.3 | 4.4 | 10.6 | 4.4 |
| 89 | 18 | M | 60 | 1.66 | 21.74 | 13.3 | 11.6 | 10.6 | 4.2 | 10.9 | 4.6 |
| 90 | 18 | M | 63 | 1.65 | 23.14 | 13.6 | 12.0 | 10.7 | 4.2 | 10.7 | 4.2 |
| 91 | 20 | F | 62 | 1.60 | 24.21 | 12.9 | 12.0 | 10.2 | 4.3 | 10.5 | 4.5 |
| 92 | 20 | M | 60 | 1.65 | 22.03 | 13.2 | 12.0 | 10.5 | 4.3 | 10.7 | 4.3 |
| 93 | 20 | M | 60 | 1.64 | 22.31 | 12.9 | 12.3 | 10.8 | 4.0 | 10.8 | 4.0 |
| 94 | 20 | F | 58 | 1.56 | 23.83 | 13.3 | 12.0 | 9.3 | 3.7 | 9.7 | 4.2 |
| 95 | 21 | M | 65 | 1.66 | 23.51 | 13.3 | 12.4 | 10.5 | 4.5 | 10.8 | 4.6 |
| 96 | 21 | F | 64 | 1.58 | 21.63 | 13.2 | 12.4 | 10.8 | 4.6 | 11.0 | 3.6 |
| 97 | 21 | F | 64 | 1.58 | 21.63 | 13.3 | 12.3 | 10.7 | 4.6 | 10.7 | 3.8 |
| 98 | 21 | M | 68 | 1.68 | 24.08 | 13.2 | 12.0 | 11.0 | 4.2 | 11.2 | 4.5 |
| 99 | 22 | M | 66 | 1.69 | 23.30 | 14.0 | 12.2 | 10.8 | 4.6 | 11.0 | 4.8 |
| 100 | 22 | F | 63 | 1.62 | 24.01 | 13.8 | 12.2 | 10.6 | 3.4 | 10.6 | 3.5 |
| 101 | 22 | M | 68 | 1.69 | 23.81 | 13.6 | 12.0 | 11.1 | 3.9 | 11.2 | 3.6 |
| 102 | 23 | F | 65 | 1.62 | 24.76 | 13.5 | 11.8 | 10.9 | 3.8 | 11.1 | 4.0 |
| 103 | 23 | M | 58 | 1.59 | 22.94 | 12.9 | 12.5 | 10.5 | 3.2 | 10.3 | 3.2 |
| 104 | 23 | M | 60 | 1.59 | 23.73 | 13.2 | 11.9 | 9.8 | 3.7 | 9.8 | 3.3 |
| 105 | 23 | M | 67 | 1.69 | 23.46 | 12.8 | 12.0 | 10.8 | 4.1 | 11.0 | 4.3 |
| 106 | 24 | F | 68 | 1.72 | 22.90 | 13.8 | 12.3 | 11.0 | 4.3 | 11.2 | 4.4 |
| 107 | 26 | M | 70 | 1.70 | 24.22 | 14.1 | 12.5 | 11.2 | 4.1 | 11.0 | 4.2 |
| 108 | 26 | M | 69 | 1.71 | 23.46 | 14.0 | 12.0 | 11.2 | 4.3 | 11.2 | 4.2 |
| 109 | 26 | M | 70 | 1.70 | 24.22 | 14.4 | 12.0 | 11.0 | 4.2 | 11.0 | 4.0 |
| 110 | 26 | F | 67 | 1.69 | 23.46 | 13.8 | 12.6 | 11.0 | 4.2 | 11.2 | 4.2 |
| 111 | 28 | M | 72 | 1.72 | 24.33 | 14.5 | 12.5 | 10.4 | 3.8 | 10.6 | 4.3 |
| 112 | 28 | F | 70 | 1.72 | 23.66 | 14.3 | 12.3 | 10.4 | 3.8 | 10.6 | 4.3 |
| 113 | 28 | M | 72 | 1.68 | 25.51 | 14.0 | 12.5 | 10.2 | 3.8 | 10.4 | 4.2 |
| 114 | 32 | F | 65 | 1.59 | 25.71 | 14.3 | 11.9 | 10.8 | 4.5 | 11.0 | 4.3 |
| 115 | 32 | F | 68 | 1.70 | 23.88 | 14.7 | 13.0 | 11.0 | 4.3 | 11.1 | 4.0 |
| 116 | 32 | M | 73 | 1.70 | 25.26 | 14.4 | 12.7 | 11.0 | 4.2 | 11.0 | 4.2 |
| 117 | 32 | M | 75 | 1.74 | 24.77 | 13.8 | 12.7 | 11.4 | 4.0 | 11.3 | 3.9 |
| 118 | 38 | M | 72 | 1.72 | 24.33 | 14.8 | 12.6 | 11.3 | 4.6 | 11.4 | 4.6 |
| 119 | 38 | M | 72 | 1.72 | 24.33 | 15.0 | 12.8 | 11.3 | 4.6 | 11.4 | 4.6 |
| 120 | 38 | F | 75 | 1.69 | 26.26 | 14.6 | 12.5 | 11.0 | 4.3 | 11.3 | 4.2 |
| 121 | 40 | M | 74 | 1.76 | 24.27 | 13.9 | 13.0 | 11.5 | 4.2 | 11.5 | 4.2 |
| 122 | 40 | F | 75 | 1.72 | 25.35 | 14.6 | 12.9 | 10.8 | 4.0 | 11.0 | 4.4 |
| 123 | 40 | F | 72 | 1.70 | 24.91 | 14.3 | 12.9 | 10.9 | 4.2 | 11.3 | 4.3 |
| 124 | 40 | M | 75 | 1.75 | 24.49 | 14.1 | 13.2 | 11.0 | 4.2 | 11.2 | 4.3 |
| 125 | 46 | M | 80 | 1.80 | 24.69 | 14.8 | 13.6 | 11.4 | 4.5 | 11.4 | 4.6 |
| 126 | 46 | M | 78 | 1.78 | 24.62 | 14.6 | 12.9 | 11.3 | 4.1 | 11.5 | 4.2 |
| 127 | 46 | F | 80 | 1.68 | 28.34 | 14.8 | 12.8 | 11.0 | 4.4 | 11.4 | 4.0 |
| 128 | 48 | M | 75 | 1.72 | 25.35 | 14.7 | 13.8 | 11.2 | 4.2 | 11.3 | 4.2 |
| 129 | 48 | M | 78 | 1.72 | 26.35 | 15.0 | 14.1 | 11.5 | 3.8 | 11.2 | 4.2 |

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| 130 | 49 | F | 72 | 1.65 | 26.44 | 14.2 | 13.9 | 10.8 | 3.8 | 10.9 | 4.1 |
| 131 | 49 | M | 76 | 1.70 | 26.30 | 15.0 | 14.0 | 11.0 | 4.2 | 11.4 | 4.2 |
| 132 | 50 | M | 80 | 1.82 | 24.15 | 15.1 | 14.1 | 11.8 | 4.6 | 11.8 | 4.8 |
| 133 | 50 | F | 80 | 1.70 | 27.68 | 15.0 | 13.7 | 11.5 | 3.8 | 11.2 | 4.0 |
| 134 | 50 | M | 80 | 1.82 | 24.15 | 15.2 | 13.8 | 11.8 | 4.6 | 11.7 | 4.3 |
| 135 | 50 | F | 75 | 1.70 | 25.95 | 15.0 | 12.9 | 11.5 | 3.8 | 11.2 | 4.0 |
| 136 | 52 | M | 82 | 1.68 | 29.05 | 14.9 | 14.0 | 11.6 | 4.2 | 11.7 | 4.5 |
| 137 | 52 | M | 80 | 1.70 | 27.68 | 14.8 | 14.0 | 11.7 | 4.2 | 12.0 | 4.4 |
| 138 | 52 | M | 80 | 1.70 | 27.68 | 15.3 | 14.2 | 11.9 | 3.9 | 12.0 | 4.8 |
| 139 | 58 | F | 73 | 1.68 | 25.86 | 14.7 | 14.2 | 11.5 | 4.3 | 11.8 | 4.7 |
| 140 | 58 | M | 65 | 1.65 | 23.68 | 14.6 | 14.3 | 11.5 | 4.6 | 11.8 | 4.2 |
| 141 | 58 | M | 78 | 1.72 | 26.37 | 14.8 | 14.0 | 11.4 | 4.2 | 11.5 | 4.5 |
| 142 | 58 | F | 70 | 1.70 | 24.22 | 14.7 | 13.5 | 11.5 | 4.3 | 11.6 | 4.2 |
| 143 | 60 | M | 75 | 1.76 | 24.27 | 13.6 | 13.8 | 10.8 | 3.2 | 11.0 | 4.8 |
| 144 | 60 | M | 75 | 1.74 | 24.77 | 13.5 | 13.8 | 10.8 | 3.9 | 10.7 | 4.5 |
| 145 | 60 | F | 68 | 1.70 | 23.53 | 13.3 | 13.3 | 10.6 | 3.9 | 10.7 | 4.2 |
| 146 | 68 | M | 65 | 1.62 | 24.76 | 13.7 | 13.6 | 9.6 | 3.6 | 9.6 | 3.8 |
| 147 | 68 | M | 65 | 1.62 | 24.76 | 13.7 | 13.2 | 9.6 | 3.5 | 9.2 | 3.8 |
| 148 | 68 | F | 67 | 1.60 | 26.17 | 13.6 | 13.0 | 9.5 | 3.7 | 9.5 | 3.6 |
| 149 | 68 | M | 70 | 1.66 | 25.40 | 13.5 | 13.0 | 9.4 | 3.8 | 9.3 | 4.0 |
| 150 | 70 | M | 70 | 1.68 | 24.80 | 13.5 | 12.6 | 9.3 | 3.2 | 9.4 | 3.8 |
| 151 | 70 | F | 65 | 1.60 | 25.39 | 13.3 | 12.5 | 9.0 | 3.7 | 9.0 | 4.0 |
| 152 | 70 | M | 68 | 1.69 | 23.81 | 13.2 | 12. | 8.8 | 3.4 | 9.0 | 3.8 |

**APPENDIX VIII OBSERVED SIGNS AND SYMPTOMS**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| S/N | Age | Sex | Wt(Kg) | Ht(Cm) | BMI | Temp.(0c) | Signs/Symptoms |
| 1 | 5 | M | 24 | 1.17 | 17.53 | 38.6 | Abd.pain & fever |
| 2 | 5 | M | 20 | 1.15 | 15.12 | 38.4 | Abd.pain & fever |
| 3 | 5 | F | 18 | 1.11 | 14.61 | 39.2 | Headache,  abd.pain&fever |
| 4 | 5 | M | 20 | 1.11 | 16.23 | 36.8 | Chest pain &cough |
| 5 | 5 | M | 21 | 1.10 | 17.36 | 39.0 | Abd.pain,fever,cough |
| 6 | 6 | F | 20 | 1.12 | 15.94 | 38.0 | Fever,cough &dyspnoea |
| 7 | 6 | F | 20 | 1.16 | 14.86 | 37.9 | Fever & headache |
| 8 | 6 | F | 21 | 1.19 | 14.83 | 37.0 | Abd.pain & diarrhoea |
| 9 | 6 | M | 20 | 1.18 | 14.36 | 38.6 | Fever % chest pain |
| 10 | 6 | M | 20 | 1.15 | 15.12 | 37.5 | Fever,malaise & cough |
| 11 | 6 | F | 24 | 1.15 | 16.23 | 37.8 | Fever &headache |
| 12 | 6 | M | 21 | 1.10 | 17.36 | 37.9 | Abd.pain,fever&Cough |
| 13 | 7 | F | 24 | 1.21 | 16.40 | 37.0 | Chest pain % cough |
| 14 | 7 | F | 21 | 1.26 | 13.23 | 37.7 | Malaise,fever & cough |
| 15 | 7 | F | 20 | 1.24 | 13.01 | 38.0 | Abd.pain,fever&headache |
| 16 | 7 | F | 21 | 1.17 | 15.34 | 37.8 | Abd.pain & fever |
| 17 | 7 | M | 21 | 1.18 | 15.08 | 36.6 | Chest pain & cough |
| 18 | 7 | M | 24 | 1.25 | 15.36 | 38.0 | Fever,chest pain&cough |
| 19 | 7 | M | 17 | 1.15 | 12.85 | 36.7 | Asymptomatic |
| 20 | 8 | M | 21 | 1.22 | 114.11 | 37.0 | Cough |
| 21 | 8 | F | 21 | 1.23 | 13.88 | 37.4 | Fever & abdominal pain |
| 22 | 8 | F | 24 | 1.21 | 16.64 | 37.0 | Abdominal pain  &malaise |
| 23 | 8 | F | 20 | 1.21 | 13.66 | 36.4 | Chest pain & cough |
| 24 | 8 | F | 25 | 1.27 | 15.50 | 36.2 | Chest pain & cough |
| 25 | 8 | M | 26 | 1.32 | 14.92 | 36.5 | Asymptomatic |
| 26 | 8 | F | 22 | 1.21 | 15.03 | 36.5 | Asymptomatic |
| 27 | 8 | F | 20 | 1.21 | 13.66 | 37.3 | Fever & headache |
| 28 | 8 | F | 24 | 1.27 | 14.88 | 38.3 | Abdominal pain & fever |
| 29 | 8 | M | 22 | 1.30 | 13.01 | 36.4 | Abdominal pain  &malaise |
| 30 | 8 | M | 27 | 1.35 | 14.81 | 37.5 | Fever & headache |
| 31 | 8 | F | 24 | 1.29 | 14.42 | 36.4 | Abd. Pain |
| 32 | 8 | F | 24 | 1.28 | 14.65 | 37.6 | Fever & cough |
| 33 | 8 | F | 22 | 1.24 | 14.31 | 37.9 | Fever & headache |
| 34 | 8 | M | 25 | 1.26 | 15.75 | 37.8 | Fever & abdominal pain |
| 35 | 8 | M | 28 | 1.30 | 16.57 | 37.8 | Fever & abdominal pain |
| 36 | 8 | F | 20 | 1.20 | 13.89 | 37.7 | Abdominal pain & fever |

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| 37 | 8 | F | 30 | 1.30 | 17.75 | 37.0 | Chest pain & cough |
| 38 | 8 | M | 23 | 1.22 | 15.54 | 36.5 | Asymptomatic |
| 39 | 8 | F | 23 | 1.33 | 13.0 | 37.0 | Asymptomatic |
| 40 | 8 | F | 22 | 1.29 | 13.22 | 37.9 | Fever & abd. Pain |
| 41 | 8 | M | 22 | 1.24 | 14.31 | 36.8 | Malaise & cough |
| 42 | 9 | M | 29 | 1.36 | 15.68 | 37.0 | Cough, sweats &chest  pain |
| 43 | 9 | M | 25 | 1.31 | 14.57 | 37.8 | Fever & abdominal pain |
| 44 | 9 | M | 25 | 1.26 | 15.75 | 36.3 | Chest pain & cough |
| 45 | 9 | F | 30 | 1.36 | 16.22 | 36.4 | Cough & malaise |
| 46 | 9 | F | 29 | 1.23 | 19.17 | 36.7 | Chest pain & cough |
| 47 | 9 | M | 25 | 1.31 | 14.57 | 37.8 | Fever &abdominal pain |
| 48 | 9 | M | 30 | 1.37 | 16.22 | 37.9 | Chest pain, cough& fever |
| 49 | 9 | F | 29 | 1.36 | 15.68 | 37.8 | Fever &chest pain |
| 50 | 10 | F | 24 | 1.25 | 15.36 | 37.3 | Abdominal pain & fever |
| 51 | 10 | M | 25 | 1.38 | 15.21 | 36.8 | Abdominal pain |
| 52 | 10 | F | 35 | 1.41 | 17.60 | 36.7 | Chest pain, cough &  dyspnoea |
| 53 | 10 | F | 24 | 1.30 | 14.20 | 37.6 | Cough & fever |
| 54 | 10 | F | 30 | 1.42 | 14.38 | 36.2 | Chest pain & cough |
| 55 | 10 | M | 32 | 1.40 | 16.32 | 36.0 | Cough |
| 56 | 11 | M | 36 | 1.46 | 16.89 | 37.0 | Abdominal pain &  malaise |
| 57 | 11 | F | 33 | 1.40 | 16.84 | 36.5 | Asymptomatic |
| 58 | 11 | M | 31 | 1.38 | 16.23 | 36.8 | Abdominal pain & sweats |
| 59 | 11 | M | 31 | 1.43 | 15.16 | 36.4 | Abdominal pain |
| 60 | 11 | M | 31 | 1.40 | 15.31 | 37.7 | Fever |
| 61 | 11 | M | 36 | 1.51 | 15.79 | 37.9 | Fever, malaise |
| 62 | 11 | M | 29 | 1.24 | 18.36 | 37.3 | Fever, cough & dyspnoea |
| 63 | 12 | M | 34 | 1.45 | 16.17 | 36.5 | Diarrhoea |
| 64 | 12 | F | 38 | 1.55 | 15.82 | 36.8 | Malaise & cough |
| 65 | 12 | F | 27 | 1.39 | 13.97 | 36.6 | Abdominal pain & cough |
| 66 | 12 | F | 35 | 1.51 | 15.79 | 36.5 | Abdominal pain |
| 67 | 12 | M | 34 | 1.45 | 16.17 | 37.0 | Cough |
| 68 | 13 | F | 34 | 1.41 | 17.10 | 36.7 | Chest pain %cough |
| 69 | 13 | M | 29 | 1.44 | 13.13 | 36.7 | Chest pain, cough &  dyspnoea |
| 70 | 13 | F | 42 | 1.48 | 19.17 | 37.0 | Chest pain & cough |
| 71 | 13 | M | 46 | 1.65 | 16.90 | 36.4 | Cough &dyspnoea |
| 72 | 13 | F | 40 | 1.47 | 18.51 | 36.3 | Cough, chest pain &  malaise |
| 73 | 13 | F | 47 | 1.54 | 19.82 | 36.9 | Cough & chest pain |
| 74 | 14 | F | 50 | 1.59 | 19.78 | 36.8 | Chest pain,cough &  dyspnoea |
| 75 | 14 | F | 32 | 1.62 | 12.19 | 37.0 | Cough & dyspnoea |

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| 76 | 14 | M | 32 | 1.62 | 12.19 | 36.8 | Chest pain & cough |
| 77 | 15 | F | 33 | 1.65 | 13.74 | 36.4 | Cough |
| 78 | 15 | M | 35 | 1.60 | 13.67 | 35.7 | Cough |
| 79 | 15 | M | 35 | 1.60 | 13.67 | 36.0 | Cough |
| 80 | 17 | F | 50 | 1.68 | 17.67 | 36.0 | Abdominal pain |
| 81 | 17 | M | 62 | 1.66 | 24.47 | 36.2 | Abdominal pain |
| 82 | 17 | F | 50 | 1.56 | 20.55 | 36.6 | Cough |
| 83 | 17 | M | 50 | 1.68 | 17.67 | 36.8 | Fever & abdominal pain |
| 84 | 17 | M | 62 | 1.66 | 22.47 | 36.6 | Chest pain & cough |
| 85 | 18 | M | 62 | 1.70 | 21.45 | 35.6 | Abdominal pain |
| 86 | 18 | F | 68 | 1.67 | 24.32 | 36.1 | Cough |
| 87 | 18 | M | 65 | 1.62 | 24.72 | 37.0 | Cough, chest pain &  dyspnoea |
| 88 | 18 | F | 56 | 1.60 | 21.88 | 36.9 | Cough. Chest pain & dyspnoea |
| 89 | 19 | M | 60 | 1.67 | 21.51 | 37.6 | Fever & abdominal pain |
| 90 | 19 | M | 60 | 1.58 | 24.03 | 36.0 | Abdominal pain |
| 91 | 19 | F | 62 | 1.58 | 24.54 | 35.8 | Cough |
| 92 | 19 | F | 56 | 1.54 | 23.61 | 36.0 | Cough |
| 93 | 20 | M | 60 | 1.72 | 20.28 | 36.5 | Chest pain & cough |
| 94 | 20 | M | 62 | 1.70 | 21.45 | 35.8 | Abdominal pain |
| 95 | 20 | M | 62 | 1.68 | 21.91 | 37.0 | Cough, chest pain &  dyspnoea |
| 96 | 20 | M | 64 | 1.69 | 22.15 | 36.8 | Cough & dyspnoea |
| 97 | 22 | F | 66 | 1.68 | 23.33 | 36.5 | Cough & malaise |
| 98 | 22 | M | 66 | 1.70 | 22.84 | 37.0 | Chest pain & cough |
| 99 | 22 | M | 65 | 1.70 | 22.49 | 36.3 | Chest pain & cough |
| 100 | 22 | F | 64 | 1.66 | 23.23 | 36.0 | Chest pain & cough |
| 101 | 23 | F | 65 | 1.65 | 24.38 | 35.5 | Chest pain, cough &  dyspnoea |
| 102 | 23 | M | 65 | 1.52 | 28.13 | 35.9 | Cough |
| 103 | 23 | F | 67 | 1.74 | 22.13 | 36.4 | Cough & haemoptysis |
| 104 | 23 | M | 66 | 1.70 | 22.83 | 36.1 | Cough & haemoptysis |
| 105 | 24 | M | 68 | 1.71 | 23.26 | 36.1 | Abdominal pain |
| 106 | 25 | F | 70 | 1.70 | 24.23 | 37.4 | Fever and abdominal pain |
| 107 | 25 | F | 65 | 1.66 | 23.59 | 36.8 | Headache & abd.pain |
| 108 | 25 | M | 68 | 1.69 | 23.81 | 35.7 | Cough & chest pain |
| 109 | 25 | M | 65 | 1.73 | 21.72 | 36.2 | Cough & haemoptysis |
| 110 | 27 | M | 70 | 1.74 | 23.11 | 36.5 | Chest pain & cough |
| 111 | 27 | M | 68 | 1.70 | 23.53 | 36.7 | Abdominal pain |
| 112 | 27 | F | 70 | 1.70 | 24.22 | 36.3 | Cough & dyspnoea |
| 113 | 35 | M | 75 | 1.72 | 25.34 | 36.8 | Cough & dyspnoea |
| 114 | 35 | M | 70 | 1.70 | 24.22 | 36.4 | Asymptomatic |
| 115 | 35 | F | 67 | 1.68 | 23.74 | 36.9 | Asymptomatic |
| 116 | 38 | F | 68 | 1.62 | 25.90 | 36.4 | Cough & haemoptysis |

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| 117 | 38 | M | 70 | 1.70 | 24.22 | 36.3 | Chest pain, cough &  dyspnoea |
| 118 | 38 | M | 70 | 1.70 | 24.22 | 36.8 | Cough |
| 119 | 39 | M | 73 | 1.72 | 24.67 | 37.0 | Chest pain, cough &  haemoptysis |
| 120 | 39 | M | 72 | 1.76 | 23.24 | 36.5 | Abdominal pain |
| 121 | 39 | F | 70 | 1.73 | 23.37 | 36.5 | Cough |
| 122 | 40 | F | 70 | 1.62 | 27.43 | 36.2 | Cough |
| 123 | 40 | M | 75 | 1.77 | 23.94 | 36.8 | Cough & dyspnoea |
| 124 | 41 | M | 75 | 1.80 | 23.20 | 36.6 | Cough, dyspnoea &  haemoptysis |
| 125 | 41 | M | 73 | 1.80 | 22.53 | 36.4 | Malaise and abd. Pain |
| 126 | 41 | F | 70 | 1.75 | 22.86 | 36.8 | Asymptomayic |
| 127 | 42 | F | 68 | 1.76 | 25.49 | 37.1 | Cough, chest pain &  dyspnoea |
| 128 | 42 | F | 64 | 1.68 | 22.68 | 37.2 | Fever |
| 129 | 42 | M | 79 | 1.70 | 27.33 | 36.8 | Chest pain |
| 130 | 48 | M | 80 | 1.80 | 24.70 | 37.5 | Fever & abdominal pain |
| 131 | 48 | F | 78 | 1.76 | 25.18 | 36.3 | Cough |
| 132 | 48 | M | 80 | 1.76 | 25.83 | 36.3 | Cough |
| 133 | 50 | M | 78 | 1.72 | 26.36 | 37.0 | Cough, chest pain &  dyspnoea |
| 134 | 50 | F | 72 | 1.70 | 24.91 | 36.0 | Abdominal pain |
| 135 | 50 | M | 75 | 1.73 | 25.06 | 37.5 | Fever, chest pain & cough |
| 136 | 50 | M | 80 | 1.80 | 24.69 | 36.3 | Abdominal pain |
| 137 | 52 | F | 75 | 1.65 | 27.48 | 36.8 | Cough, chest pain &  dyspnoea |
| 138 | 52 | M | 76 | 1.82 | 22.94 | 36.6 | Chest pain & cough |
| 139 | 52 | F | 80 | 1.80 | 24.69 | 36.5 | Cough |
| 140 | 54 | M | 80 | 1.82 | 22.60 | 37.9 | Fever & abdominal pain |
| 141 | 54 | F | 80 | 1.82 | 22.60 | 36.6 | Asymptomatic |
| 142 | 56 | M | 65 | 1.65 | 23.81 | 36.7 | Cough & haemoptysis |
| 143 | 56 | M | 75 | 1.70 | 25.95 | 36.8 | Chest pain |
| 144 | 56 | F | 70 | 1.68 | 24.80 | 36.5 | Cough & dyspnoea |
| 145 | 60 | M | 72 | 1.74 | 24.33 | 36.5 | Cough & chest pain |
| 146 | 60 | M | 75 | 1.76 | 24.20 | 36.2 | Abdominal pain |
| 147 | 62 | F | 70 | 1.69 | 24.51 | 37.0 | Cough, chest pain &  dyspnoea |
| 148 | 62 | M | 65 | 1.68 | 23.03 | 36.7 | Chest pain & cough |
| 149 | 68 | M | 60 | 1.70 | 20.76 | 37.8 | Fever & abdominal pain |
| 150 | 68 | M | 65 | 1.67 | 23.31 | 36.0 | Cough & swollen leg |
| 151 | 70 | F | 60 | 1.65 | 25.34 | 36.5 | Chest & chain |
| 152 | 70 | M | 62 | 1.68 | 21.97 | 36.8 | Cough & haemoptysis |