# MORPHOMETRIC ANALYSIS OF CRYPT VILLOUS RATIO IN TROPICAL SPRUE AND ITS PHENOTYPICAL CORRELATION

*A thesis submitted to*

**THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY, CHENNAI**

*in partial fulfillment of the requirements for the award of the degree of*

**M.D in PATHOLOGY**


**DEPARTMENT OF PATHOLOGY**

**PSG INSTITUTE OF MEDICAL SCIENCES & RESEARCH**

**PEELAMEDU, COIMBATORE- 641 004**

**TAMILNADU, INDIA**

# TABLE OF CONTENTS

# CERTIFICATE

This is to certify that the dissertation work entitled **"Morphometric analysis of crypt villous ratio in tropical sprue and its phenotypical correlation"** submitted by **Dr. R. Ramya,** is a bonafide work done by her, during the post-graduation study period in the department of Pathology of PSGIMS&R, from 2017 to 2020. This work was done under the guidance of **Dr. S. Shanthakumari** M.D., Professor, Department of Pathology, PSGIMS&R

**Dr. T.M.Subba Rao M.D.,**
Professor&HOD ,Pathology
PSGIMS&R
Coimbatore – 04

**Dr. S. Ramalingam M.D.,**
Dean, PSGIMS&R
Coimbatore – 04

# CERTIFICATE II

This is to certify that this dissertation work titled **"Morphometric analysis of crypt villous ratio in tropical sprue and its phenotypical correlation"** of the candidate **Dr.R.Ramya,** with registration Number **201713402** for the award of MD degree in the branch of Pathology. I personally verified the urkund.com website for the purpose of plagiarism Check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows **Two (2)** percentage of plagiarism in the dissertation.

**Dr. S. Shanthakumari M.D.,**
Professor, Pathology
PSGIMS&R
Coimbatore - 641004

# DECLARATION

I, **Dr.R.Ramya,** do hereby declare that the thesis entitled **"Morphometric analysis of crypt villous ratio in tropical sprue and its phenotypical correlation"**is a bonafide work done by me under the guidance of **Dr S. Shanthakumari M.D.,** Professor, in the Department of Pathology, PSG Institute of Medical Sciences &Research. This study was performed at the PSG Institute of Medical Sciences &Research, Coimbatore, under the aegis of The Tamilnadu Dr MGR Medical University, Chennai, as part of the requirement for the award of the MD degree in Pathology.

Place :

Date :

**Dr.R.Ramya**
M.D Pathology post graduate
Department of Pathology
PSGIMS&R
Coimbatore - 641004

URKUND

# Urkund Analysis Result

| | |
|---|---|
| Analysed Document: | MORPHOMETRIC ANALYSIS OF VILLOUS CRYPT RATIO IN TROPICAL SPRUE AND ITS PHENOTYPICAL CORRELATION.doc (D57561624) |
| Submitted: | 10/24/2019 6:20:00 AM |
| Submitted By: | ramymdl2000@gmail.com |
| Significance: | 2 % |

## Sources included in the report:

Master Elina Udén.pdf (D46254372)
https://cyberleninka.org/article/n/723936.pdf
97ea90f7-26d7-4f69-9ad6-c609991f556d

## Instances where selected sources appear:

10

# PSG Institute of Medical Sciences & Research
## Institutional Human Ethics Committee

Recognized by The Strategic Initiative for Developing Capacity in Ethical Review (SIDCER)
POST BOX NO. 1674, PEELAMEDU, COIMBATORE 641 004, TAMIL NADU, INDIA
Phone : 91 422 - 2598822, 2570170, Fax : 91 422 - 2594400, Email : ihec@psgimsr.ac.in


December 23, 2017

To
Dr R Ramya
Postgraduate
Department of Pathology
PSG IMS & R
Coimbatore

The Institutional Human Ethics Committee, PSG IMS & R, Coimbatore -4, has reviewed your proposal and discussed your request for approval for the study proposal titled:

*"Morphometric analysis of crypt villous ratio in tropical Sprue and its phenotypical correlation"*

The following are the suggestions / recommendations made by the reviewer:

- As this study comes under consent waiver category, kindly give an undertaking not to collect other personal details like phone number, address etc
- Kindly submit itemized budget

Decision: Approval pending minor modifications

Yours truly,

Dr D Vijaya
Member - Secretary
Institutional Human Ethics Committee

## ACKNOWLEDGEMENT

I thank **THE ALMIGHTY** and my **PARENTS** for the blessings bestowed upon me during the course of my study.

Words are insufficient to express my deep sense of gratitude and heartfelt thanks to my Guide **Dr. S.Shanthakumari M.D**, Professor, Department of Pathology for her versatile guidance, valuable suggestions, advice, untiring patience and continued encouragement during the process of writing my thesis. It was a rare privilege and honour to have worked under her guidance.

I feel elated to keep on record my sincere thanks to **Dr.T.M.SubbaRao**, Professor and Head, Department of Pathology, for his constant encouragement.

I wish to express my sincere thanks to **Dr. Prasanna N Kumar**, Professor, Department of Pathology, for her constant support.

I record my sincere thanks to **Dr.Karthikeyan**, Associate Professor, Department of Community Medicine, for helping me with statistics.

I wish to express my thanks to all teaching and non teaching staff members of the Department of Pathology, for their timely help rendered during the course of study.

I am in short of words to express my profound gratitude and thanks to my junior colleagues, particularly **Dr.Nithyanandham** for his help and valuable suggestions rendered during the thesis period.

On a personal note, my heartfelt thanks to my affectionate husband, **Dr.M.Vijayasarathi** and loving daughter **R.V.Sivaharshani** for their dedicated efforts to whom I owe everything I have achieved with utmost devotion.

I express my deep sense of feeling to my beloved Parents **Shri. K.K.M.Ramadoss** and **Dr.S.Saroja.** for their love, affection, patience, support, continuous encouragement and wishes that propelled me to work towards this cherished goal. More on a personal note, I am grateful to my mother in law **Smt.M.Jeya** for her love, support and affection.

Words are inadequate to express my deep sense of thanks to my friends D**r.S.Tabbu, Dr.G.Saranyadevi and Dr.D.Pavithra**.

## ABBREVIATIONS

| | | |
|---|---|---|
| PI-IBS | - | Post infectious-Irritable bowel syndrome |
| TGase | - | Transglutaminase |
| APCs | - | Antigen presenting cells |
| EMA | - | Endomysial autoantibody |
| ESPGHAN | - | European society for Pediatric , Gastroenterology, Hepatology and Nutrition |
| H&E | - | Hematoxylin and Eosin |
| PDF | - | portable document format |
| V:C | - | villous crypt ratio |
| MRD | - | Medical Records Department |

# INTRODUCTION

Malabsorption is characterized by defective absorption of water, fat soluble vitamins, fat and all other nutrients including electrolytes and water[1].

Malabsorption generally results from disturbances in one of the four phases of absorption of nutrients namely intraluminal digestion, terminal digestion, transepithelial transport and lymphatic transport of lipids absorbed[1].

Defects in any one or more of the four mechanisms mentioned above lead to malabsorptive disorders. As the mechanisms of these diseases are more or less the same the patients present with common clinical features. The symptoms include diarrhea, weight loss, anemia predominantly megaloblastic and also symptoms associated with other vitamins and nutrient deficiencies. The etiological factors for malabsorptive disorders are varied of which celiac disease and tropical sprue are most common.

Affecting residents and visitors of tropical region is an acquired chronic diarrheal disorder, the tropical sprue. Patients present with profuse watery diarrhea, vitamin B12 deficiency, folate deficiency and

megaloblastic anemia[2].As the symptoms are common to other malabsorptive disorders like celiac sprue goes unnoticed.

Changing life styles and food habits have increased the incidence of malabsorption. Recently there is a surge in malabsorptive disorders and department of pathology receives increased number of small intestinal biopsies from duodenum because of its easy approachability for a definitive diagnosis.

Pathologists rely on the morphological changes in the mucosa namely villous blunting, crypt elongation, budding, hyperplasia, presence of intra epithelial lymphocytosis, basement membrane thickening etc. for making a diagnosis. Most of the observations are subjective. Therefore, to objectivize the observations, to reduce the interobserver variability and to standardize reporting protocols many quantative studies are being done in this part of the world.

Therefore, Keeping in view of the above and increased number of duodenal biopsies received for malabsorptive disorders, this study proposes to analyze the villous height, crypt depth and villous crypt ratio in duodenal biopsies diagnosed as tropical sprue and to correlate with the clinical features of diarrhea and megaloblastic anaemia.

## AIMS AND OBJECTIVES

- To assess villous and crypt ratio in duodenal biopsies reported as tropical sprue using Morphometry analysis grid in the Nikon eclipse Ci microscope and
- To correlate these changes with the clinical presentation.

# REVIEW OF LIERATURE

Malabsorption, is characterized by defective absorption of fats, fat- and water-soluble vitamins, proteins, carbohydrates, electrolytes, minerals, and water. Malabsorption presents as chronic diarrhea, anemia predominantly megaloblastic, weight loss, anorexia, abdominal distension, borborygmi and muscle wasting.[1]

Malabsorption results from disturbances in nutrient absorption in any of the four phases of absorption mentioned below[1]

1. Intraluminal digestion

2. Terminal digestion

3. Transepithelial transport

4. Lymphatic transport of absorbed lipids

Causes of malabsorption are gluten sensitive enteropathy, milk / protein allergy, Whipple's disease, tropical sprue and many more.

Defect in more than any one of the above-mentioned mechanisms may result in malabsorption. As a result, clinically malabsorption syndromes resemble each other. The following table 1 (courtesy Robbin's textbook of pathology) highlights the various types of defects along with associated disease's presenting as malabsorption.

Table 1: Defects in Malabsorptive and Diarrheal Disease

(table courtesy from Robbins & Cotran - Pathologic Basis of Disease )

| **Disease** | **Intraluminal Digestion** | **Terminal digestion** | **Transepithelial transport** | **Lymphatic transport** |
|---|---|---|---|---|
| Celiac disease | - | + | + | - |
| Environmental enteropathy | - | + | + | - |
| Chronic pancreatitis | + | - | - | - |
| Primary bile acid malabsorption | + | - | + | - |
| Whipple disease | - | - | - | + |
| Viral gastroenteritis | - | + | + | - |
| Bacterial gastroenteritis | - | + | + | - |
| Parasitic gastroenteritis | - | + | + | - |
| Inflammatory bowel disease | + | + | + | - |

From this table we infer that celiac disease, (environmental enteropathy) tropical sprue and infective pathology leading to malabsorption have similar mechanisms and therefore also presents with similar features clinically. Coeliac disease is the most important cause of intestinal malabsorption in the developed world[3].Coeliac disease is also known as gluten sensitive enteropathy and is triggered by ingestion of gluten. Gluten is present in wheat and similar grains and the alcoholic soluble fractions of gluten-**gliadin** contain the disease producing component.[1]. It has an overall worldwide incidence of 0.6% to1%[1].

Tropical sprue is a disorder that is seen in populations living in a poor hygienic condition such as those in developing countries including parts of Sub Saharan Africa, parts of Northern Australia and in countries like Brazil, India and Pakistan[1]. This condition affects both the visitors and residents of tropical regions i.e. $30^0$ North and South of equator. This can present as both endemic and epidemic diseases.[4] The controversy surrounding tropical sprue is its lack of precise definition. Tropical sprue is considered as an acquired chronic inflammatory disorder. Patients present with continuing diarrhea and steatorrhea following an insidious onset of gastro intestinal infection in tropical sprue. A simple definition of tropical sprue by Marjorie M Walker in his editorial highlights this. The definition is quoted as below.[5]

"Tropical sprue is an acquired disease of unknown etiology characterized by malabsorption, multiple nutritional deficiencies and mucosal abnormalities in the small bowel."[5,6]

Even as early as two millennia ago in the ancient Indian medical treatise CHARAKA SAMHITA there is a mention of an illness characterized by chronic diarrhea and weight loss attributed to the failure of the digestive system.[7] The above suggests the presence of malabsorption in Ancient India.

William Hillay in 1759 described the presence of malabsorption in the expatriates living in Barbados and in 1880 the term "Sprue" was introduced by Manson. This word was derived from the Dutch word "Indische Sprouw" denoting glossitis and mouth ulcers.[7]

In the 20th century it was found that tropical sprue was just not seen in visitors but also in the in the residents especially the indigenous residents.[7-11]

Armed forces and Prisoners of war in the world war II and South India in 1960's and 1980's reported epidemics of malabsorption.[7-11]

Madras state health division recorded five episodes of chronic diarrhea between 1930 and 1942 [12] . This was considered as diarrhea of unknown etiology.

Other condition that closely mimics tropical sprue is post infectious irritable bowel syndrome.In a study done by Uday C Ghoshal et al stated that PIIBS has a significant overlap of symptoms. This article also states that tropical sprue as a cause for malabsorption is on the rise in this part of the world.[12]

Understanding the pathogenesis of all three conditions is important for reporting on histopathology slides.

**Pathogenesis of malabsorption in celiac disease, tropical sprue and PIIBS is as follows.**

**Celiac disease:**

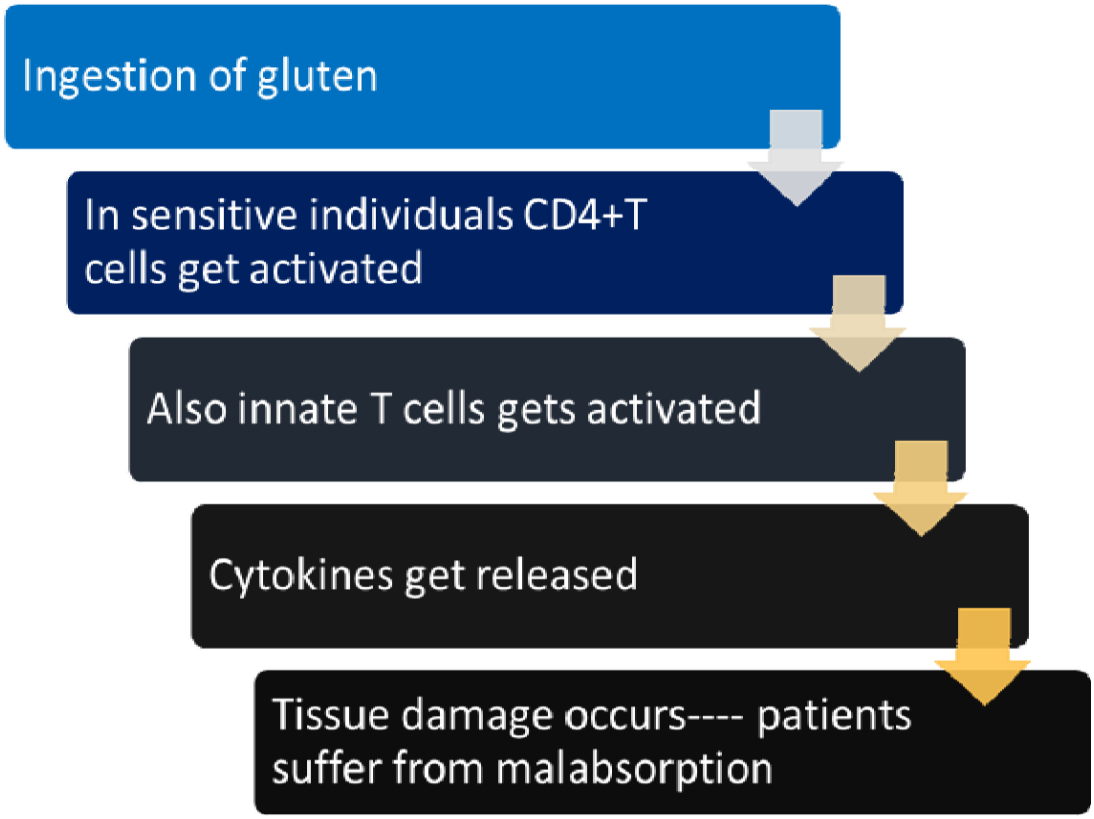
The pathogenesis of Celiac Disease is divided into 3 major series of events by Martin F. KAGNOFF in his article as follows.[13]

1. Luminal and early mucosal events;
2. The activation of pathogenic $CD4^+$ T cells; and
3. The subsequent events leading to tissue damage.

In the luminal and early mucosal stage, ingestion of "gluten" by a genetically susceptible individual is not fully digested giving rise to a number of large undigested "gluten" peptides. These peptides cross the epithelial barrier enter the lamina propria and react with tissue TGase and APCs. These express HLA-DQ2 or HLA-DQ8 heterodimers. Therefore

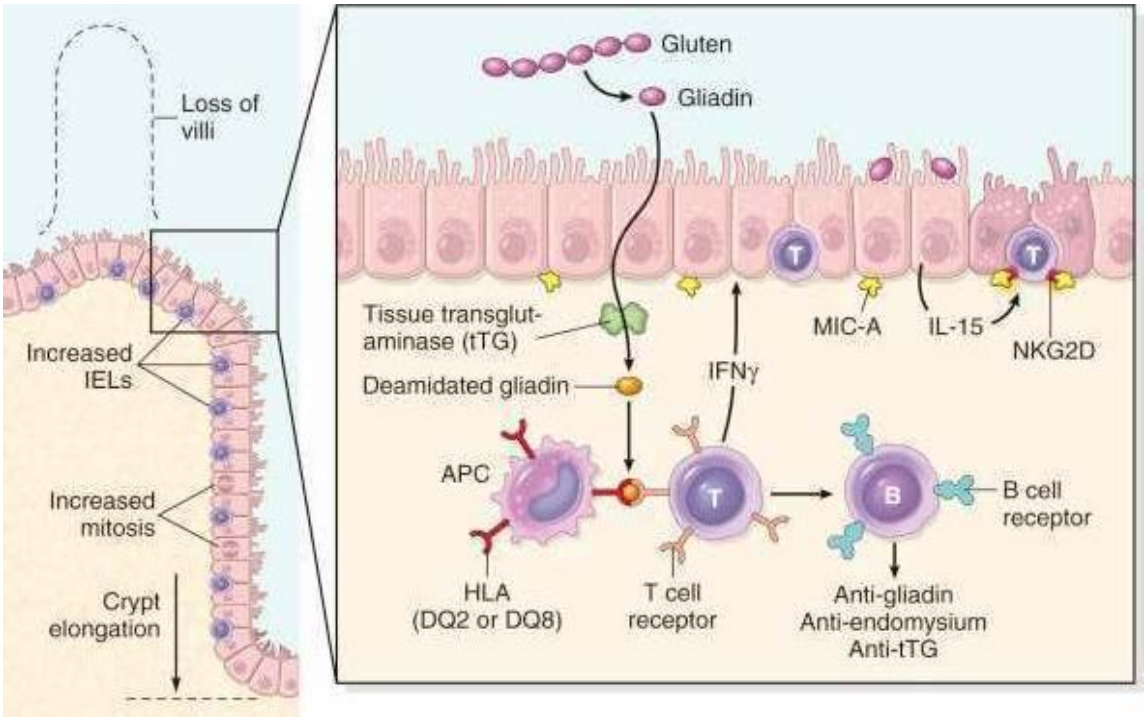
$CD4^+$ T cells become activated and release mediators which lead to tissue damage. The innate CD8 cells also get activated to cause the disease. The antibodies involved are anti EMA, anti-tTG, and anti -Gliadin. Pathogenesis is explained in the chart given below.

Chart 1 : Pathogenesis of Celiac disease.




The following figure from Robbins[1] chapter on malabsorption pictorially represents the pathogenesis of celiac disease.

Figure 1- Pictorial representation of pathogenesis of celiac disease (Image courtesy from Robbins & Cotran - Pathologic Basis of Disease)




**Pathogenesis of Post Infectious Irritable Bowel syndrome (PIIBS)**:

Mucosal injury following an acute infective diarrhea leads to activation of CD4+ lymphocytes and calprotectin enabled macrophages leading to more severe injury at various sites in small intestine. Added to this is mast cell hyperplasia leading to increase in secretions and thereby diarrhea and malabsorption. In the later part of the disease release of infective cytokines leads to tissue damage and changes in microbiota of the intestines[14]. This is explained diagrammatically in the following 3 flow charts.

Chart 2 : Pathogenesis of PIIBS (1)

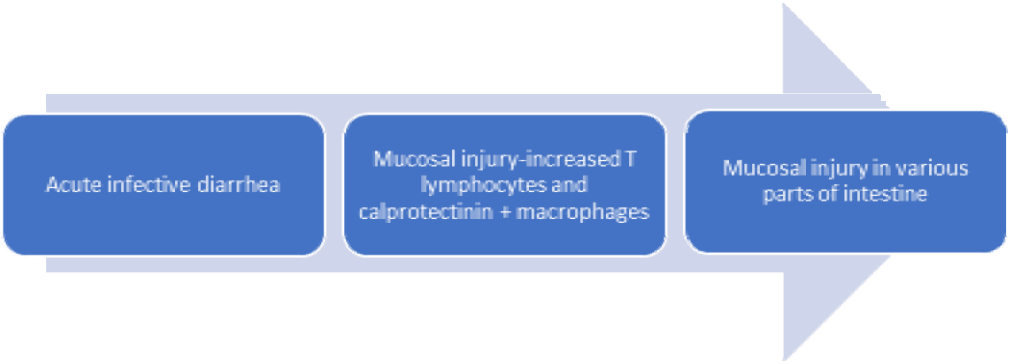



Chart 3: Pathogenesis of PIIBS (2)


Chart 4: Pathogenesis of PIIBS (3)

Chart 5 : A conceptual representation of PIIBS is as follows[15]

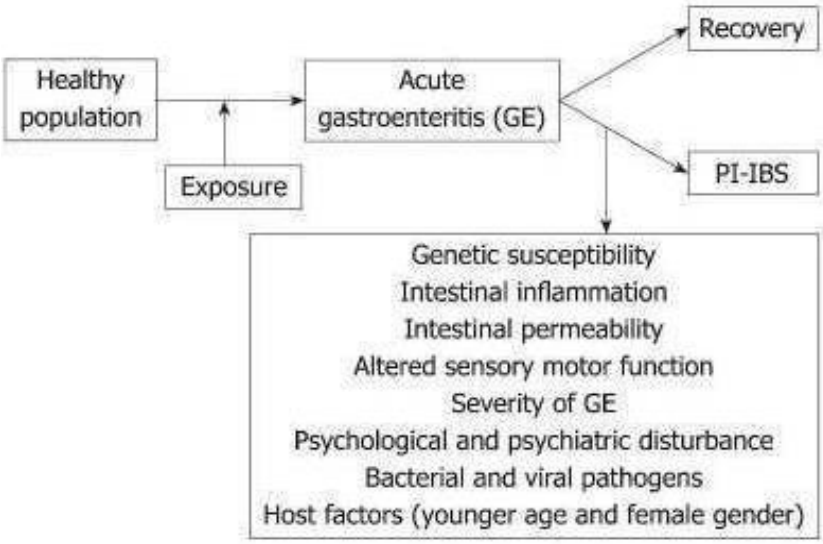
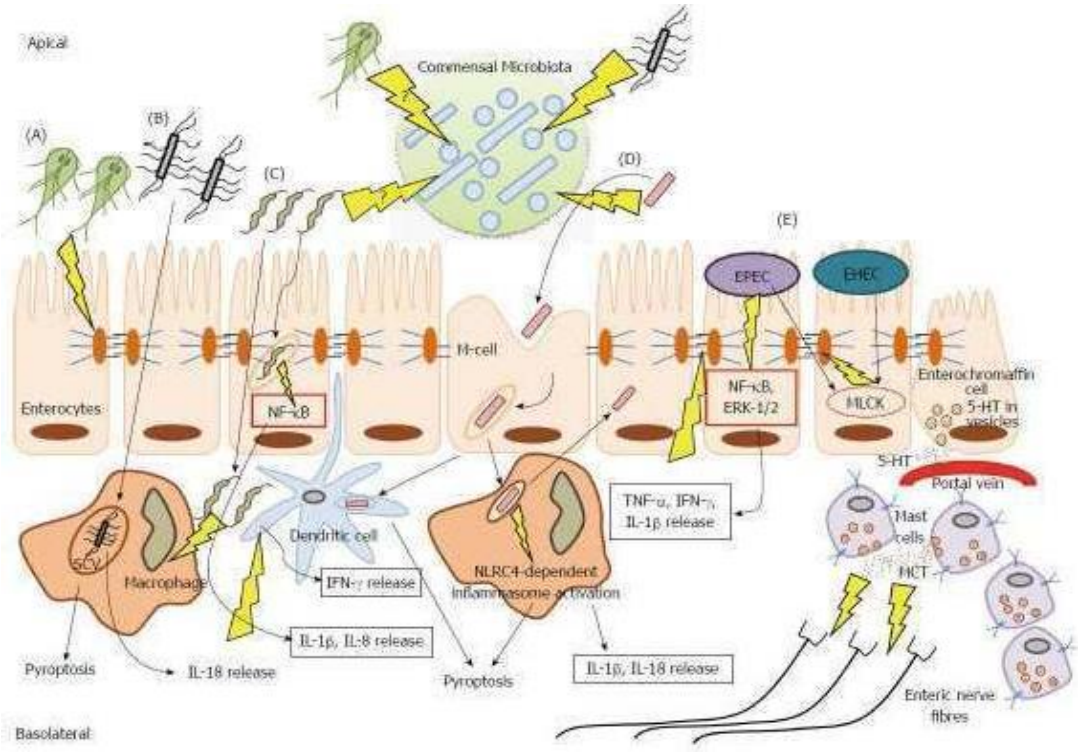



**Figure 2 :**




The above figure 2 represents the interaction of several pathogens with the intestinal epithelium and innate immune cells, and the development of post-infectious-irritable bowel syndrome.

**Pathogenesis of Tropical sprue**

In an article by B.S. Ramakrisha et al. have categorized malabsorption into two categories as primary and secondary[15]. Primary is idiopathic and secondary is due to infections. This is as shown in table 2.

| Table 2: Causes of tropical malabsorption (courtesy - B.S. Ramakrisha et al.) |
|---|
| ***Small intestinal disease with known etiology*** |
| ***Protozoa*** |
| Giardia intestinalis |
| Isospora belli |
| Cryptosporidium parvum |
| Enterocytozoon bieuneusi |
| Encephalitozoon intestinalis |
| Cyclospora cayetanensis |
| ***Helminths*** |
| Strongyloides stercoralis |
| Capillaria philippinensis |

***Bacteria***

Mycobacterium tuberculosis

***Viruses***

Human immunodeficiency virus

***Inflammatory and immune related***

Coeliac disease

Crohn's disease

Primary immunodeficiency

***Malignant***

Immunoproliferative small-intestinal disease and smallintestinal lymphoma

Pancreatic disease

Tropical pancreatitis

***Unknown aetiology***

Tropical enteropathy

Tropical sprue

Tropical sprue is also caused by infections. The pathogenesis behind infective etiology is that the enterocytes brush border motility is altered, leading to slowing of small intestinal transit by release of enteroglucagon and motilin. [16]

This also leads to increased intestinal organisms and injury. This injury leads to increase in luminal fatty acids and thereby decreased absorption of fat-soluble vitamins. This bacterial overgrowth also leads to destruction of the villi thereby absorption and a vicious cycle sets in. This leads to morbidity and extreme wasting sometimes. The following flow charts 6 & 7 explains the mechanism of mucosal injury and onset of malabsorption in tropical sprue.

The below image [12] shows the steps involved in the pathogenesis of tropical sprue.

Image courtesy Uday C Ghoshal et al.

**Figure 3 : Steps involved in the pathogenesis of tropical sprue**

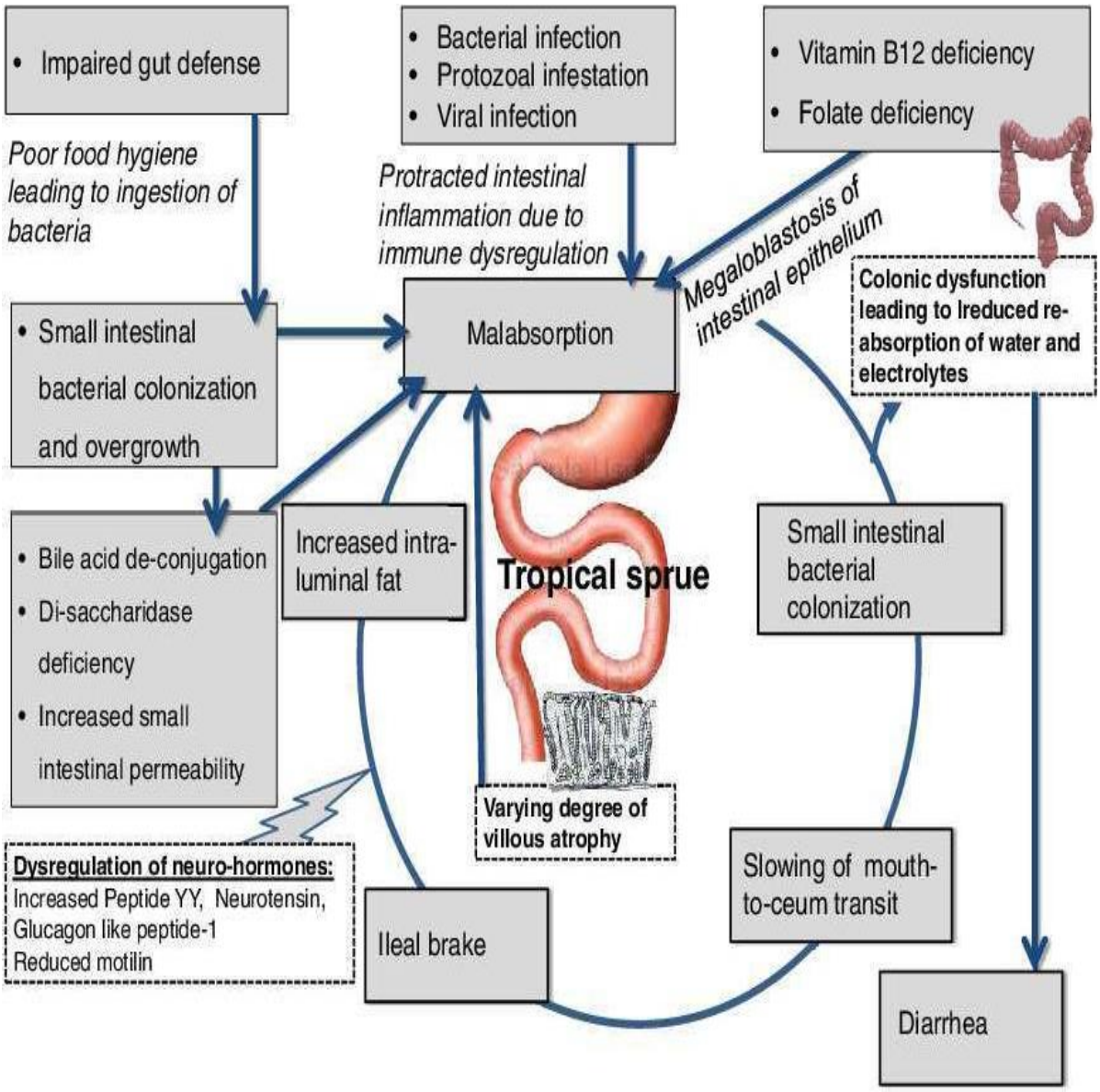


**Chart 6: Mechanism of mucosal injury of malabsorpti**

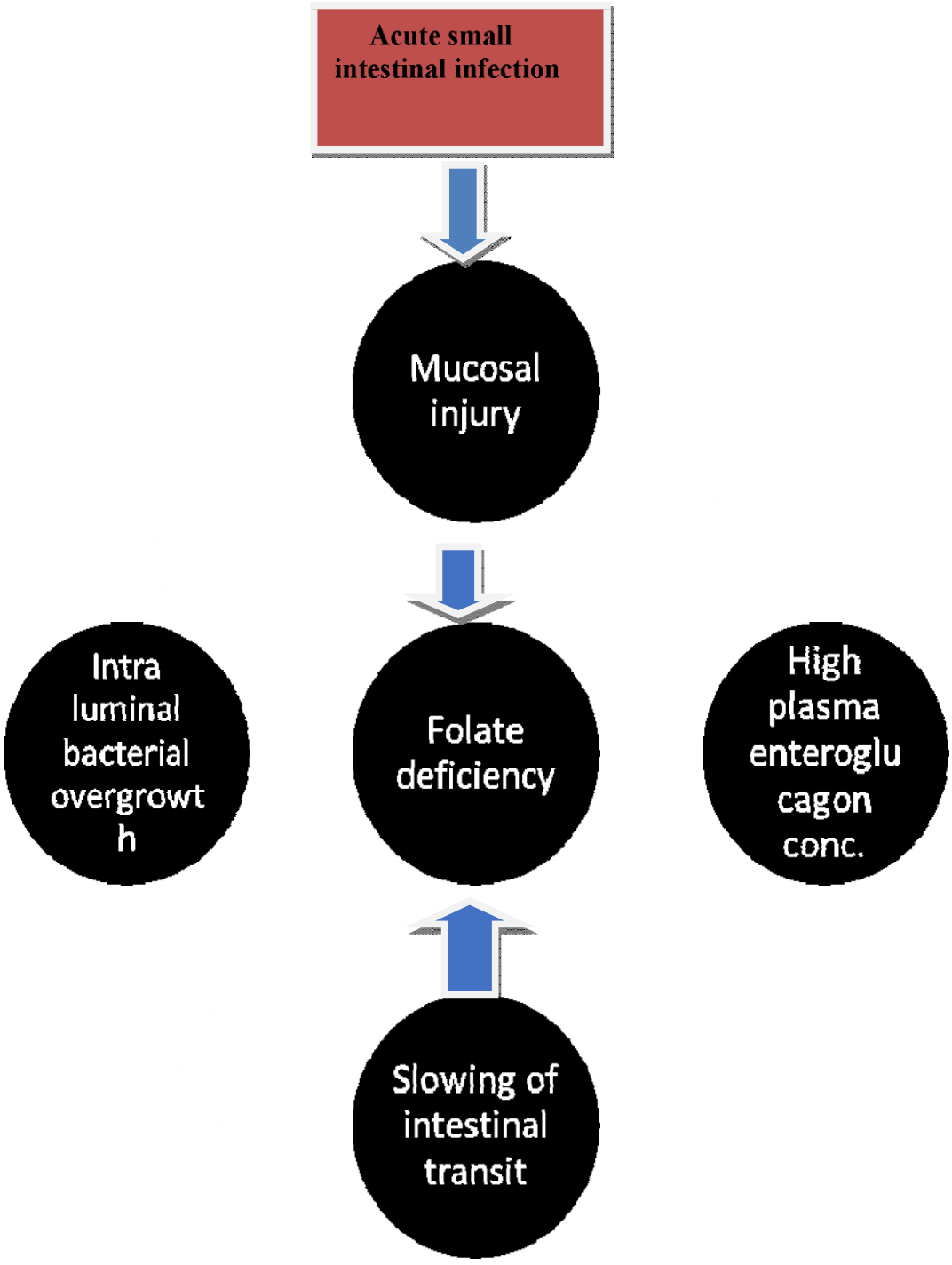
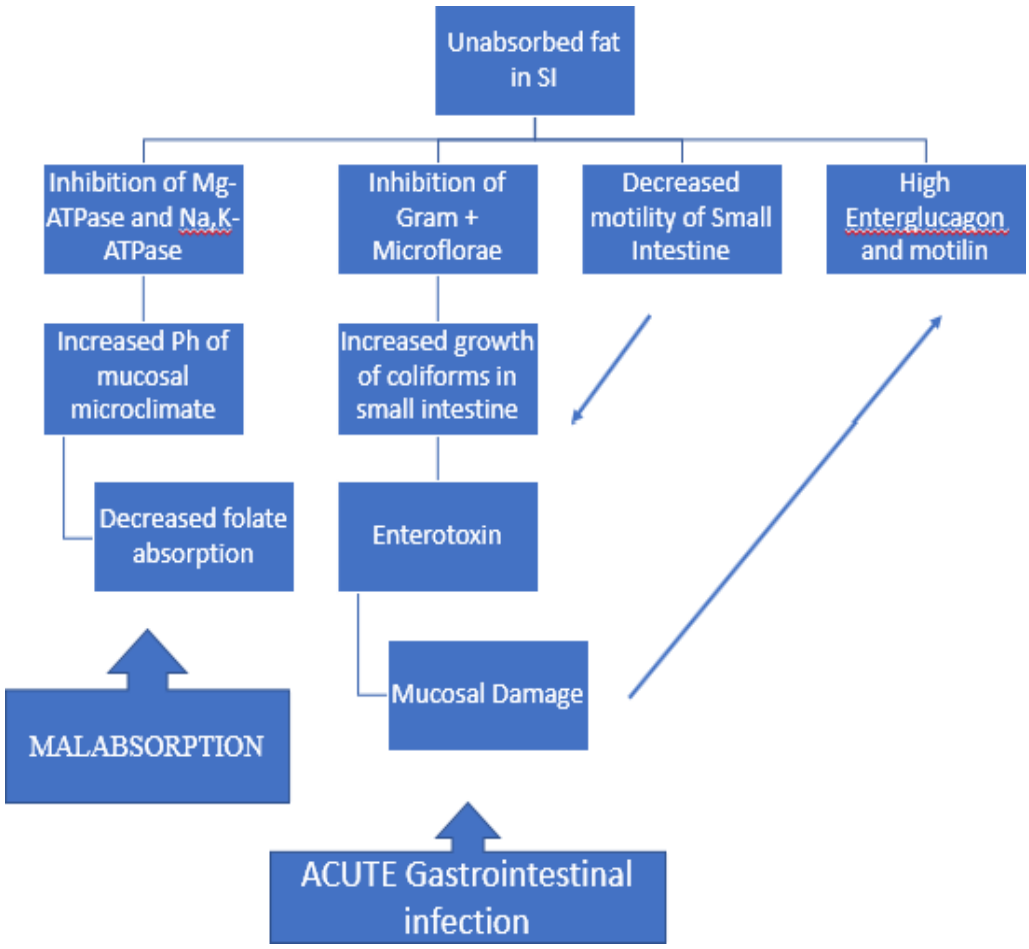


**Chart 7: Mechanism of mucosal injury of malabsorption (2)**




In all the three diseases there is definite mucosal injury and an overlap of pathogenesis. This explains the common presenting clinical features. A constellation of clinical, endoscopic, pathologic and biochemical features is essential for clinching a specific diagnosis. Understanding the differences between all three are essential for reporting these biopsies. Differences between tropical sprue and PIIBS[12] is as in the following table.

**Table 3 : Differences between tropical sprue and PI**

| Features | Post infectious Tropical Sprue | PI-IBS |
|---|---|---|
| Epidemiology | | |
| Frequency of occurrence following An attack of gastroenteritis (%) | 8–20 | 7–31 |
| Time period when reported | 5 to 6 decades ago | Mostly last 2 decades |
| Areas of the world from where reported | Tropics and temperate region -called tropical and temperate sprue | Mostly from temperate regions |
| Clinical presentation and diagnosis | | |
| Predominant clinical feature | Diarrhea as defined by liquidity and frequency of stool | Diarrhea as defined by Bristol stool form and frequency |
| Biochemical evidence of mucosal malabsorption (D-xylose test, fecal fat estimation, Schilling's test for B12 malabsorption) | Malabsorption of two unrelated substances is essential for diagnosis | Results of these tests have not been reported in any study |
| Abnormal small-intestinal histology | Require for the diagnosis | Has not been performed in any study |
| Pathogenesis | | |
| Possible infective agents that might predispose | Bacteria, virus, protozoa | Bacteria, virus, protozoa |
| Change in gut flora and small-intestinal bacterial overgrowth | Often associated | Increasing reports among patients with diarrhea-predominant IBS |

| | | |
|---|---|---|
| Small-intestinal permeability abnormality | Demonstrated | Demonstrated |
| Neurohumoral dysregulation | Demonstrated | Demonstrated |
| Treatment | | |
| Agents used in the treatment | Antibiotics, folic acid, vitamin B12 | Drugs modulating gut flora such as probiotics and antibiotics. |

Meta analysis and systematic review by Various authors from India have studied the differences between celiac sprue and tropical sprue and this is as summarized in the table below[17]. (Table courtesy- Journal of Gastroenterology and Hepatology 34 (2019) 74–83).

**Table 4 : Summary of differences between celiac disease and tropical sprue studed by various authors**

| **Authors** | **Year** | **Diagnostic criteria (Celiac disease)** | **Diagnostic criteria (Tropical sprue)** |
|---|---|---|---|
| Yadav et al., | 2011 | ESPGHAN criterion 1990; positive serological test in a subset | Chronic diarrhea, malabsorption, exclusion of other causes, and persistent response to antibiotic |

| | | | |
|---|---|---|---|
| Ghoshal et al., | 2012 | | Exclusion of |
| Dutta et al., | 2011 | | Malabsorption |
| Jain1 | 2015 | Positive | |
| Lo et al., | 2007 | Positive serology and histological changes | Compatible histology and exclusion of other causes of malabsorption |
| Schenck et al., | 1965 | Response to gluten-free diet | Tropical sprue was defined by its occurrence in tropical/ subtropical regions, no response to gluten free diet, response to folic acid, vitamin B12, and/or oral Antibiotics. |
| Langenburg et al., | 2014 | Celiac disease and tropical sprue patients were diagnosed based on compatible histopathological changes in an appropriate epidemiological | Celiac disease and tropical sprue patients were diagnosed based on compatible histopathological changes in an appropriate epidemiological setting and |

| | | | |
|---|---|---|---|
| | | setting and | appropriate |
| | | | |
| | 1985 | Not described | |
| Pipaliya et al., | 2016 | Diagnosed by | |
| Karegar et al., | 2016 | Not defined | Not defined |
| Thurlbeck et al., | 1960 | Not defined | Not defined |

From all the above we understand that one of the most important steps in evaluating malabsorption is small intestinal mucosal biopsies. Duodenum is the preferred site of biopsy as it is easily accessible for the clinician. Mucosal architecture pattern varies from villous blunting to atrophy, crypt hyperplasia and intraepithelial lymphocytosis.

Studies done for celiac disease and other malabsorptive disease demonstrates the morphological changes that are important in arriving at a diagnosis[18,19]

Villous architecture and the utility of villous height and crypt ratio has been widely studied[20]. As reporting on duodenal biopsies for malabsorption is highly subjective these studies aimed at an objective way of evaluation and also quantifying the changes in the biopsies received.[20]

Biopsies are taken from duodenum are assessed. And for this a well oriented specimen is necessary.

A well-oriented biopsy is essential and this provides more accurate information on mucosal architecture. Specimens can be oriented with the naked eye or with stereomicroscopy. If the biopsy is oriented in the endoscopy room it should be clearly indicated to the laboratory. Mostly the well oriented specimens lose their orientation during regular

processing. Therefore, it is essential to analyse for tangential cuts so as to not overinterpret villous architectural abnormality. Despite biopsy orientation the presence of intra epithelial lymphocytosis and villous architecture is sufficient to support a histopathological diagnosis. Samples obtained for histopathologic evaluation should be immediately placed in specimen containers containing the appropriate fixative (10% formalin) to avoid air drying.

History of obtaining small intestinal biopsies and assessing the mucosa for villous blunting began in as early as early part of 20th century from autopsy reports in patients with tropical and non- sprue by[20] Beneke in 1910 and Manson-Bahr in 1924.

In 1954, Paulley reported on laparotomy samples and found that the finding of morphologically differing villi was accurate. Only when multiple biopsies became possible through endoscopy specific examination became possible. Holmes et al. in 1961 found there were changes in villi even under dissection microscope.[20]

It was Watson or Crosby-Kegler started taking biopsies from the distal duodenum or proximal jejunum immediately adjacent to the ligament of Treitz by using suction capsules. This procedure does not

require anesthesia but had complications like hemorrhage and perforation while retrieving the capsule.

In 1980s biopsies using endoscopy came into being. In a study done by Lebwohl et al. 2011 and Ludvigsson 2014 senstivity of reporting reached 100% with 4 duodenal biopsies taken. Though the endoscopist can observe through fiberoptic endoscopy scalloping or reduction of duodenal folds, this is not sensitive or specific to dispense with biopsy (Dickey and Hughes 2001)[20]. Therefore, taking duodenal biopsies and correlating with the morphological changes is an important step incoming to conclusive diagnosis for malabsorption.

The first classification of villous abnormality on mucosal sections was done by Doniach and Shiner in 1957. They classified villous changes as normal, partial villous and subtotal villous atrophy. This was subsequently acknowledged by The European Society for Pediatric Gastroenterology Hepatology and Nutrition ESPGHAN to be the standard (Meeuwisse 1970). Marsh et al came up with a new criterion in 1990s which was later modified by Oberhuber (Marsh 1992, Oberhuber et al.1999)[20].

In addition to the above classifications, Shiner and Doniach in 1960 gave precise values for villous height and crypt depth (Shiner and Doniach 1960, Doniach and Shiner 1960). This was further developed by Kuitunen and 37associates in 1966 and 1982, and the ratio of villous heights and crypt depths was found more specific.

Figure 4 : Method of narrowing the villous height and crypt depth (courtesy figure 3 by Juha Tara Vela)

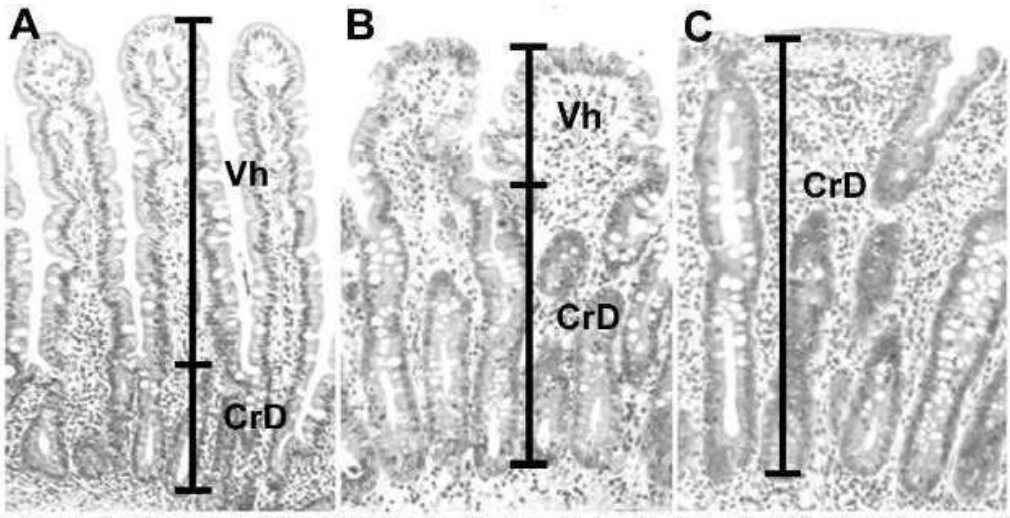



**Figure 3.** Measurement of villous height crypt depth ratio in different degrees of damage. VH, villous height; CrD, crypt depth. Images by Juha Taavela.

Since 1990 villous crypt ratio has been in use and is evidenced in the Tampere coeliac disease research groups study and the first publication regarding the utility of villous crypt ratio came in 1993 (Holm 1993). Though the normal ratio has been a matter of controversy values above 3 was considered as normal by many. Ratio of Villous height to crypt depth is more accurate. However, as these measurements require

software and considerable time and burdensome usually the evaluation of villous height and crypt depth is done as a personal estimate. This is subject to pathologists viewing the slides. Hence reproducibility is very low.

Measuring or reporting of villi height and crypt depth also depends on the biopsy cuttings. Misinterpretation and reliability depend on the final histological sections received. Rubin et al. in 1960 have shown that interpretation of histologic specimens is of crucial importance.

Correct orientation of specimen has been recognized as the most important step to report Histopathological specimens as early as 1959. The histologic sections should be perpendicular to the mucosal surface and it was reported even a slight variation in section cutting leads to a false diagnosis. It is a surprise to note that when these were considered important as early as 1959 in the recent studies published by Collin et al. in 2005, Ravelli et al[21]. in 2012 stating this is ignored or not taken into account in routine day today practice.

Incorrect biopsy orientation leads to cross-sectioning of the crypts. Therefore, loss of evidence of crypt hyperplasia under the microscope leading to non identification of conditions like celiac disease. Risdon and Keeling 1960, Thurlbeck et al. 1960, Shidrawi 1994, Rostom et al. 2006, Arguelles-Grande et al. 2011 stated non orientation of mucosal biopsies

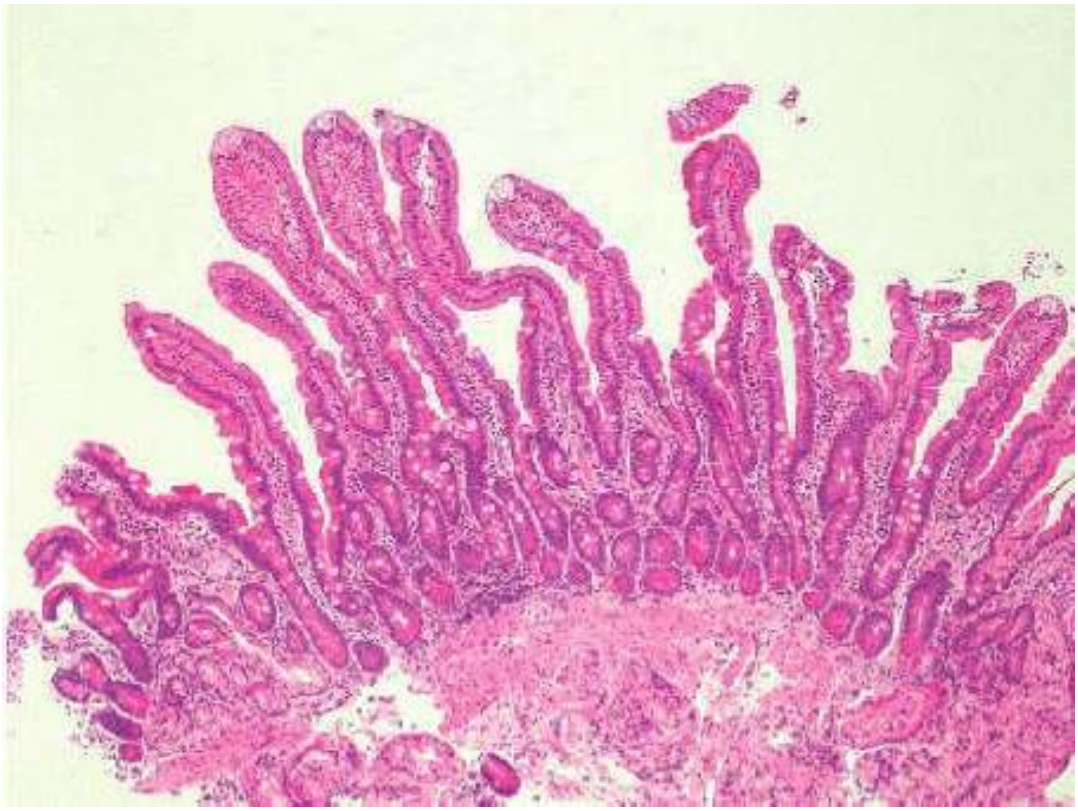
were one of the main reasons for missing a coeliac disease diagnosis. Non orientation of biopsy will also show broad and shortened villi.[20]

Collin et al. in 2005 reported that 10% of biopsies received are unreadable and in 2009 Gonzalez et al. reported a 70% of duodenal biopsies being unreadable. It must be noted that tangential or en face cutting leads to distortion of villi and crypts. In tangential cuts one should either reorient and resection or no reading to be done and a repeat biopsy to be requested. [20]

As we have seen evaluation of small intestinal mucosal biopsy is the most important step in diagnosing the etiologic cause of malabsorption. Of the entire small intestine , duodenum is the most preferred site because of its approachability in endoscopy. Multiple biopsies from the second part is usually given and a minimum of four is always taken. [21]

Evaluation of the biopsies are to be done where at least 3 villi were well oriented. Well oriented biopsy under microscope means at 3-5 villi are visible in its entirety from base to the tip as shown in the figure and the villous crypt ratio is 3:1 or above.

**Figure 5: Image of a well oriented duodenal biopsy**



Villi are seen from tip to base and the V:C ratio is >3:1.Recently from 2006 many researches have been done for malabsorption from Indian subcontinent.

B.S.Ramakrishnan et al. from Tamil Nadu India states that sporadic tropical sprue is the most common and important cause of malabsorption in children and adults in South Asia. In this article the authors also state the specific causes are to be excluded before considering tropical sprue. At the end the authors also give an algorithm for investigation of malabsorption and its treatment.

Changing into cosmopolitan life styles, rapid mobilization of people with changing diet pattern and the recent newly found food habits of the population has increased the incidence of malabsorption disorders in the southern part of the country[19]. India has seen an improvement in the health and sanitation due to better socio-economic status, but the food style habits have lead to increased diarrheal disorders causing malabsorption . AK Dutta et al. categorically states though other causes of malabsorption in India is on the rise, Tropical Sprue is still the leading factor[22].

Recently there is a surge in malabsorptive disorders and department of pathology receives increased number of small intestinal biopsies from duodenum because of its easy approachability for a definitive diagnosis.

Pathologists rely on the morphological changes in the mucosa namely villous blunting, crypt elongation, budding, hyperplasia, presence of intra epithelial lymphocytosis, basement membrane thickening etc. for making a diagnosis. Most of the observations are subjective. Therefore, to objectivize the observations, reduce the interobserver variability and to standardize reporting protocols many quantative studies are being done in India.

Keeping in view of the increased number of duodenal biopsies received for malabsorptive disorders this study aims to analyze the villous height, crypt depth and villous crypt ratio in duodenal biopsies diagnosed as tropical sprue and to correlate with the clinical features of diarrhea and megaloblastic anaemia.

# MATERIALS AND METHODS:

This is a retrospective observational study. After getting permission and ethical clearance, duodenal biopsies reported as tropical sprue were taken from the archives of department of Pathology for a period of 3 years from 2015-2018. Necessary clinical details were collected from the MRD files after taking permissions.

## INCLUSION CRITERIA:

All well oriented duodenal biopsies reported as tropical sprue from both sexes above 18 years of age.

## EXCLUSION CRITERIA:

Duodenal biopsies with other diagnosis, poorly oriented and tangentially cut sections

Once cases were selected, blocks were retrieved, sections were cut and stained with H & E stain and then evaluated. The villi height and crypt depth were measured using the morphometric grid attached to NIKON eclipse Ci microscope.

Routine H & E stain was performed as follows.

## HEMATOXYLIN AND EOSIN STAIN:

The hematoxylin and eosin (H&E) is the most widely used stain in a histopathology laboratory. The advantage of H&E lies in its simplicity and ability to clearly demonstrate enormous number of different tissue structures. The hematoxylin component stains the nuclei blue, while the eosin component stains the cytoplasm and most of the connective tissue fibers.

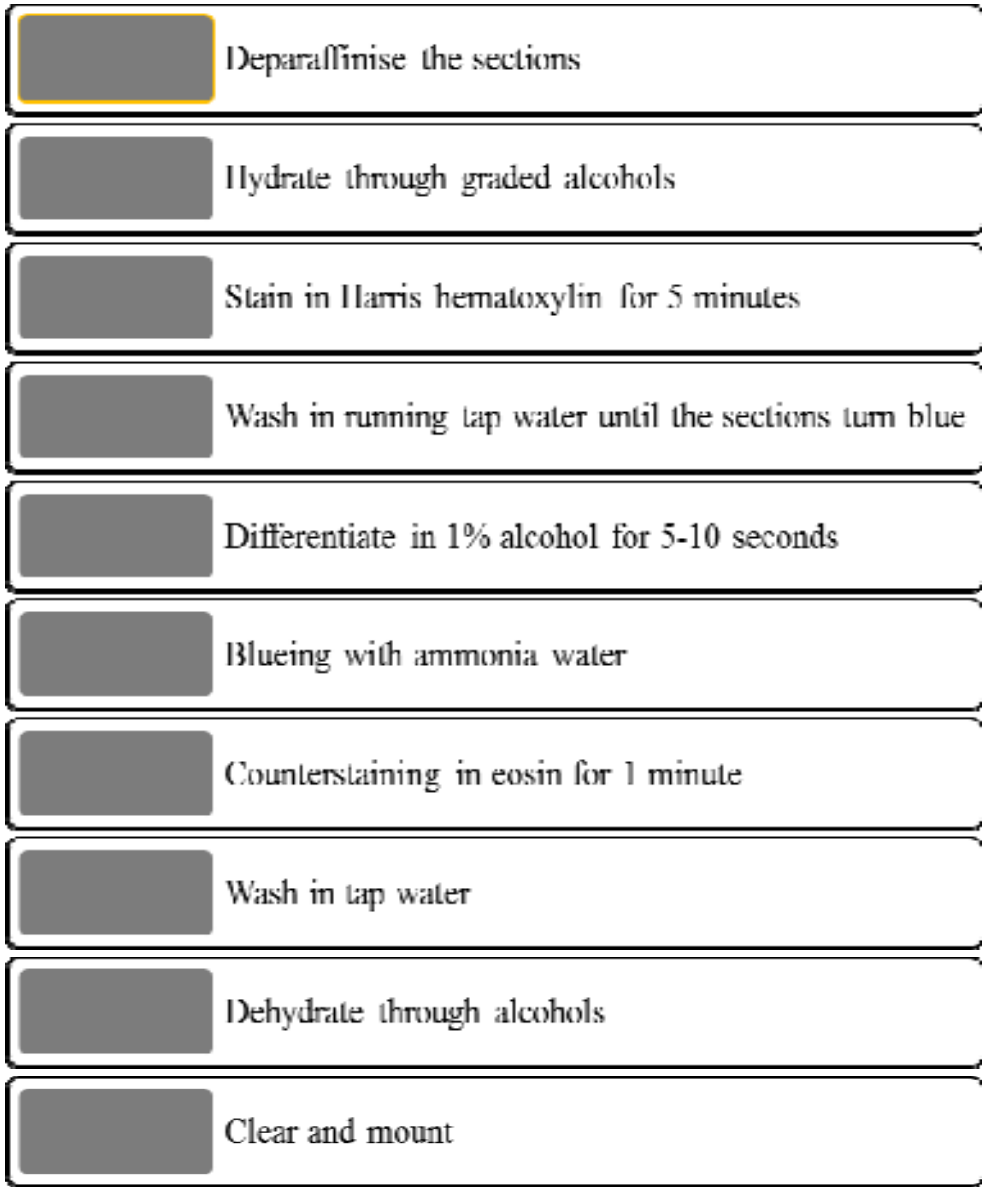
There are various methods of performing the H&E staining, we commonly use the Harris hematoxylin method. This is a type of alum hematoxylin. It is chemically oxidized with mercuric oxide. As mercuric oxide is toxic, we commonly use sodium or potassium iodate as a substrate for oxidation.

Materials required includes:

- Harris hematoxylin
- Eosin
- Xylene
- 1% acetic acid
- Ammonia water
- 1% eosin
- Graded alcohols

**PROCEDURE:**

Chart 8: Steps Involved in H&E staining on routine paraffin sections




The staining was done in routine paraffin sections.

## RESULTS:

Nuclei: blue

Cytoplasm: pink

Red cells: orange

Fibrin: deep pink

In order to take accurate measurements, "Annotations" from PDF studio was used. To calculate the length, the distance Measurement Annotations was used. First the distance tool on the tool bar was selected by clicking the icon in the comment tab which displayed the measurement dialog from where the scale is set for the measurement before drawing the annotations. Thereafter the lines drawn with the cursor between two points facilitated direct measurement. Villous height was measured from the tip of the villi to the base of the crypt and the crypt depth from base of the crypt to the deepest crypt edge in the mucosa.

For each case the villous crypt ratio of both normal and diseased segments were then calculated.

A villous crypt ratio of >3:1 considered normal. The ratio of diseased villi and crypt were graded as mild, moderate and severe using the following criteria.[19] (Morphologic spectm.Jcdr)

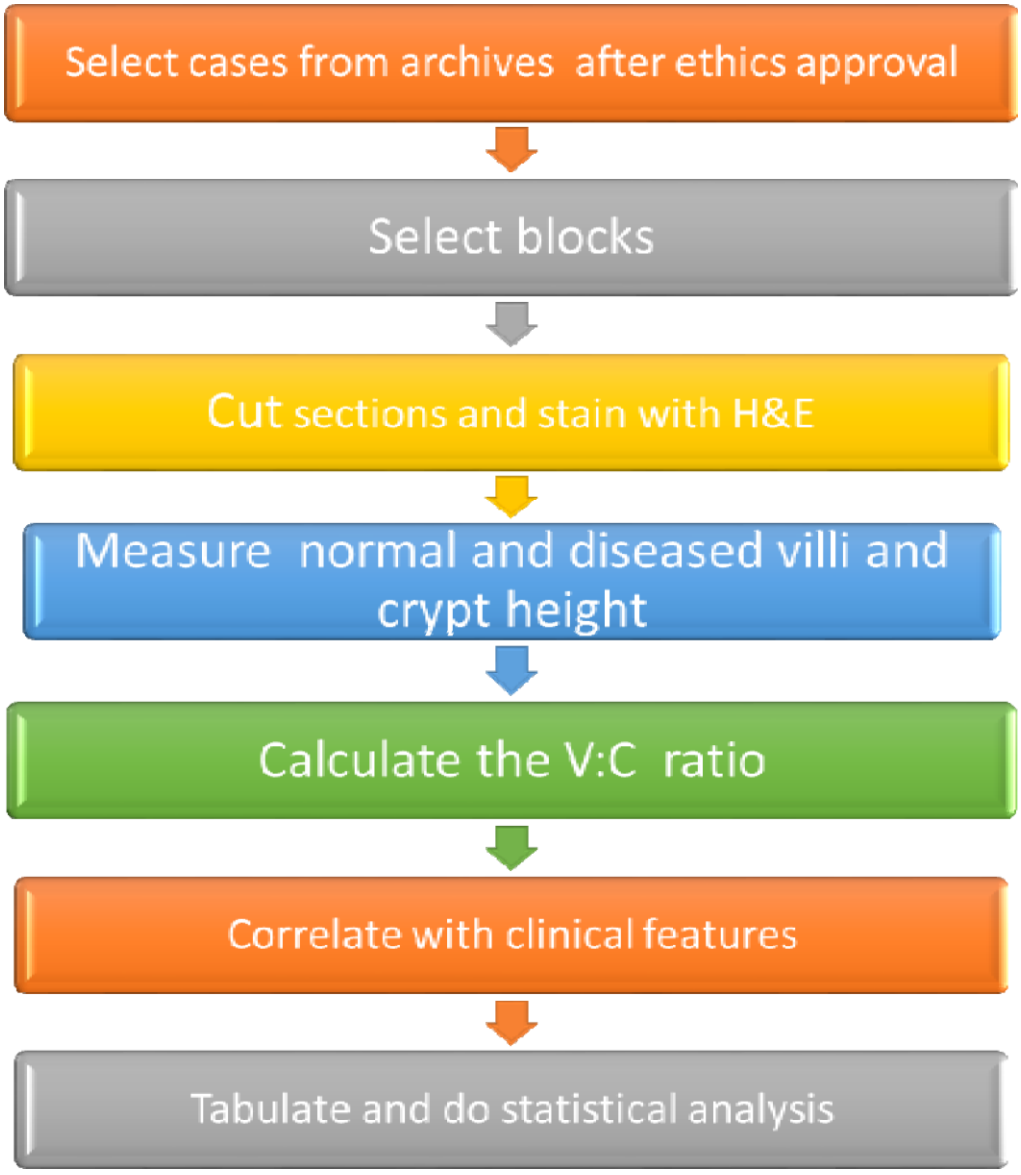
<3:1 to 2:1- mild(figure:6a.6b,6c)

<2:1 to 1:1-moderate and(figure:7a,7b)

<1:1 to 0.1:1-severe(figure:8a,8b)

The parameters were then matched with the age, sex and clinical features of diarrhea and megaloblastic anemia.

Chart 9 :



# RESULTS AND OBSERVATION

Department of pathology received 2386 duodenal biopsies over a period of 3 years of which 500 were reported as tropical sprue.

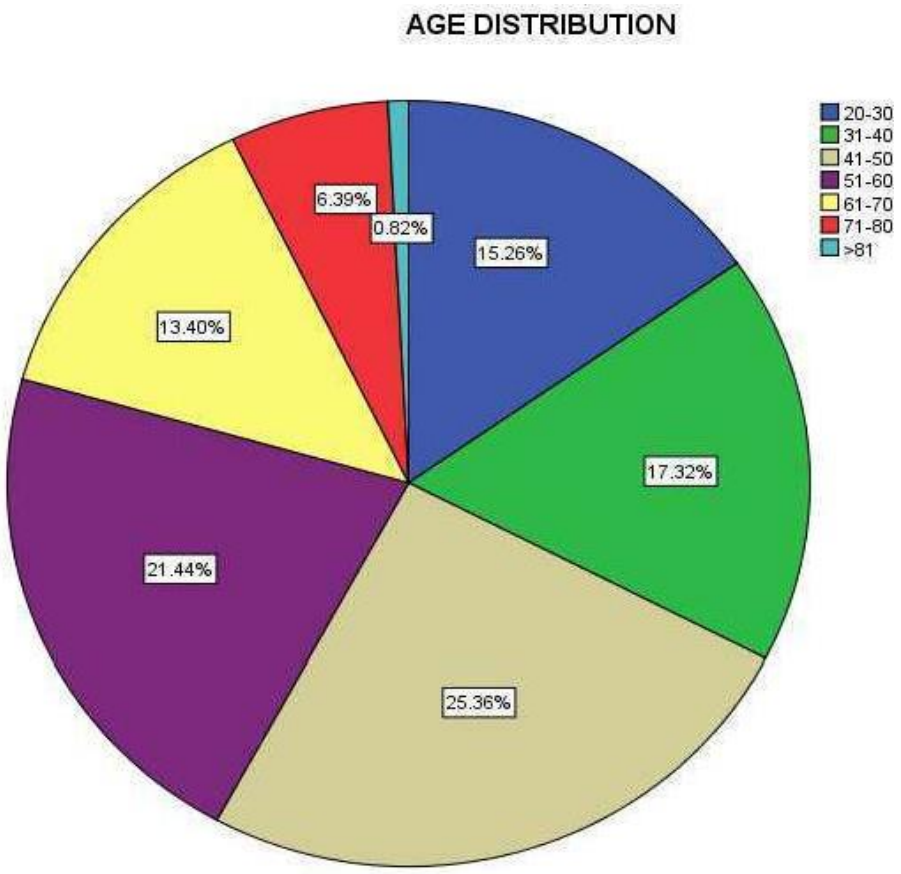
Using the inclusion and exclusion criteria 485 cases were selected.

The cases were then grouped into the three grades depending on the V:C ratio. The details are as in the following table 5.

Table 5: Grading of Villous: Crypt ratio

| **Grade** | **No of cases/485** |
|---|---|
| | |
| Moderate | 436 |
| Severe | 23 |

## Chart 10:




It was observed that among the 485 specimens the incidence of tropical sprue was highest 123(25.4%) in the age group of 41-50 and it was less than 7% in the age group of >70 yrs. as shown in chart 10

# SEX DISTRIBUTION

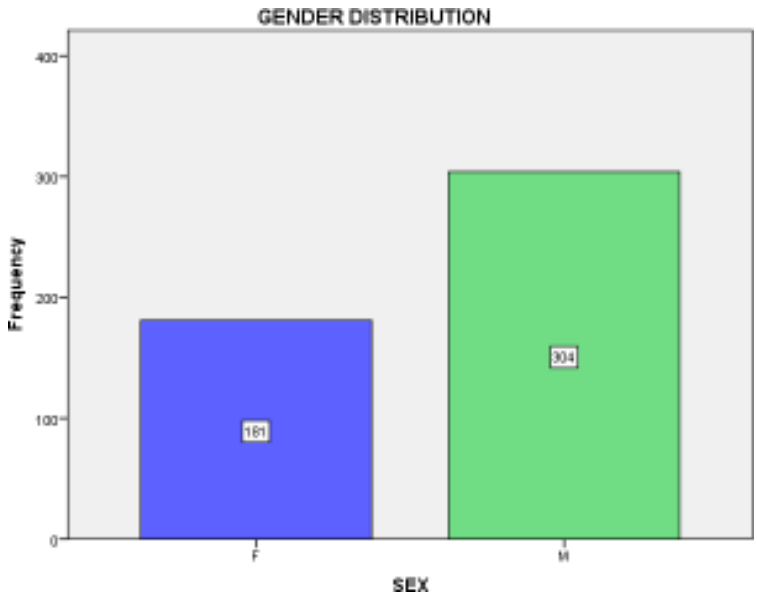
Table 6 highlights the sex distribution

Table 6: Sex distribution

| Male | Female | Total |
|---|---|---|
| 304 | 181 | 485 |

In 485 specimens analysed,304(62.7%) were male and 181(37.3%) were female as shown in chart 11. Thus, there was a male preponderance over females. As shown in chart 11.

**Chart 11: Gender distribution**



# AGE DISTRIBUTION

The age group of presentation with various grades is as in the table 7 given.

Table 7: Age distribution of various grades of V:C

| Age | Mild | Moderate | Severe |
|---|---|---|---|
| 20-30 | 4 | 68 | 2 |
| 31-40 | 5 | 77 | 3 |
| 41-50 | 7 | 112 | 4 |
| 51-60 | 4 | 94 | 7 |
| 61-70 | 3 | 57 | 5 |
| 71-80 | 2 | 27 | 2 |
| >80 | 1 | 3 | nil |
| Total -485 | 26 | 438 | 23 |

.

The following table highlights various grades of V:C ratio with various age group and gender.

**Table 8: Age and Sex distribution of grades of V:C ratio**

| Age | Mild- | | Moderate | | Severe | |
|---|---|---|---|---|---|---|
| | male | female | male | female | male | female |
| 20-30 | 1 | 3 | 42 | 21 | 2 | - |
| 31-40 | 2 | 3 | 52 | 25 | 2 | 1 |
| 41-50 | 6 | 1 | 70 | 43 | 2 | 2 |
| 51-60 | 2 | 2 | 55 | 39 | 6 | 1 |
| 61-70 | 1 | 2 | 34 | 24 | 3 | 2 |
| 71-80 | 1 | 1 | 21 | 5 | - | 2 |
| >80 | 1 | - | 3 | - | - | - |
| Total | 14 | 12 | 277 | 161 | 15 | 8 |

The following tables from table 9 to table 15 highlights correlation of sex v:c ratio and category of grades among various age groups

## Table 9: AGE GROUP OF 20-30YRS:

| S. No | SEX | V:C | CATEGORY |
|---|---|---|---|
| 1 | M | 0.5:1 | severe |
| 2 | M | 0.2:1 | severe |
| 3 | F | 01:01 | moderate |
| 4 | F | 1.4:1 | moderate |
| 5 | F | 1.1:1 | moderate |
| 6 | F | 1.1:1 | moderate |
| 7 | F | 1.2:1 | moderate |
| 8 | F | 1.2:1 | moderate |
| 9 | F | 01:01 | moderate |
| 10 | F | 1.4:1 | moderate |
| 11 | F | 01:01 | moderate |
| 12 | F | 01:01 | moderate |
| 13 | F | 1.1:1 | moderate |
| 14 | F | 1.1:1 | moderate |
| 15 | F | 1.3:1 | moderate |
| 16 | F | 1.1:1 | moderate |
| 17 | F | 1: `1 | moderate |
| 18 | F | 1.7:1 | moderate |

| | | | |
|---|---|---|---|
| 19 | F | 01:01 | moderate |
| 20 | F | 1.2:1 | moderate |
| 21 | F | 01:01 | moderate |
| 22 | F | 1.3:1 | moderate |
| 23 | F | 1.2:1 | moderate |
| 24 | F | 1.3;1 | moderate |
| 25 | F | 01:01 | moderate |
| 26 | F | 1.6:1 | moderate |
| 27 | F | 1.4:1 | moderate |
| 28 | F | 1.1:1 | moderate |
| 29 | M | 1.1:1 | moderate |
| 30 | M | 01:01 | moderate |
| 31 | M | 1.3:1 | moderate |
| 32 | M | 1.2:1 | moderate |
| 33 | M | 1.1:1 | moderate |
| 34 | M | 1.6:1 | moderate |
| 35 | M | 1.3:1 | moderate |
| 36 | M | 1.5:1 | moderate |
| 37 | M | 1.9:1 | moderate |
| 38 | M | 1.4:1 | moderate |
| 39 | M | 1.1:1 | moderate |

| | | | |
|---|---|---|---|
| 40 | M | 1.1:1 | moderate |
| 41 | M | 01:01 | moderate |
| 42 | M | 1.4:1 | moderate |
| 43 | M | 1.1:1 | moderate |
| 44 | M | 01:01 | moderate |
| 45 | M | 01:01 | moderate |
| 46 | M | 1.2:1 | moderate |
| 47 | M | 1.3:1 | moderate |
| 48 | M | 1.4:1 | moderate |
| 49 | M | 1.2:1 | moderate |
| 50 | M | 1.1:1 | moderate |
| 51 | M | 1.1:1 | moderate |
| 52 | M | 1.1:1 | moderate |
| 53 | M | 1.4:1 | moderate |
| 54 | M | 01:01 | moderate |
| 55 | M | 1.8:1 | moderate |
| 56 | M | 01:01 | moderate |
| 57 | M | 1.2:1 | moderate |
| 58 | M | 1.4:1 | moderate |
| 59 | M | 01:01 | moderate |
| 60 | M | 1.3:1 | moderate |

| | | | |
|---|---|---|---|
| 61 | M | 1.3:1 | moderate |
| 62 | M | 1.5:1 | moderate |
| 63 | M | 1.3:1 | moderate |
| 64 | M | 1.8:1 | moderate |
| 65 | M | 1.1:1 | moderate |
| 66 | M | 01:01 | moderate |
| 67 | M | 1.7:1 | moderate |
| 68 | M | 1.5:1 | moderate |
| 69 | M | 1.2:1 | moderate |
| 70 | M | 1.:1 | moderate |
| 71 | F | 2.1:1 | mild |
| 72 | F | 02:01 | mild |
| 73 | F | 2.4:1 | mild |
| 74 | M | 2.1:1 | mild |

## Table 10 : AGE GROUP 31-40YRS:

| S. No | SEX | V:C | CATEGORY |
|---|---|---|---|
| 1 | F | 0.4:1 | severe |
| 2 | M | 0.4:1 | severe |
| 3 | M | 0.3:1 | severe |
| 4 | F | 1.2:1 | moderate |
| 5 | F | 01:01 | moderate |
| 6 | F | 1.2:1 | moderate |
| 7 | F | 1.1:1 | moderate |
| 8 | F | 1.2:1 | moderate |
| 9 | F | 1.1:1 | moderate |
| 10 | F | 1.1:1 | moderate |
| 11 | F | 1.4:1 | moderate |
| 12 | F | 1.1:1 | moderate |
| 13 | F | 1.1:1 | moderate |
| 14 | F | 01:01 | moderate |
| 15 | F | 01:01 | moderate |
| 16 | F | 01:01 | moderate |
| 17 | F | 1.3:1 | moderate |
| 18 | F | 1.1:1 | moderate |

| | | | |
|---|---|---|---|
| 19 | F | 1.1:1 | moderate |
| 20 | F | 1.2:1 | moderate |
| 21 | F | 01:01 | moderate |
| 22 | F | 1.1:1 | moderate |
| 23 | F | 1.8:1 | moderate |
| 24 | F | 1.9:1 | moderate |
| 25 | F | 1.1:1 | moderate |
| 26 | F | 1.4:1 | moderate |
| 27 | F | 1.1:1 | moderate |
| 28 | F | 1.4:1 | moderate |
| 29 | M | 1.1:1 | moderate |
| 30 | M | 01:01 | moderate |
| 31 | M | 01:01 | moderate |
| 32 | M | 1.1:1 | moderate |
| 33 | M | 1.2:1 | moderate |
| 34 | M | 1.2:1 | moderate |
| 35 | M | 1.2:1 | moderate |
| 36 | M | 1.3:1 | moderate |
| 37 | M | 1.1:1 | moderate |
| 38 | M | 01:01 | moderate |
| 39 | M | 1.1:1 | moderate |

| | | | |
|---|---|---|---|
| 40 | M | 1.6:1 | moderate |
| 41 | M | 1.1:1 | moderate |
| 42 | M | 1.2:1 | moderate |
| 43 | M | 1.6:1 | moderate |
| 44 | M | 01:01 | moderate |
| 45 | M | 1.2:1 | moderate |
| 46 | M | 01:01 | moderate |
| 47 | M | 1.1:1 | moderate |
| 48 | M | 1.2:1 | moderate |
| 49 | M | 1.1:1 | moderate |
| 50 | M | 1.1:1 | moderate |
| 51 | M | 01:01 | moderate |
| 52 | M | 1.2:1 | moderate |
| 53 | M | 1.7:1 | moderate |
| 54 | M | 1.1:1 | moderate |
| 55 | M | 1.3:1 | moderate |
| 56 | M | 1.1:1 | moderate |
| 57 | M | 1.6:1 | moderate |
| 58 | M | 1.1:1 | moderate |
| 59 | M | 01:01 | moderate |
| 60 | M | 1.1:1 | moderate |

| | | | |
|---|---|---|---|
| 61 | M | 1.1:1 | moderate |
| 62 | M | 1.1;1 | moderate |
| 63 | M | 1.1:1 | moderate |
| 64 | M | 1.1:1 | moderate |
| 65 | M | 1.4:1 | moderate |
| 66 | M | 01:01 | moderate |
| 67 | M | 1.2:1 | moderate |
| 68 | M | 1.1:1 | moderate |
| 69 | M | 1.3:1 | moderate |
| 70 | M | 1.2:1 | moderate |
| 71 | M | 01:01 | moderate |
| 72 | M | 1.3:1 | moderate |
| 73 | M | 1.2:1 | moderate |
| 74 | M | 1.4;1 | moderate |
| 75 | M | 1.2;1 | moderate |
| 76 | M | 1.2:1 | moderate |
| 77 | M | 01:01 | moderate |
| 78 | M | 1.5:1 | moderate |
| 79 | M | 1.3:1 | moderate |
| 80 | M | 1.6:1 | moderate |
| 81 | F | 2.4:1 | mild |

| | | | |
|---|---|---|---|
| 82 | F | 2.4:1 | mild |
| 83 | F | 2.7:1 | mild |
| 84 | M | 2.1:1 | mild |

**Table 11: AGE GROUP 41-50YRS:**

| S. No | SEX | V:C | CATEGORY |
|---|---|---|---|
| 1 | F | 0.5:1 | severe |
| 2 | F | 0.3:1 | severe |
| 3 | M | 0.3:1 | severe |
| 4 | M | 0.7:1 | severe |
| 5 | F | 1.4:1 | moderate |
| 6 | F | 01:01 | moderate |
| 7 | F | 01:01 | moderate |
| 8 | F | 1.9:1 | moderate |
| 9 | F | 01:01 | moderate |
| 10 | F | 1.7:1 | moderate |
| 11 | F | 1.2:1 | moderate |
| 12 | F | 1.8:1 | moderate |
| 13 | F | 1.4:1 | moderate |
| 14 | F | 1.1:1 | moderate |

| | | | |
|---|---|---|---|
| 15 | F | 01:01 | moderate |
| 16 | F | 01:01 | moderate |
| 17 | F | 1.1:1 | moderate |
| 18 | F | 01:01 | moderate |
| 19 | F | 1.5:1 | moderate |
| 20 | F | 1.7:1 | moderate |
| 21 | F | 1.1:1 | moderate |
| 22 | F | 1.3:1 | moderate |
| 23 | F | 1.1:1 | moderate |
| 24 | F | 1.2:1 | moderate |
| 25 | F | 1.1:1 | moderate |
| 26 | F | 1.6:1 | moderate |
| 27 | F | 1.1:1 | moderate |
| 28 | F | 1.2:1 | moderate |
| 29 | F | 1.1:1 | moderate |
| 30 | F | 1.2:1 | moderate |
| 31 | F | 1.3:1 | moderate |
| 32 | F | 01:01 | moderate |
| 33 | F | 01:01 | moderate |
| 34 | F | 1.4:1 | moderate |
| 35 | F | 01:01 | moderate |

| | | | |
|---|---|---|---|
| 36 | F | 1.6:1 | moderate |
| 37 | F | 1.3:1 | moderate |
| 38 | F | 1.2:1 | moderate |
| 39 | F | 1.3:1 | moderate |
| 40 | F | 1.1:1 | moderate |
| 41 | F | 1.1:1 | moderate |
| 42 | F | 1.8:1 | moderate |
| 43 | F | 1.1:1 | moderate |
| 44 | F | 01:01 | moderate |
| 45 | F | 1.5:1 | moderate |
| 46 | F | 1.1:1 | moderate |
| 47 | M | 01:01 | moderate |
| 48 | M | 1.8:1 | moderate |
| 49 | M | 1.8:1 | moderate |
| 50 | M | 01:01 | moderate |
| 51 | M | 01:01 | moderate |
| 52 | M | 1.2:1 | moderate |
| 53 | M | 1.1:1 | moderate |
| 54 | M | 1.2:1 | moderate |
| 55 | M | 1.1:1 | moderate |
| 56 | M | 1.1:1 | moderate |

| | | | |
|---|---|---|---|
| 57 | M | 1.2:1 | moderate |
| 58 | M | 1.2:1 | moderate |
| 59 | M | 1.2:1 | moderate |
| 60 | M | 01:01 | moderate |
| 61 | M | 1.1:1 | moderate |
| 62 | M | 1.4:1 | moderate |
| 63 | M | 01:01 | moderate |
| 64 | M | 1.1:1 | moderate |
| 65 | M | 1.2:1 | moderate |
| 66 | M | 1.2:1 | moderate |
| 67 | M | 1.4:1 | moderate |
| 68 | M | 01:01 | moderate |
| 69 | M | 01:01 | moderate |
| 70 | M | 1.2:1 | moderate |
| 71 | M | 1.2:1 | moderate |
| 72 | M | 1.1:1 | moderate |
| 73 | M | 1.1:1 | moderate |
| 74 | M | 01:01 | moderate |
| 75 | M | 1.1:1 | moderate |
| 76 | M | 1.1:1 | moderate |
| 77 | M | 1.2:1 | moderate |

| | | | |
|---|---|---|---|
| 78 | M | 01:01 | moderate |
| 79 | M | 1.2:1 | moderate |
| 80 | M | 1.7:1 | moderate |
| 81 | M | 01:01 | moderate |
| 82 | M | 01:01 | moderate |
| 83 | M | 01:01 | moderate |
| 84 | M | 1.4:1 | moderate |
| 85 | M | 1.4:1 | moderate |
| 86 | M | 1.4:1 | moderate |
| 87 | M | 01:01 | moderate |
| 88 | M | 01:01 | moderate |
| 89 | M | 1.2:1 | moderate |
| 90 | M | 1.2:1 | moderate |
| 91 | M | 1.3:1 | moderate |
| 92 | M | 01:01 | moderate |
| 93 | M | 1.1:1 | moderate |
| 94 | M | 1.9:1 | moderate |
| 95 | M | 1.1:1 | moderate |
| 96 | M | 01:01 | moderate |
| 97 | M | 1.3:1 | moderate |
| 98 | M | 1.1:1 | moderate |

| | | | |
|---|---|---|---|
| 99 | M | 01:01 | moderate |
| 100 | M | 1.5:1 | moderate |
| 101 | M | 01:01 | moderate |
| 102 | M | 1.2:1 | moderate |
| 103 | M | 01:01 | moderate |
| 104 | M | 1.1:1 | moderate |
| 105 | M | 1.1:1 | moderate |
| 106 | M | 01:01 | moderate |
| 107 | M | 1.2:1 | moderate |
| 108 | M | 1.1:1 | moderate |
| 109 | M | 01:01 | moderate |
| 110 | M | 1.3:1 | moderate |
| 111 | M | 1.4:1 | moderate |
| 112 | M | 1.1:1 | moderate |
| 113 | M | 01:01 | moderate |
| 114 | M | 01:01 | moderate |
| 115 | M | 1.5:1 | moderate |
| 116 | M | 1.5:1 | moderate |
| 117 | F | 2.4:1 | mild |
| 118 | M | 3.3:1 | mild |
| 119 | M | 2.2:1 | mild |

| | | | |
|---|---|---|---|
| 120 | M | 2.1:1 | mild |
| 121 | M | 2.1:1 | mild |
| 122 | M | 2.3:1 | mild |
| 123 | M | 2.8:1 | mild |

**Table 12: AGE GROUP 51-60 YRS:**

| S. No | SEX | V:C | CATEGORY |
|---|---|---|---|
| 1 | F | 0.2:1 | severe |
| 2 | M | 0.5:1 | severe |
| 3 | M | 0.1:1 | severe |
| 4 | M | 0.3:1 | severe |
| 5 | M | 0.3:1 | severe |
| 6 | M | 0.4:1 | severe |
| 7 | M | 0.2:1 | severe |
| 8 | F | 1.1:1 | moderate |
| 9 | F | 1.9:1 | moderate |
| 10 | F | 1.6:1 | moderate |
| 11 | F | 1.1:1 | moderate |
| 12 | F | 1.1:1 | moderate |
| 13 | F | 1.6:1 | moderate |
| 14 | F | 01:01 | moderate |
| 15 | F | 1.5:1 | moderate |

| | | | |
|---|---|---|---|
| 16 | F | 1.9:1 | moderate |
| 17 | F | 1.6:1 | moderate |
| 18 | F | 1.1:1 | moderate |
| 19 | F | 1.1:1 | moderate |
| 20 | F | 1.1:1 | moderate |
| 21 | F | 1.1:1 | moderate |
| 22 | F | 01:01 | moderate |
| 23 | F | 1.3:1 | moderate |
| 24 | F | 01:01 | moderate |
| 25 | F | 01:01 | moderate |
| 26 | F | 01:01 | moderate |
| 27 | F | 1.6:1 | moderate |
| 28 | F | 1.3:1 | moderate |
| 29 | F | 1.1:1 | moderate |
| 30 | F | 1.6:1 | moderate |
| 31 | F | 1.1:1 | moderate |
| 32 | F | 1.1:1 | moderate |
| 33 | F | 1.5:1 | moderate |
| 34 | F | 1.6:1 | moderate |
| 35 | F | 01:01 | moderate |
| 36 | F | 1.8:1 | moderate |
| 37 | F | 1.5:1 | moderate |
| 38 | F | 1.4:1 | moderate |

| | | | |
|---|---|---|---|
| 39 | F | 1.1:1 | moderate |
| 40 | F | 1.1;1 | moderate |
| 41 | F | 1.3:1 | moderate |
| 42 | F | 1.1:1 | moderate |
| 43 | F | 1.1:1 | moderate |
| 44 | F | 01:01 | moderate |
| 45 | F | 1.4:1 | moderate |
| 46 | F | 1.7:1 | moderate |
| 47 | M | 1.9:1 | moderate |
| 48 | M | 1.1:1 | moderate |
| 49 | M | 1.1:1 | moderate |
| 50 | M | 1.1:1 | moderate |
| 51 | M | 1.5:1 | moderate |
| 52 | M | 01:01 | moderate |
| 53 | M | 1.1:1 | moderate |
| 54 | M | 1.2:1 | moderate |
| 55 | M | 1.2:1 | moderate |
| 56 | M | 01:01 | moderate |
| 57 | M | 1.1:1 | moderate |
| 58 | M | 1.2:1 | moderate |
| 59 | M | 01:01 | moderate |
| 60 | M | 01:01 | moderate |
| 61 | M | 1.1:1 | moderate |

| | | | |
|---|---|---|---|
| 62 | M | 1.1:1 | moderate |
| 63 | M | 01:01 | moderate |
| 64 | M | 1.1:1 | moderate |
| 65 | M | 1.5:1 | moderate |
| 66 | M | 1.2:1 | moderate |
| 67 | M | 01:01 | moderate |
| 68 | M | 1.5:1 | moderate |
| 69 | M | 1.2:1 | moderate |
| 70 | M | 1.1:1 | moderate |
| 71 | M | 1.9:1 | moderate |
| 72 | M | 1.3:1 | moderate |
| 73 | M | 01:01 | moderate |
| 74 | M | 1.1:1 | moderate |
| 75 | M | 1:1` | moderate |
| 76 | M | 1.1:1 | moderate |
| 77 | M | 1.1:1 | moderate |
| 78 | M | 1.5:1 | moderate |
| 79 | M | 1.6:1 | moderate |
| 80 | M | 01:01 | moderate |
| 81 | M | 1.1:1 | moderate |
| 82 | M | 01:01 | moderate |
| 83 | M | 1.1:1 | moderate |
| 84 | M | 1.1:1 | moderate |

| | | | |
|---|---|---|---|
| 85 | M | 1.3:1 | moderate |
| 86 | M | 1.1:1 | moderate |
| 87 | M | 01:01 | moderate |
| 88 | M | 1.1:1 | moderate |
| 89 | M | 1.1:1 | moderate |
| 90 | M | 1.1:1 | moderate |
| 91 | M | 1.4:1 | moderate |
| 92 | M | 1.1:1 | moderate |
| 93 | M | 1.9;1 | moderate |
| 94 | M | 1.3:1 | moderate |
| 95 | M | 1.3;1 | moderate |
| 96 | M | 1.1:1 | moderate |
| 97 | M | 1.5:1 | moderate |
| 98 | M | 1.3:1 | moderate |
| 99 | M | 01:01 | moderate |
| 100 | M | 1.3:1 | moderate |
| 101 | M | 01:01 | moderate |
| 102 | F | 2.3:1 | mild |
| 103 | M | 2.9:1 | mild |
| 104 | M | 2.1:1 | mild |

## Table 13 :AGE GROUP 61-70YRS:

| S. No | AGE | SEX | V:C | CATEGORY |
|---|---|---|---|---|
| 1 | 63 | F | 0.1:1 | severe |
| 2 | 68 | F | 0.3:1 | severe |
| 3 | 69 | M | 0.2:1 | severe |
| 4 | 63 | M | 0.2:1 | severe |
| 5 | 68 | M | 0.9:1 | severe |
| 6 | 68 | F | 1.1:1 | moderate |
| 7 | 70 | F | 1.3:1 | moderate |
| 8 | 63 | F | 1.2:1 | moderate |
| 9 | 67 | F | 1.1:1 | moderate |
| 10 | 61 | F | 1.1:1 | moderate |
| 11 | 65 | F | 01:01 | moderate |
| 12 | 67 | F | 1.1:1 | moderate |
| 13 | 65 | F | 01:01 | moderate |
| 14 | 62 | F | 01:01 | moderate |
| 15 | 65 | F | 1.8:1 | moderate |
| 16 | 65 | F | 01:01 | moderate |
| 17 | 67 | F | 1.2:1 | moderate |
| 18 | 66 | F | 1.1:1 | moderate |
| 19 | 70 | F | 1.5:1 | moderate |

| | | | | |
|---|---|---|---|---|
| 20 | 61 | F | 1.1:1 | moderate |
| 21 | 65 | F | 1.1:1 | moderate |
| 22 | 61 | F | 1.3:1 | moderate |
| 23 | 69 | F | 01:01 | moderate |
| 24 | 63 | F | 01:01 | moderate |
| 25 | 70 | F | 1.3:1 | moderate |
| 26 | 67 | F | 1.5:1 | moderate |
| 27 | 66 | F | 1.4:1 | moderate |
| 28 | 61 | F | 1.4:1 | moderate |
| 29 | 66 | F | 1.5:1 | moderate |
| 30 | 65 | M | 01:01 | moderate |
| 31 | 61 | M | 1.4:1 | moderate |
| 32 | 61 | M | 1.2:1 | moderate |
| 33 | 65 | M | 1.8:1 | moderate |
| 34 | 63 | M | 1.2:1 | moderate |
| 35 | 64 | M | 1.1:1 | moderate |
| 36 | 70 | M | 1.2:1 | moderate |
| 37 | 63 | M | 01:01 | moderate |
| 38 | 65 | M | 1.1:1 | moderate |
| 39 | 65 | M | 1.5:1 | moderate |
| 40 | 64 | M | 01:01 | moderate |

| | | | | |
|---|---|---|---|---|
| 41 | 65 | M | 1.1:1 | moderate |
| 42 | 69 | M | 01:01 | moderate |
| 43 | 64 | M | 1.3:1 | moderate |
| 44 | 63 | M | 1.1:1 | moderate |
| 45 | 63 | M | 1.5:1 | moderate |
| 46 | 65 | M | 1.3:1 | moderate |
| 47 | 65 | M | 01:01 | moderate |
| 48 | 70 | M | 1.7:1 | moderate |
| 49 | 65 | M | 1.5:1 | moderate |
| 50 | 68 | M | 1.1:1 | moderate |
| 51 | 66 | M | 1.2:1 | moderate |
| 52 | 68 | M | 1.8:1 | moderate |
| 53 | 69 | M | 1.5:1 | moderate |
| 54 | 68 | M | 1.4:1 | moderate |
| 55 | 64 | M | 01:01 | moderate |
| 56 | 64 | M | 1.2:1 | moderate |
| 57 | 64 | M | 1.3:1 | moderate |
| 58 | 64 | M | 1.1:1 | moderate |
| 59 | 68 | M | 1.1:1 | moderate |
| 60 | 66 | M | 1.1:1 | moderate |
| 61 | 65 | M | 1;1 | moderate |

| | | | | |
|---|---|---|---|---|
| 62 | 65 | M | 1.1:1 | moderate |
| 63 | 70 | F | 2.2:1 | mild |
| 64 | 63 | F | 2.4:1 | mild |
| 65 | 62 | M | 2.1:1 | mild |

**Table 14 :AGE GROUP 71-80YRS:**

| S. No | AGE | SEX | V:C | CATEGORY |
|---|---|---|---|---|
| 1 | 73 | F | 0.2:1 | severe |
| 2 | 72 | F | 0.12:1 | severe |
| 3 | 71 | F | 1.3:1 | moderate |
| 4 | 71 | F | 1.6:1 | moderate |
| 5 | 74 | F | 1.2:1 | moderate |
| 6 | 78 | F | 01:01 | moderate |
| 7 | 76 | F | 1.1:1 | moderate |
| 8 | 76 | F | 01:01 | moderate |

| | | | | |
|---|---|---|---|---|
| 9 | 71 | M | 1.1:1 | moderate |
| 10 | 78 | M | 1.1:1 | moderate |
| 11 | 77 | M | 01:01 | moderate |
| 12 | 71 | M | 1.1:1 | moderate |
| 13 | 75 | M | 01:01 | moderate |
| 14 | 78 | M | 1.6:1 | moderate |
| 15 | 80 | M | 01:01 | moderate |
| 16 | 72 | M | 1.4:1 | moderate |
| 17 | 80 | M | 01:01 | moderate |
| 18 | 75 | M | 1.2:1 | moderate |
| 19 | 71 | M | 1.2:1 | moderate |
| 20 | 72 | M | 1.3:1 | moderate |
| 21 | 75 | M | 01:01 | moderate |

| | | | | |
|---|---|---|---|---|
| 22 | 78 | M | 1.1:1 | moderate |
| 23 | 77 | M | 01:01 | moderate |
| 24 | 77 | M | 1.1:1 | moderate |
| 25 | 71 | M | 01:01 | moderate |
| 26 | 77 | M | 1.4:1 | moderate |
| 27 | 71 | M | 1.8;1 | moderate |
| 28 | 75 | M | 01:01 | moderate |
| 29 | 80 | M | 1.2:1 | moderate |
| 30 | 79 | F | 2.1:1 | mild |
| 31 | 78 | M | 2.7:1 | mild |

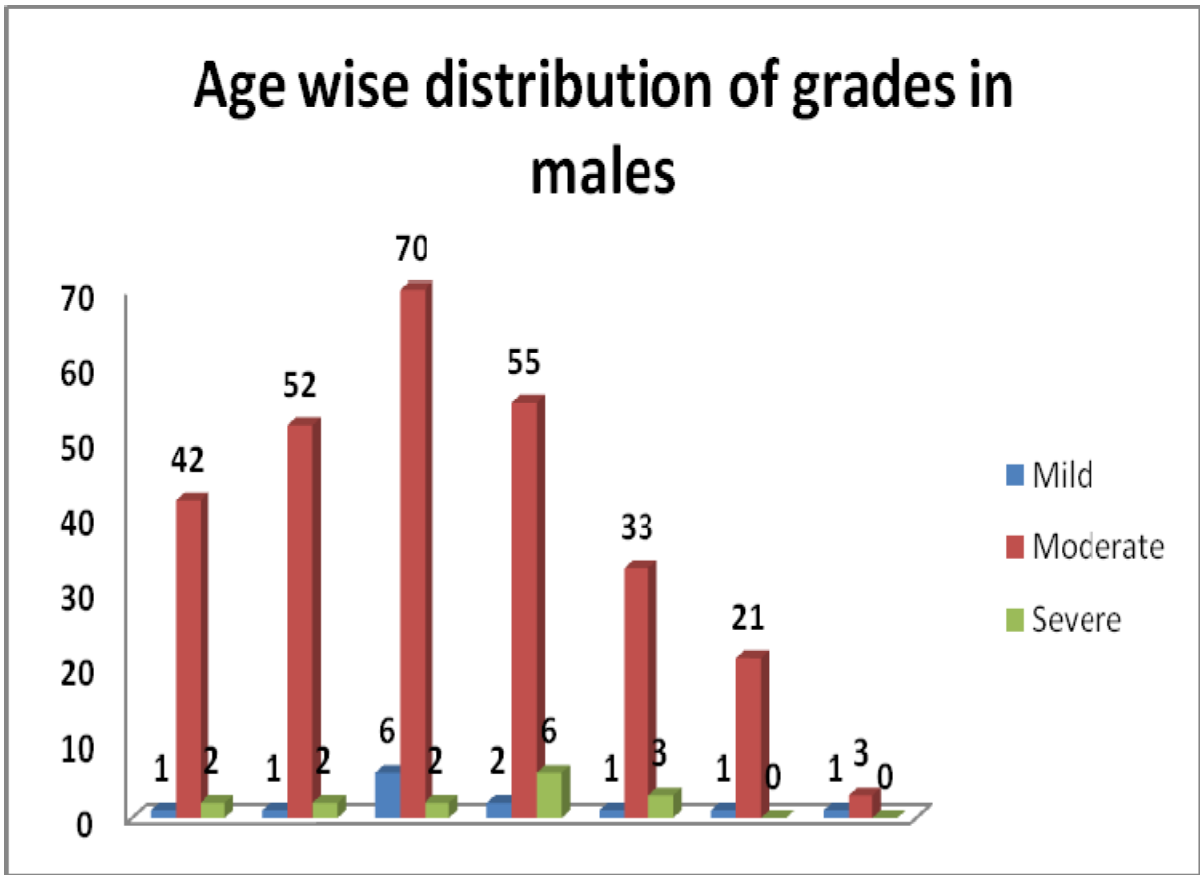
**Table 15 : AGE GROUP >81 YRS:**

| S. No | AGE | SEX | V:C | CATEGORY |
|---|---|---|---|---|
| 1 | 82 | M | 01:01 | moderate |
| 2 | 84 | M | 1.5:1 | moderate |
| 3 | 83 | M | 1.1:1 | moderate |
| 4 | 83 | M | 2.1:1 | mild |

## AGE WISE DISTRIBUTION OF GRADES IN MALES

The age wise distribution of grades for male was studied through chi-square test and found that moderate grade was ranging from 75% to 95.5% in all the age group while the incidence was less than 10% in mild and severe grades except the age group of > 81 years where the mild grade was 25% as shown in the following chart 12

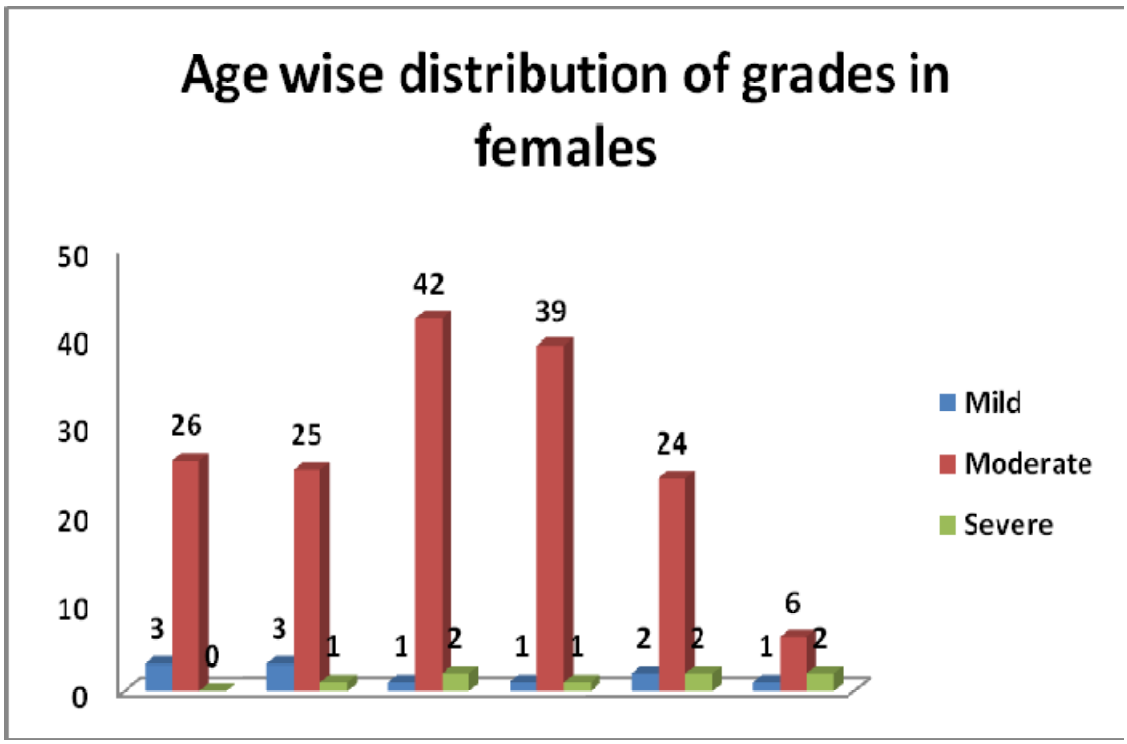
**Chart 12 : Distribution of grades in males using chi-square test**




## AGE WISE DISTRIBUTION OF GRADES IN FEMALES

In the case of female category also the incidence of moderate grade was more than 85% in respect of all the age group except the age group of 71-80 where it was only 66.7%. Though the mild and severe grades in respect of almost all the age groups were less than 10.5% it was slightly increased to 22.2% in severe grade in the age group of 71-80 as shown in the following chart.13

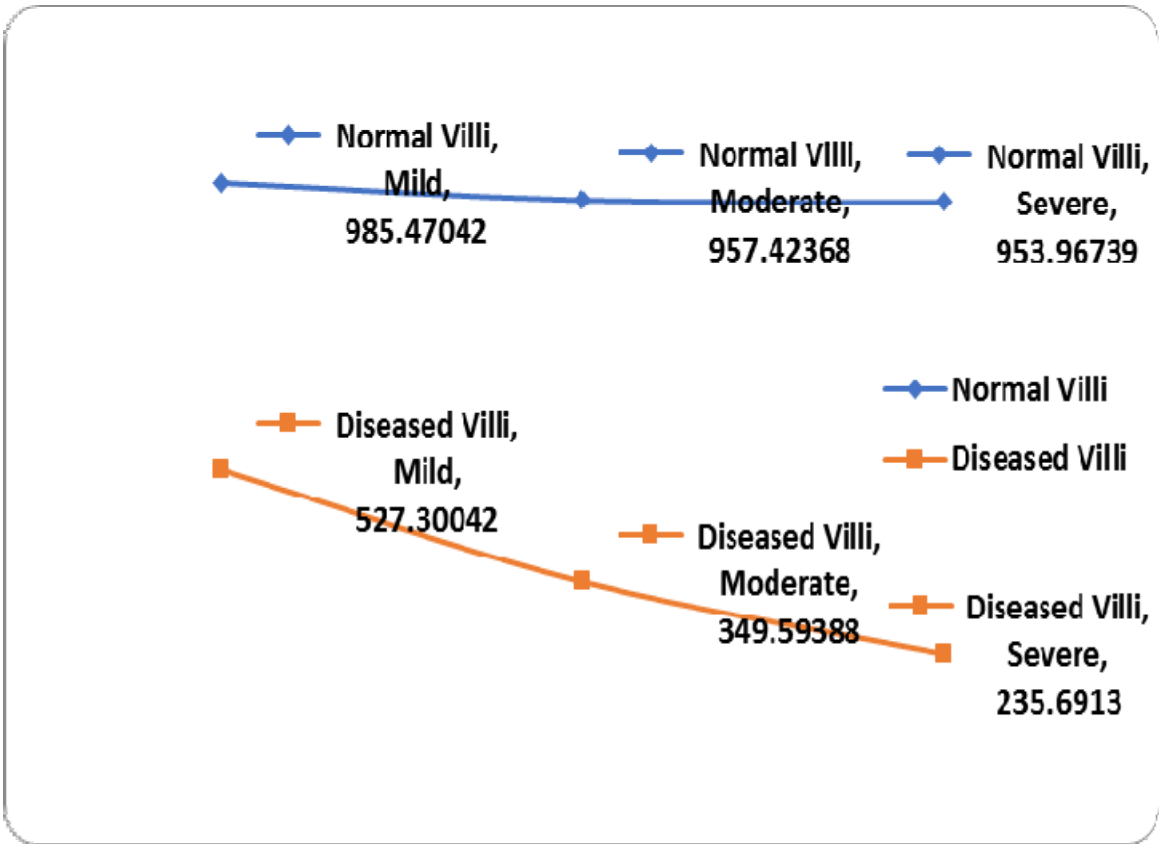
**Chart 13: Distribution of grades in females using chi-square test**




## GRADE WISE ASSESSMENT OF NORMAL TO DISEASED VILLI

Statistical analysis of the data was done using chi-square test for grade wise assessment of normal to diseased villous atrophy. Mean standard deviation and P value were assessed. It was found that in moderate grade the P value was .788 as shown in chart 14.

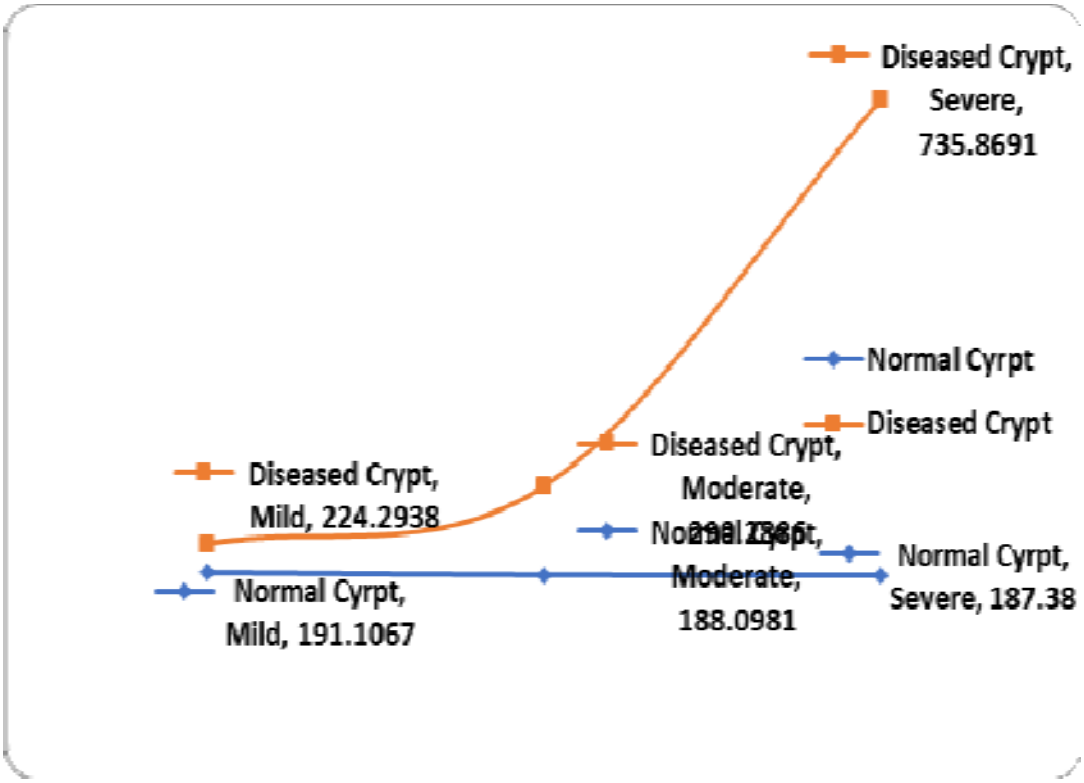
**Chart 14:**




## GRADE WISE ASSESSMENT OF NORMAL TO DISEASED CRYPT

Also, chi-square test was carried out for grade wise assessment of normal to diseased crypt and found that the P value was 0.934 in moderate grade as shown in chart 15.

**Chart 15**



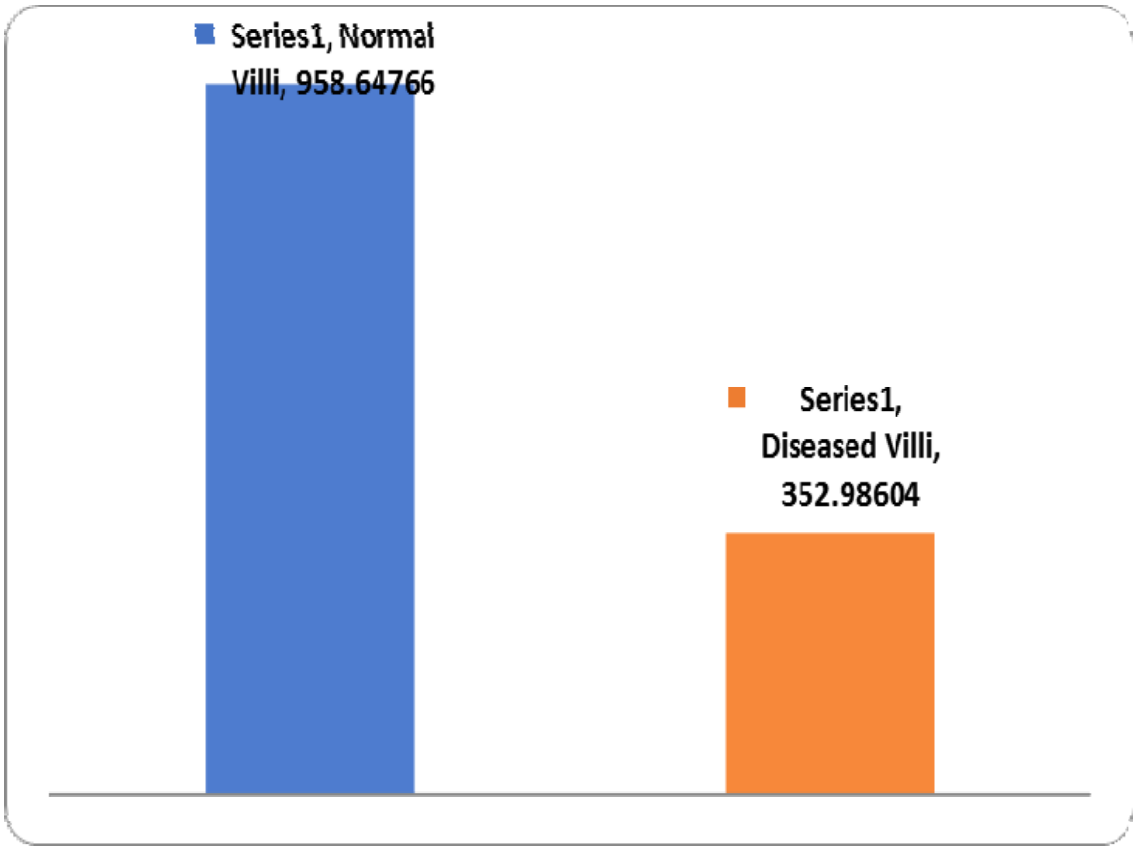

## MORPHOMETRIC MEASUREMENT OF NORMAL TO DISEASED VILLI

Morphometric measurements was taken to correlate the villous atrophy for normal villi to diseased villi by using Pearson Correlation test mean (958.65), standard (196.48) and a P value of (.003) were assessed and it was found that the values were statistically significant at the 0.01 level (2-tailed) as shown in table 16 and chart 16

## Table 16

| | N | MEAN | | | |
|---|---|---|---|---|---|
| Normal villi | 485 | 958.64 | 196. 48 | .134 | .003 |
| Diseased villi | 485 | 352.98 | | | |

## Chart 16



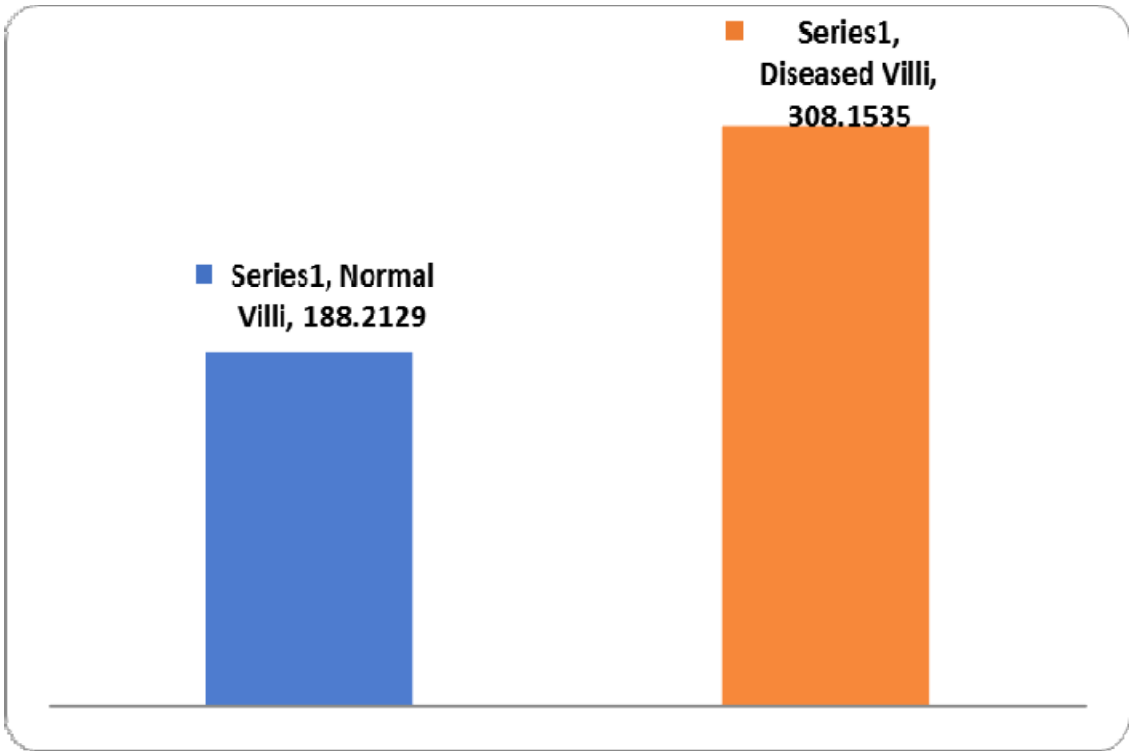
## MORPHOMETRIC MEASUREMENT OF NORMAL TO DISEASED CRYPT

Also, the Pearson Correlation test was conducted to assess the correlation between normal and diseased crypt and found mean (188.21) and standard deviation (40.29) with P value of 252.as shown in chart 17 and table 17.

**Table 17 - Pearson Correlation test**

| | N | MEAN | | | |
|---|---|---|---|---|---|
| Normal crypt | 485 | 188.21 | 40.28 | .052 | 252 |
| | 485 | 308.15 | 171.06 | | |

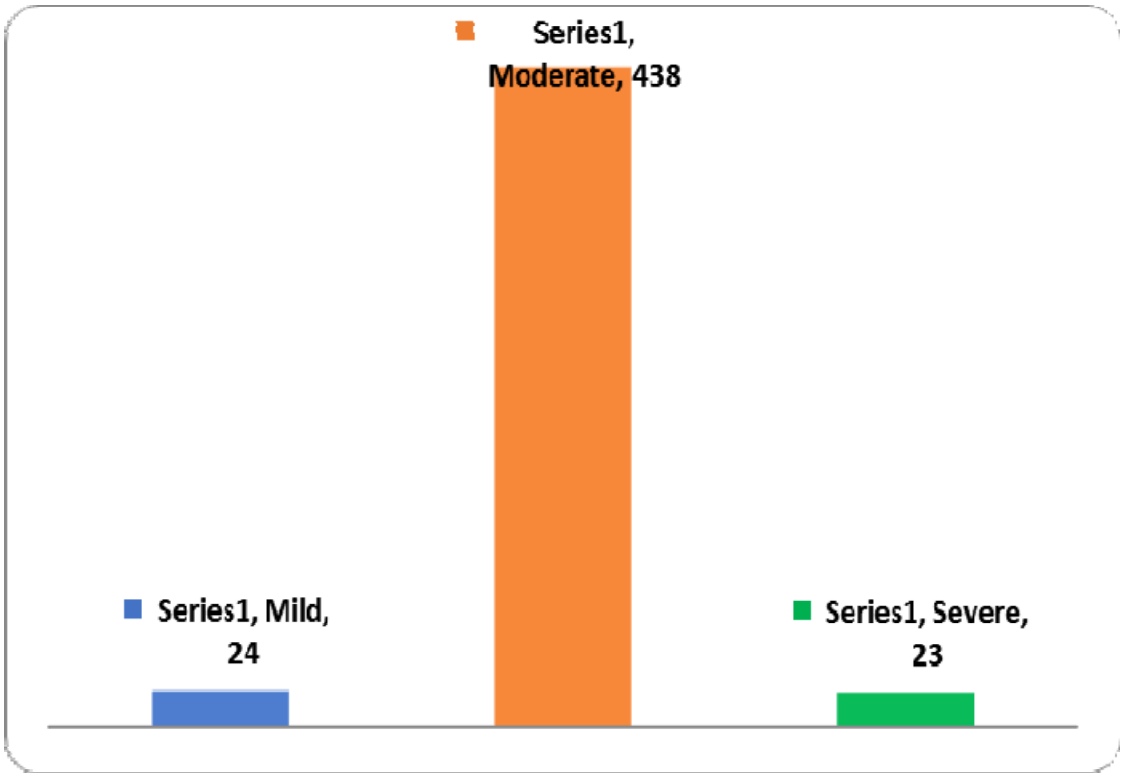
**Chart 17:**




## FREQUENCY OF DISTRIBUTION OF GRADES OF V:C IN OUR STUDY

It was noted that the moderate grade was as high as 90.3% while the mild and severe grade was only 4.9% and 4.7% respectively as shown in chart 18 and table 18.

**Table 18:**




Out of 485 cases 154 cases presented with megaloblastic anemia and 250 cases presented with chronic diarrhea. 81 cases presented with vague symptoms and fatigue.

**Table 18 – Megaloblastic anaemia with various grades V:C ratio**

| | |
|---|---|
| Mild | 11 |
| Moderate | 134 |
| Severe | 9 |

# DISCUSSION

Malabsorption is diminished absorption of nutrients and the patients present to us with clinical features of diarrhea, weight loss, anemia, vitamin deficiency etc[1]. The clinical consequences of malabsorption are varied and the expression of symptoms are variable too. Important causes of malabsorption are gluten sensitive enteropathy, milk /protein allergy, whipple's disease, tropical sprue and many more[1].

Non infective causes are more predominant cause for malabsorption in the developed countries whereas in developing countries like India tropical sprue and infective etiology are more common.

Tropical sprue is one of the most common cause of malabsorption in our setting and also the incidence of tropical sprue is on the rise. Changing life styles and diet pattern with rapid mobilization of the population has led to increase in malabsorption related disorders. Of the entire small intestine, duodenum plays an important role in digestive process in terms of motility, secretion and absorption. Histopathological examination of small intestinal biopsies is one of the most important steps in evaluating malabsorption. As duodenum is easily approachable. site the clinician prefers to take biopsies from duodenum.

Therefore, this study aimed to analyze the villous crypt ratio in mucosal biopsies received and diagnosed as tropical sprue and also to correlate with phenotypical expression of the disease.

We received 2386 number of duodenal biopsies over a period of 3 years 500 cases were reported as tropical sprue. This gives a percentage incidence of 21%. This incidence is a little less than the reported incidence of 29% by AK Dutta et al in their study on spectrum of malabsorption in India.[23]

Using inclusion and exclusion criteria 485 cases were selected for our study.

The clinical details were collected from the MRD files and the slides were analyzed for villous crypt ratio. As mentioned earlier in materials and methods the V:C ratio were graded as mild, moderate and severe as in page no:38.

It was observed that among the 485 specimens the incidence of malabsorption was highest 123(25.4%) in the age group of 41-50 and it was less than 7% in the age group of >70 yrs as shown in table-7 and chart-10.

In 485 specimens analysed,304(62.7%) were male and 181(37.3%) were female (table- 6 and chart-11). Thus, the male were preponderance over female. This is similar to the studies reported in literature.

It was noted that the moderate grade was as high as 90.3%(436/485) while the mild and severe grade was only 4.9%(26/485) and 4.7%9(23/485) respectively (table:5,8,9 to 15).

The age wise distribution for grades in male was studied through chi-square test and found that moderate grade was ranging from 75% to 95.5% in all the age group while the incidence was less than 10% in mild and severe grades except the age group of > 81 years where the mild grade was 25%(chart-12).

In the case of female category also the incidence of moderate grade was more than 85% in respect of all the age group except the age group of 71-80 where it was only 66.7%. Though the mild and severe grades in respect of almost all the age groups were less than 10.5% it was slightly increased to 22.2% in severe grade in the age group of 71-80(chart-13)

Morphometric measurements was taken to correlate the villous atrophy for normal villi to diseased villi by using Pearson Correlation test mean (958.65), standard (196.48) and a P value of (.003) were assessed and it was found that the values were statistically significant at the 0.01

level (2-tailed).Hence villous blunting is the most important parameter in diagnosing tropical sprue. Morphometric measurement of normal to diseased crypt had a P value of 252 and was statistically insignificant. Stand alone crypt depth measurements not including budding and expansion of the crypt does not make an impact on diagnosis and was statistically proven in our study.

Analysis of V:C ratio along with clinical presentation of the disease shows 154 cases out of 485 cases presented with megaloblastic anemia giving a prevalence ratio of 31.8%.When correlating with the grade of V:C only 9 cases of severe grade had megaloblastic anemia where as 134 cases and 11 cases were seen in the moderate and mild category respectively(table-18). This indicates the presence of megaloblastic anemia does not correlate with the villous blunting or grades of V:C ratio's According to literature search the severity of the disease improves with treatment and mucosa completely reverts to normal. A study done by Chidambaram et al states nearly 51% of cases diagnosed as megaloblastic anemia have tropical sprue[23]. In our study nearly 50% of the cases presented with chronic diarrhea and therefore it is important to biopsy the small intestine for confirming the diagnosis of tropical sprue by assessing the villous architecture and V:C ratio.

From our study we infer that villous blunting and calculating villous crypt ratio whenever possible will aid in diagnosing tropical sprue.

## LIMITATIONS

The limitation of this study is that this study does not include other parameters like intraepithelial lymphocytosis, megaloblastosis of crypt epithelium, stool fat estimation etc. which are corroborative features in diagnosing tropical sprue larger study with all parameters along with V:C ratio will help in formulating the morphological spectrum for diagnosing tropical sprue.

# BIBLIOGRAPHY


1. Robbins Robbins, S., Kumar, V. and Cotran, R. (2010). Robbins and Cotran Pathologic basis of disease. Philadelphia, PA: Saunders/Elsevier.

2. Brown IS, Bettington A, Bettington M, Rosty C. Tropical sprue: revisiting an under recognized disease. The American journal of surgical pathology. 2014 May 1;38(5):666-72.

3. Lee FD, Toner PG. Biopsy pathology of the small intestine. Lippincott Williams & Wilkins; 1980.

4. Glynn J. Tropical sprue—its aetiology and pathogenesis. Journal of the Royal Society of Medicine. 1986 Oct;79(10):599-606.

5. Walker MM. What is tropical sprue?. Journal of gastroenterology and hepatology. 2003 Aug;18(8):887-90.

6. Klipstein FA, Baker SJ. Regarding the definition of tropical sprue. Gastroenterology. 1970 May 1;58(5):717-21.

7. Ramakrishna BS, Venkataraman S, Mukhopadhya A. Tropical malabsorption. Postgraduate medical journal. 2006 Dec 1;82(974): 779-87.

8. Ramakrishna BS, Malabsorption syndrome in India. Indian J Gastroenterol. 1996;15:127-33.

9. Ayrey F. Outbreaks of sprue during the Burma campaign. Transactions of the Royal Society of Tropical Medicine and Hygiene. 1948;41: 377-406.

10. Girdwood RH. Fifty years after: some experiences of the medical care of prisoners of war. Scottish medical journal. 1993 Aug;38(4):120-4.

11. Mathan VI, Baker SJ. An epidemic of tropical sprue in southern India: I: Clinical features. Annals of Tropical Medicine & Parasitology. 1970 Dec 1;64(4):439-51.

12. Ghoshal UC, Srivastava D, Verma A, Ghoshal U. Tropical sprue in 2014: the new face of an old disease. Current gastroenterology reports. 2014 Jun 1;16(6):391.

13. Kagnoff MF. Overview and pathogenesis of celiac disease. Gastroenterology. 2005 Apr 1;128(4):S10-8.

*14.* Pathogenesis of Post Infectious Irritable Bowel syndrome: medicine update APICON 2011 *www.apiindia.org*

15. Thabane M, Marshall JK. Post-infectious irritable bowel syndrome. World journal of gastroenterology: WJG. 2009 Aug 7;15(29): 3591:3591.

16. Alvarez JJ, Zaga-Galante J, Vergara-Suarez A, Randall CW (2014) Tropical Sprue. J Trop Dis 2: 130. doi: 10.4172/2329-891X.1000130

17. Sharma P, Baloda V, Gahlot GP, Singh A, Mehta R, Vishnubathla S, Kapoor K, Ahuja V, Gupta SD, Makharia GK, Das P. Clinical, endoscopic, and histological differentiation between celiac disease and tropical sprue: A systematic review. Journal of Gastroenterology and Hepatology. 2019 Jan;34(1):74-83.

18. Taavela J, Koskinen O, Huhtala H, Lähdeaho ML, Popp A, Laurila K, Collin P, Kaukinen K, Kurppa K, Mäki M. Validation of morphometric analyses of small-intestinal biopsy readouts in celiac disease. PloS one. 2013 Oct 11;8(10):e76163.

19. Balasubramanian P, Badhe BA, Ganesh RN, Panicker LC, Mohan P. Morphologic Spectrum of Duodenal Biopsies in Malabsorption: A Study from Southern India. Journal of clinical and diagnostic research: JCDR. 2017 Jul;11(7):EC17.

20. Juha Taavela. Morphometry of Duodenal Mucosa in Coeliac Disease Validation of morphometry and correlation to disease manifestations: Acta Universitatis Tamperensis 2126

21. Karegar MM, Kothari K, Mirjolkar AS. Duodenal biopsy in malabsorption–A clinicopathological study. Ind J Pathol Oncol. 2016 Apr;3(2):197-201.

22. Dutta AK, Balekuduru A, Chacko A. Spectrum of malabsorption in India-tropical sprue is still the leader. J Assoc Physicians India. 2011 Jul;59(59):420-2.

23. Chidambaram Y et al. Tropical sprue in megaloblastic anemia Int J Res Med Sci. 2017 Sep;5(9):4133-4137

# MASTER CHART

| S.No | AGE | SEX | HISTO NO | NORMAL VILLI | NORMAL CRYPT | V:C | DISEASED VILLI | DISEASED CRYPT | V:C | CLINICAL FEATURES |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 50 | F | 012/15 | 783.14 | 189.85 | 4.1:1 | 176.33 | 121.89 | 1.4:1 | Malabsorption |
| 2 | 54 | M | 66 | 901.41 | 140.88 | 6.3:1 | 395.8 | 200.82 | 1.9:1 | Malabsorption |
| 3 | 71 | M | 68 | 998.25 | 231.41 | 4.3:1 | 391.48 | 371.51 | 1.1:1 | Malabsorption |
| 4 | 38 | F | 116 | 855.75 | 189.72 | 4.5:1 | 367.22 | 304.25 | 1.2:1 | Malabsorption |
| 5 | 21 | M | 187 | 788.01 | 201.49 | 3.9:1 | 313.88 | 297.56 | 1.1:1 | Malabsorption |
| 6 | 23 | F | 190 | 927.5 | 222.49 | 4.2:1 | 313.88 | 300.01 | 1:01 | Malabsorption |
| 7 | 59 | M | 200 | 954.85 | 237.34 | 4:01 | 415.58 | 755.57 | 0.5:1 | Anemia for evaluation |
| 8 | 55 | M | 229 | 974.59 | 158.3 | 6.1:1 | 324.59 | 307.97 | 1.1:1 | Malabsorption |
| 9 | 60 | F | 243 | 1111.21 | 172.5 | 6.4:1 | 338.75 | 300.81 | 1.1:1 | Malabsorption |
| 10 | 65 | M | 298 | 1056.72 | 167.56 | 6.3:1 | 420.31 | 400.31 | 1:01 | Malabsorption |
| 11 | 58 | M | 299 | 998.26 | 232.41 | 4.3:1 | 392.48 | 372.51 | 1.1:1 | Malabsorption |
| 12 | 52 | M | 372 | 759.59 | 120.73 | 6.3:1 | 124.79 | 694.75 | 0.1:1 | Rheumatic heart disease |
| 13 | 41 | M | 384 | 1106.84 | 194.56 | 5.7:1 | 1018.33 | 304.09 | 3.3:1 | B12 deficiency |
| 14 | 38 | M | 404 | 1098.15 | 164.95 | 6.7:1 | 458.95 | 403.12 | 1.1:1 | B12 deficiency |
| 15 | 48 | F | 472 | 751.8 | 238.12 | 3.2:1 | 554.11 | 513.45 | 1:01 | Abdominal discomfort |
| 16 | 71 | F | 504 | 1234.86 | 217.19 | 5.7:1 | 360.124 | 286.02 | 1.3:1 | Recurrent abdominal pain |
| 17 | 38 | M | 554 | 661.02 | 206.19 | 3.2:1 | 217.53 | 207.86 | 1:01 | Malabsorption |
| 18 | 61 | M | 556 | 789.5 | 190.74 | 4.1:1 | 575.66 | 398.33 | 1.4:1 | Malabsorption |
| 19 | 34 | M | 576 | 822.76 | 160.88 | 5.1:1 | 294.57 | 293.3 | 1:01 | Malabsorption |
| 20 | 49 | M | 603 | 1120.55 | 229.96 | 4.9:1 | 506.27 | 501.02 | 1:01 | Loose stools |
| 21 | 15 | M | 615 | 771.44 | 115.18 | 6.7:1 | 480.65 | 199.69 | 2.4:1 | Malabsorption |
| 22 | 22 | M | 662 | 680.49 | 144.47 | 4.7:1 | 322.02 | 311.19 | 1:01 | Malabsorption |
| 23 | 34 | M | 706 | 1238.7 | 195.89 | 6.3:1 | 439.37 | 413.59 | 1.1:1 | Malabsorption |
| 24 | 43 | F | 735 | 777.86 | 114.49 | 6.7:1 | 322.02 | 311.19 | 1:01 | Malabsorption |
| 25 | 38 | M | 844 | 1294.82 | 200.02 | 6.5:1 | 400.05 | 340.74 | 1.2:1 | Malabsorption |
| 26 | 44 | M | 879 | 819.44 | 189.08 | 4.3:1 | 603.53 | 269.12 | 2.2:1 | B12 deficiency |
| 27 | 52 | F | 882 | 1025.95 | 228.96 | 4.5:1 | 595.58 | 256.03 | 2.3:1 | Malabsorption |
| 28 | 52 | M | 1010 | 1057.23 | 177.89 | 5.9:1 | 395.09 | 361.56 | 1.1:1 | Malabsorption |
| 29 | 21 | M | 1118 | 764.37 | 162.14 | 4.7:1 | 366.21 | 274.51 | 1.3:1 | Heart burn |
| 30 | 82 | M | 1144 | 1243.89 | 182.98 | 6.8:1 | 435.39 | 426.89 | 1:01 | Heart burn |
| 31 | 48 | F | 1152 | 1063.12 | 193.06 | 5.5:1 | 741.25 | 389.48 | 1.9:1 | Loose stools,Weight loss |
| 32 | 54 | M | 1158 | 1016.42 | 173.4 | 5.8:1 | 544.85 | 366.1 | 1.5:1 | Anemia for evaluation |
| 33 | 61 | M | 1202 | 938.97 | 173.04 | 5.4:1 | 515.39 | 441.95 | 1.2:1 | Weight loss |
| 34 | 54 | F | 1212 | 993.74 | 158.65 | 6.3:1 | 540.8 | 302.81 | 1.9:1 | Chronic diarrhea under evaluation |
| 35 | 48 | M | 1221 | 1093.74 | 188.65 | 5.8:1 | 540.8 | 302.81 | 1.8:1 | To rule out Malabsorption |
| 36 | 49 | M | 1286 | 860.76 | 169.69 | 5.1:1 | 540.8 | 302.81 | 1.8:1 | To rule out Abdominal pain |
| 37 | 34 | M | 1307 | 1038.86 | 165.74 | 6.3:1 | 594.32 | 285.68 | 2.1:1 | To rule out Malabsorption syndrome |
| 38 | 70 | F | 1392 | 872.35 | 182.95 | 4.8:1 | 594.08 | 267.4 | 2.2:1 | To rule out Malabsorption |
| 39 | 65 | M | 1398 | 1102.85 | 175.69 | 6.3:1 | 489.08 | 267.4 | 1.8:1 | To rule out Malabsorption |
| 40 | 57 | F | 1540 | 926.85 | 189.72 | 4.9:1 | 456.36 | 289.06 | 1.6:1 | Dimorphic anemia/B12 deficiency |
| 41 | 55 | F | 1543 | 867.22 | 138.86 | 6.3:1 | 304.01 | 284.92 | 1.1:1 | B12 deficiency |
| 42 | 28 | M | 1545 | 1217.32 | 185.02 | 6.6:1 | 365.385 | 315.52 | 1.2:1 | To rule out Malabsorption |

# MASTER CHART

| S.No | AGE | SEX | HISTO NO | NORMAL VILLI | NORMAL CRYPT | V:C | DISEASED VILLI | DISEASED CRYPT | V:C | CLINICAL FEATURES |
|---|---|---|---|---|---|---|---|---|---|---|
| 43 | 71 | F | 1553 | 1170.21 | 170.02 | 6.9:1 | 427.82 | 259.92 | 1.6:1 | Malabsorption |
| 44 | 78 | M | 1598 | 1083.98 | 159.11 | 6.8:1 | 390.39 | 347.53 | 1.1:1 | To rule out Malabsorption |
| 45 | 54 | F | 1626 | 1144.99 | 242.66 | 4.7:1 | 389.73 | 340.26 | 1.1:1 | To rule out Malabsorption |
| 46 | 24 | F | 1630 | 830.38 | 189.42 | 4.4:1 | 404.35 | 282.01 | 1.4:1 | To rule out Malabsorption |
| 47 | 47 | F | 1670 | 893.93 | 274.15 | 3.3:1 | 291.21 | 282.61 | 1:01 | To rule out Malabsorption syndrome |
| 48 | 25 | F | 1744 | 979.36 | 263.41 | 3.7:1 | 491.05 | 434.22 | 1.1:1 | To rule out Malabsorption |
| 49 | 56 | M | 1746 | 984.498 | 213.47 | 4.6:1 | 425.6 | 418.55 | 1:01 | Chronic diarrhea |
| 50 | 49 | M | 1867 | 1001.79 | 309.81 | 3.2:1 | 699.39 | 339.38 | 2.1:1 | Malabsorption |
| 51 | 63 | M | 1877 | 1141.68 | 248.62 | 4.6:1 | 470.28 | 383.2 | 1.2:1 | Dimorphic anemia |
| 52 | 20 | M | 1891 | 1086.56 | 192.26 | 5.7:1 | 286.02 | 254.38 | 1.1:1 | Abdominal pain |
| 53 | 48 | M | 2000 | 1363.25 | 319.04 | 4.3:1 | 399.73 | 383.98 | 1:01 | Malabsorption |
| 54 | 68 | F | 2101 | 1390.42 | 368.13 | 3.8:1 | 462.98 | 421.48 | 1.1:1 | To rule out Malabsorption |
| 55 | 57 | M | 2116 | 1111.62 | 211.07 | 5.3:1 | 309.92 | 273.09 | 1.1:1 | Malabsorption under evaluation |
| 56 | 64 | M | 2137 | 806.36 | 202.11 | 3.9:1 | 328.81 | 309.33 | 1.1:1 | Eosinophilic colitis |
| 57 | 52 | M | 2166 | 1233 | 179.63 | 6.9:1 | 594.19 | 198.17 | 2.9:1 | Malabsorption |
| 58 | 41 | F | 2373 | 1418.57 | 206.03 | 6.9:1 | 628.85 | 380.46 | 1.7:1 | Chronic diarrhea for evaluation |
| 59 | 50 | M | 2401 | 1059.63 | 171.12 | 6.2:1 | 392.14 | 185.08 | 2.1:1 | Megaloblastic anemia |
| 60 | 33 | M | 2547 | 1380.14 | 234.01 | 5.9:1 | 386.12 | 309.4 | 1.2:1 | chronic diarrhea |
| 61 | 70 | F | 2571 | 823.89 | 211.38 | 3.9:1 | 402.22 | 320.46 | 1.3:1 | Malabsorption syndrome |
| 62 | 63 | F | 2594 | 1001.9 | 146.41 | 6.8:1 | 413.47 | 344.7 | 1.2:1 | Iron deficiency anemia |
| 63 | 47 | M | 2631 | 1265.07 | 250.53 | 5:01 | 315.52 | 303.05 | 1:01 | Malabsorption |
| 64 | 42 | M | 2645 | 1314.46 | 197.45 | 6.7:1 | 473.17 | 403.59 | 1.2:1 | Malabsorption |
| 65 | 43 | M | 2674 | 1162.52 | 210.54 | 5.5:1 | 379.57 | 355.07 | 1.1:1 | Loose stools |
| 66 | 40 | F | 2994 | 607.63 | 281.92 | 2.2:1 | 548.79 | 225.38 | 2.4:1 | Dysphagia/Odynophagia |
| 67 | 35 | M | 3006 | 953.24 | 254.7 | 3.7:1 | 471.55 | 410.04 | 1.2:1 | To rule out Abdominal pain |
| 68 | 34 | M | 3081 | 998.73 | 142.83 | 6.9:1 | 465.76 | 366.1 | 1.3:1 | To rule out Anemia/Abdominal pain |
| 69 | 45 | F | 3101 | 1107.39 | 181.71 | 6.1:1 | 260.47 | 510.87 | 0.5:1 | To rule out Malabsorption |
| 70 | 77 | M | 3173 | 1151.62 | 229.29 | 5:01 | 434.63 | 422.82 | 1:01 | Anemia for evaluation/Anorexia |
| 71 | 70 | M | 3450 | 884.73 | 210.54 | 4.2:1 | 483.89 | 405.18 | 1.2:1 | Malabsorption syndrome |
| 72 | 60 | F | 3459 | 996.97 | 181.75 | 5.5:1 | 479.05 | 303.31 | 1.6:1 | B12 deficiency |
| 73 | 63 | M | 3503 | 1021.71 | 190.57 | 5.4:1 | 407.8 | 393.79 | 1:01 | To rule out Malabsorption |
| 74 | 15 | F | 3519 | 1021.71 | 190.57 | 5.4:1 | 407.8 | 404.81 | 1:01 | To rule out Malabsorption |
| 75 | 50 | M | 3558 | 1181.3 | 177.02 | 6.7:1 | 271.89 | 221.99 | 1.2:1 | To rule out Malabsorption |
| 76 | 65 | M | 3760 | 837.96 | 217.23 | 3.9:1 | 441.06 | 386.63 | 1.1:1 | Generalized weakness |
| 77 | 58 | F | 3819 | 1014.7 | 166.52 | 6.1:1 | 338.24 | 328.92 | 1:01 | Chronic anemia /Non specific duodenitis |
| 78 | 44 | F | 3824 | 1447.52 | 207.6 | 6.9:1 | 348.55 | 274.56 | 1.2:1 | Malabsorption |
| 79 | 36 | M | 3890 | 1303.31 | 197.25 | 6.6:1 | 711 | 622.61 | 1.1:1 | To rule out Malabsorption |
| 80 | 27 | M | 3960 | 1154.01 | 196.47 | 5.8:1 | 514.84 | 329.84 | 1.6:1 | To rule out Malabsorption |
| 81 | 46 | M | 3968 | 922.61 | 169.3 | 5.4:1 | 355.88 | 310.4 | 1.1:1 | Dyspepsia |
| 82 | 65 | M | 4031 | 1067.78 | 225.13 | 4.7:1 | 554.77 | 377.05 | 1.5:1 | Macrocytic anemia |
| 83 | 21 | M | 4066 | 903.61 | 146.92 | 6.2:1 | 368.37 | 293.64 | 1.3:1 | T o rule out Abdominal pain |

# MASTER CHART

| S.No | AGE | SEX | HISTO NO | NORMAL VILLI | NORMAL CRYPT | V:C | DISEASED VILLI | DISEASED CRYPT | V:C | CLINICAL FEATURES |
|---|---|---|---|---|---|---|---|---|---|---|
| 84 | 30 | M | 4104 | 1036.76 | 195.07 | 5.3:1 | 396.15 | 267.91 | 1.5:1 | Pancytopenia under evaluation |
| 85 | 49 | F | 4139 | 863.44 | 136.92 | 6.3:1 | 354.15 | 195.72 | 1.8:1 | To rule out Malabsorption syndrome |
| 86 | 32 | F | 4142 | 1164.82 | 227.92 | 5.1:1 | 269.03 | 265.58 | 1:01 | To rule out Malabsorption |
| 87 | 20 | F | 4233 | 1112.14 | 185.19 | 6:01 | 552.21 | 260.18 | 2.1:1 | To rule out Malabsorption |
| 88 | 22 | M | 4275 | 1148.58 | 210.54 | 5.4:1 | 590.54 | 298.85 | 1.9:1 | To rule out Malabsorption |
| 89 | 60 | M | 4282 | 998.75 | 153.05 | 6.5:1 | 270.56 | 218.28 | 1.2:1 | To rule out Malabsorption |
| 90 | 44 | M | 4316 | 876.6 | 348.35 | 2.5:1 | 429.93 | 384.45 | 1.1:1 | To rule out Malabsorption |
| 91 | 40 | F | 4381 | 1019.33 | 165.85 | 6.1:1 | 548.35 | 231.54 | 2.4:1 | To rule out Malabsorption syndrome |
| 92 | 52 | M | 4405 | 1028.05 | 221 | 4.7:1 | 425.9 | 363.88 | 1.2:1 | Macrocytic anemia |
| 93 | 48 | F | 4409 | 856.1 | 122.33 | 6.9:1 | 448.4 | 328.24 | 1.4:1 | To rule out Malabsorption |
| 94 | 59 | F | 4426 | 730.48 | 112.91 | 6.5:1 | 547.06 | 356.7 | 1.5:1 | To rule out Malabsorption |
| 95 | 32 | F | 4486 | 1098.99 | 254.45 | 4.3:1 | 369.18 | 307.11 | 1.2:1 | To rule out Vomitting under evaluation |
| 96 | 36 | M | 4513 | 1067.32 | 196.59 | 5.4:1 | 247.81 | 243.6 | 1:01 | To rule out Malabsorption |
| 97 | 83 | M | 4516 | 1011.28 | 174.16 | 5.8:1 | 454.19 | 219.78 | 2.1:1 | To rule out Megaloblastic aneemia |
| 98 | 39 | F | 4530 | 1146.94 | 193.4 | 5.9:1 | 329.34 | 300.56 | 1.1:1 | To rule out Malabsorption |
| 99 | 71 | M | 4887 | 1122.65 | 181.89 | 6.2:1 | 349.25 | 311.94 | 1.1:1 | To rule out Malabsorption |
| 100 | 48 | F | 5051 | 1210.82 | 214.12 | 5.7:1 | 566.05 | 514.89 | 1.1:1 | To rule out Malabsorption |
| 101 | 32 | M | 5272 | 967.05 | 195.1 | 4.9:1 | 297.88 | 260.49 | 1.1:1 | To rule out Malabsorption |
| 102 | 60 | F | 5325 | 923.4 | 225.42 | 4.1:1 | 492.69 | 262.21 | 1.9:1 | Increased frequency of stools |
| 103 | 20 | F | 5333 | 1039.17 | 149.63 | 6.9:1 | 273.53 | 257.56 | 1.1:1 | Chronic small bowel diarrhea |
| 104 | 50 | F | 5362 | 1157.92 | 197.36 | 5.9:1 | 289.65 | 286.05 | 1:01 | Recurrent oral ulcer/Weight loss |
| 105 | 57 | M | 5439 | 974.54 | 184.58 | 5.3:1 | 331.28 | 330.95 | 1:01 | Malabsorption |
| 106 | 46 | F | 5476 | 868.51 | 147.51 | 5.9:1 | 217.34 | 207.64 | 1:01 | Chronic diarrhea/Weight loss |
| 107 | 50 | M | 5720 | 978.5 | 156.19 | 6.3:1 | 266.34 | 213.14 | 1.2:1 | Abdominal pain/Fatigue |
| 108 | 27 | F | 5739 | 1047.75 | 152.26 | 6.9:1 | 452.19 | 219.78 | 2:01 | Abdominal bloating sensation |
| 109 | 64 | M | 5926 | 1005.08 | 225.02 | 4.7:1 | 258.45 | 251.98 | 1:01 | To rule out Malabsorption syndrome |
| 110 | 33 | M | 5983 | 1145.69 | 175.23 | 6.5:1 | 343.39 | 217.71 | 1.6:1 | Dyspepsia |
| 111 | 46 | M | 6067 | 1002.76 | 149.68 | 6.7:1 | 250.28 | 213.71 | 1.2:1 | To rule out malabsorption syndrome |
| 112 | 59 | F | 6198 | 660.43 | 207.32 | 3.2:1 | 436.93 | 273.97 | 1.6:1 | Malabsorption syndrome |
| 113 | 46 | M | 6349 | 638.69 | 185.41 | 3.4:1 | 251.98 | 217.32 | 1.2:1 | To rule out Malabsorption syndrome |
| 114 | 48 | M | 6365 | 953.27 | 168.45 | 5.7:1 | 404.53 | 403.87 | 1:01 | To rule out Malabsorption syndrome |
| 115 | 21 | M | 6396 | 859.12 | 126.3 | 6.8:1 | 540.46 | 398.51 | 1.4:1 | Abdominal pain |
| 116 | 47 | M | 6415 | 1432.1 | 242.96 | 5.9:1 | 332.77 | 305.21 | 1.1:1 | Anemia |
| 117 | 49 | M | 6485 | 873.68 | 181.75 | 4.8:1 | 269.69 | 192.72 | 1.4:1 | To r/O Malabsorption |
| 118 | 84 | M | 6533 | 1052.02 | 175.69 | 5.9:1 | 337.9 | 225.56 | 1.5:1 | B12 deficiency /CAD |
| 119 | 28 | F | 73 | 875.24 | 135.18 | 6.5:1 | 202.43 | 162.88 | 1.2:1 | To rule out Malabsorption syndrome |
| 120 | 35 | F | 168 | 1266.41 | 222.67 | 5.7:1 | 278.57 | 240.59 | 1.2:1 | To rule out Malabsorption syndrome |
| 121 | 62 | M | 227 | 1018.67 | 172.2 | 5.9:1 | 395.5 | 184.17 | 2.1:1 | Megaloblastic anemia |

# MASTER CHART

| S.No | AGE | SEX | HISTO NO | NORMAL VILLI | NORMAL CRYPT | V:C | DISEASED VILLI | DISEASED CRYPT | V:C | CLINICAL FEATURES |
|---|---|---|---|---|---|---|---|---|---|---|
| 122 | 75 | M | 247 | 800.17 | 123.9 | 6.5:1 | 349.25 | 346.76 | 1:01 | GERD |
| 123 | 78 | M | 270 | 1015.7 | 178.71 | 5.7:1 | 508.87 | 316.09 | 1.6:1 | Fever,Dyspepsia,Duodenitis |
| 124 | 59 | M | 300 | 1105.96 | 213.51 | 5.2:1 | 307.92 | 280.2 | 1.1:1 | To rule out Malabsorption |
| 125 | 41 | F | 332 | 1141.73 | 175.23 | 6.5:1 | 301.68 | 280.9 | 1.1:1 | To rule out Malabsorption |
| 126 | 43 | F | 348 | 1179.29 | 188.85 | 6.2:1 | 202.76 | 198.89 | 1:01 | To rule out Malabsorption |
| 127 | 44 | F | 352 | 675.26 | 136.1 | 4.9:1 | 202.11 | 138.14 | 1.5:1 | Known case of Tropical sprue |
| 128 | 26 | M | 366 | 1080.57 | 189.47 | 5.7:1 | 472.98 | 435.06 | 1.1:1 | Chronic diarrhea |
| 129 | 40 | M | 370 | 870.23 | 127.19 | 6.8:1 | 227.1 | 211.71 | 1.1:1 | Loose stools on & off |
| 130 | 27 | M | 379 | 1170.23 | 227.19 | 5.2:1 | 277.1 | 251.71 | 1.1:1 | Megaloblastic anemia |
| 131 | 39 | F | 381 | 1195.37 | 247.81 | 4.8:1 | 338.55 | 295.44 | 1.1:1 | To rule out Tropical sprue |
| 132 | 59 | M | 404 | 852.02 | 194.92 | 4.4:1 | 437.76 | 370.58 | 1.2:1 | To rule out Malabsorption |
| 133 | 60 | F | 408 | 511.44 | 177.7 | 2.9:1 | 468.94 | 439.94 | 1.1:1 | Anemia for evaluation/B12 deficiency |
| 134 | 59 | F | 438 | 1091.47 | 199.99 | 5.5:1 | 366.49 | 328.24 | 1.1:1 | Anemia/B12 deficiency/Weight loss |
| 135 | 65 | M | 463 | 1046.025 | 154.16 | 6.8:1 | 194.16 | 175.19 | 1.1:1 | Small bowel diarrhea/B12 deficiency |
| 136 | 45 | M | 480 | 898.45 | 183.44 | 4.9:1 | 241.99 | 237.68 | 1:01 | To rule out Malabsorption syndrome |
| 137 | 55 | M | 565 | 1145.37 | 290.59 | 3.9:1 | 408.93 | 400.02 | 1:01 | To rule out Malabsorption |
| 138 | 21 | M | 776 | 850.6 | 172.15 | 4.9:1 | 437.65 | 424.08 | 1:01 | Weight loss/Postprandial bloating |
| 139 | 60 | F | 987 | 816.6 | 151.15 | 5.4:1 | 347.39 | 306.65 | 1.1:1 | Chronic diarrhea |
| 140 | 26 | M | 1071 | 792.37 | 184.71 | 4.2:1 | 472.23 | 328.95 | 1.4:1 | To rule out Eoisnophilic gastritis |
| 141 | 69 | M | 1092 | 990.48 | 184.53 | 5.4:1 | 310.33 | 310.11 | 1:01 | To rule out Malabsorption |
| 142 | 30 | M | 1185 | 836.07 | 166.52 | 5:01 | 464.43 | 911.52 | 0.5:1 | Dysphagia for solids/B12 deficiency |
| 143 | 52 | M | 1293 | 1311.04 | 196.56 | 6.7:1 | 217.71 | 662.58 | 0.3:1 | B12 deficiency |
| 144 | 18 | M | 1393 | 967.08 | 156.5 | 6.2:1 | 359.25 | 262.99 | 1.4:1 | Fever/B12 deficiency |
| 145 | 34 | M | 1479 | 793.37 | 185.71 | 4.3:1 | 359.4 | 307.69 | 1.2:1 | To rule out Malabsorption |
| 146 | 67 | F | 1486 | 812.76 | 191.72 | 4.2:1 | 295.841 | 261.23 | 1.1:1 | Loose stools/B12 deficiency |
| 147 | 64 | M | 1506 | 1088.39 | 173.95 | 6.3:1 | 292.54 | 231.79 | 1.3:1 | Malabsorption |
| 148 | 31 | M | 1654 | 1008.73 | 180.99 | 5.6:1 | 469.83 | 285 | 1.6:1 | To rule out Malabsorption |
| 149 | 61 | F | 1682 | 998.16 | 188.52 | 5.3:1 | 472.37 | 434.8 | 1.1:1 | Severe microcytic anemia |
| 150 | 20 | M | 1848 | 1025.89 | 179.41 | 5.7:1 | 274.56 | 260.02 | 1.1:1 | To rule out Malabsorption |
| 151 | 65 | F | 1854 | 1036.58 | 174.4 | 5.9:1 | 330.94 | 328.24 | 1:01 | To rule out Malabsorption syndrome |
| 152 | 19 | M | 1869 | 1321.5 | 347.26 | 3.8:1 | 225.02 | 202.02 | 1.1:1 | Iron deficiency anemia |
| 153 | 42 | M | 1882 | 847.21 | 166.27 | 5.1:1 | 290.29 | 253.01 | 1.1:1 | Vomitting on & off/ Weight loss |
| 154 | 49 | M | 1919 | 823.86 | 221.36 | 3.7:1 | 270.29 | 230.8 | 1.2:1 | Malabsorption syndrome |
| 155 | 80 | M | 2039 | 792.52 | 136.99 | 5.8:1 | 291.87 | 276.59 | 1:01 | To rule out Malabsorption |
| 156 | 38 | M | 2042 | 1057 | 182.66 | 5.8:1 | 426.46 | 412.51 | 1:01 | Post prandial increased stools |
| 157 | 38 | M | 2071 | 1046.11 | 178.71 | 5.9:1 | 250.06 | 198.2 | 1.2:1 | Malabsorption |
| 158 | 69 | M | 2157 | 931.47 | 202.91 | 4.6:1 | 136.99 | 611.83 | 0.2:1 | To rule out Tropical sprue |
| 159 | 19 | M | 2167 | 844.23 | 230.07 | 3.7:1 | 269.57 | 240.13 | 1.1:1 | Non specific ileitis |
| 160 | 34 | F | 2191 | 1096.98 | 186.49 | 5.9:1 | 360.76 | 333.92 | 1.1:1 | Loose stools/Severe megaloblastic anemia |
| 161 | 50 | M | 2198 | 1133.36 | 164.32 | 6.9:1 | 267.76 | 220.22 | 1.2:1 | Malabsorption |

# MASTER CHART

| S.No | AGE | SEX | HISTO NO | NORMAL VILLI | NORMAL CRYPT | V:C | DISEASED VILLI | DISEASED CRYPT | V:C | CLINICAL FEATURES |
|---|---|---|---|---|---|---|---|---|---|---|
| 162 | 57 | M | 2218 | 725.86 | 159.52 | 4.6:1 | 400.96 | 399.66 | 1:01 | Dimorphic anemia/Spleenomagaly |
| 163 | 25 | M | 2222 | 1184.36 | 171.02 | 6.9:1 | 309.02 | 300.22 | 1:01 | Loss of weight/B12 deficiency |
| 164 | 43 | M | 2246 | 1041.63 | 184.18 | 5.7:1 | 199.16 | 138.76 | 1.4:1 | Easy fatigue/Dcreased appetite/Anemia |
| 165 | 39 | F | 2253 | 1102.02 | 201.02 | 5.5:1 | 329.44 | 242.31 | 1.4:1 | Malabsorption |
| 166 | 72 | M | 2257 | 764.46 | 137.58 | 5.6:1 | 294.6 | 213.31 | 1.4:1 | To r/o Malabsorption |
| 167 | 35 | M | 2286 | 780.88 | 151.22 | 5.2:1 | 300.34 | 286.68 | 1:01 | Chronic diarrhea |
| 168 | 43 | F | 2311 | 999.8 | 147.29 | 6.8:1 | 483.32 | 285.82 | 1.7:1 | Malabsorption |
| 169 | 67 | F | 2368 | 792.3 | 182.11 | 4.4:1 | 415.27 | 395.04 | 1.1:1 | To rule out Malabsorption |
| 170 | 53 | M | 2408 | 1391.28 | 210.77 | 6.6:1 | 270.2 | 771.87 | 0.3:1 | B12 deficiency |
| 171 | 27 | M | 2442 | 976.21 | 140.08 | 6.9:1 | 353.67 | 350.12 | 1:01 | To rule out Malabsorption |
| 172 | 47 | F | 2449 | 928.23 | 171.12 | 5.4:1 | 296.79 | 265.21 | 1.1:1 | Heart burn |
| 173 | 40 | M | 2465 | 792.44 | 132.51 | 5.9:1 | 231.51 | 211.62 | 1.1:1 | B12 deficiency |
| 174 | 52 | F | 2534 | 748.52 | 185.41 | 4:01 | 322.62 | 304.85 | 1.1:1 | Malabsorption |
| 175 | 73 | F | 2585 | 1058.05 | 188.56 | 5.6:1 | 196.26 | 914.1 | 0.2:1 | Malabsorption |
| 176 | 60 | M | 2702 | 1209.23 | 198.43 | 6.1:1 | 189.72 | 445.52 | 0.4:1 | Malabsorption |
| 177 | 35 | F | 2706 | 1084.66 | 155.06 | 6.9:1 | 194.73 | 475.7 | 0.4:1 | To rule out Malabsorption |
| 178 | 29 | F | 2716 | 902.08 | 205.77 | 4.3:1 | 276.55 | 220.02 | 1.2:1 | B12 deficiency |
| 179 | 46 | M | 2755 | 761.79 | 207.32 | 3.7:1 | 315.52 | 310.52 | 1:01 | Loss of weight/B12 deficiency |
| 180 | 63 | M | 2788 | 1098.88 | 188.87 | 5.8:1 | 197.25 | 940.87 | 0.2:1 | On & off watery diarrhea/B12 deficiency |
| 181 | 47 | M | 2793 | 1117.43 | 257.04 | 4.3:1 | 292.13 | 284.29 | 1:01 | Megaloblastic aneemia/Pancytopenia |
| 182 | 38 | F | 2815 | 1187.2 | 176.97 | 6.7:1 | 211.61 | 185.6 | 1.1:1 | To rule out Malabsorption |
| 183 | 46 | M | 2862 | 901.08 | 209.77 | 4.3:1 | 276 | 227.02 | 1.2:1 | Megaloblastic aneemia/B12 deficiency |
| 184 | 23 | F | 2891 | 1277.54 | 230.98 | 5.5:1 | 416.63 | 407.35 | 1:01 | Weight loss/Chronic diarrhea |
| 185 | 34 | F | 2925 | 756.51 | 177.15 | 4.3:1 | 247.45 | 228.72 | 1.1:1 | pain abdomen/Vomitting |
| 186 | 25 | F | 3154 | 1099.79 | 216.82 | 5.1:1 | 324.89 | 224.47 | 1.4:1 | Anemia/Weight loss/B12 deficiency |
| 187 | 28 | M | 3202 | 780.66 | 165.1 | 4.7:1 | 219.45 | 817.62 | 0.2:1 | Loose stools/Nausea/Vomitting |
| 188 | 53 | F | 3210 | 1655.77 | 287.26 | 5.8:1 | 301.52 | 289.92 | 1:01 | Dyspepsia |
| 189 | 25 | M | 3244 | 1029.18 | 237.54 | 4.3:1 | 370.56 | 300.08 | 1.2:1 | Epigastric discomfort/Loose stools |
| 190 | 74 | F | 3277 | 1086.12 | 175.18 | 6.2:1 | 234.01 | 202.16 | 1.2:1 | B12 deficiency/Dimorphic anemia |
| 191 | 39 | F | 3287 | 1311.9 | 205.48 | 6.4:1 | 352.23 | 337.1 | 1:01 | Megaloblastic anemia/B12 deficiency |
| 192 | 27 | F | 3338 | 1052.36 | 176.19 | 5.9:1 | 273.09 | 269.48 | 1:01 | Dyspepsia |
| 193 | 51 | M | 3490 | 855.11 | 139.62 | 6.1:1 | 248.23 | 217.67 | 1.1:1 | B12 deficiency/Megaloblastic anemia |
| 194 | 80 | M | 3573 | 854.01 | 162.54 | 5.3:1 | 316.01 | 309.51 | 1:01 | B12 deficiency/Generalized weakness |
| 195 | 75 | M | 3597 | 563.74 | 138.69 | 4.1:1 | 246.66 | 213.72 | 1.2:1 | B12 deficiency |
| 196 | 55 | M | 3599 | 1185.75 | 257.22 | 4.6:1 | 364.22 | 327.08 | 1.1:1 | To rule out Malabsorption |
| 197 | 40 | M | 3601 | 756.84 | 176.7 | 4.3:1 | 271.99 | 224.27 | 1.2:1 | Malabsorption |
| 198 | 63 | M | 3646 | 1036.96 | 159.67 | 6.5:1 | 222.49 | 210.38 | 1.1:1 | Megaloblastic anemia |
| 199 | 71 | M | 3798 | 927.92 | 164.91 | 5.6:1 | 264.51 | 212.72 | 1.2:1 | Malabsorption |
| 200 | 78 | F | 3874 | 873.91 | 168.02 | 5.2:1 | 193.65 | 184.65 | 1:01 | Loss of weight/B12 deficiency |

# MASTER CHART

| S.No | AGE | SEX | HISTO NO | NORMAL VILLI | NORMAL CRYPT | V:C | DISEASED VILLI | DISEASED CRYPT | V:C | CLINICAL FEATURES |
|---|---|---|---|---|---|---|---|---|---|---|
| 201 | 72 | M | 4042 | 839.32 | 190.23 | 4.4:1 | 260.93 | 202.16 | 1.3:1 | Anemia |
| 202 | 30 | F | 4052 | 1091.14 | 189.72 | 5.8:1 | 511.11 | 499.99 | 1:01 | B12 deficiency/Chronic diarrhea |
| 203 | 27 | M | 4110 | 1078.45 | 159.27 | 6.8:1 | 364.68 | 271.39 | 1.3:1 | B12 deficiency/Parasites |
| 204 | 34 | F | 4233 | 972.94 | 160.18 | 6.1:1 | 428.39 | 412.63 | 1:01 | Malabsorption |
| 205 | 57 | M | 4257 | 900.35 | 185.41 | 4.9:1 | 313.75 | 300.7 | 1:01 | Loose stools/B12 deficiency |
| 206 | 55 | M | 4263 | 1175.25 | 142.66 | 8.2:1 | 341.71 | 324.49 | 1.1:1 | Frequent burps of regurgitation of food |
| 207 | 53 | F | 4279 | 720 | 181.48 | 3.9:1 | 404.85 | 303.25 | 1.3:1 | Dyspeptic symptoms |
| 208 | 63 | M | 4286 | 798.21 | 225.6 | 3.5:1 | 362.55 | 242.16 | 1.5:1 | Loose stools/Loss of weight |
| 209 | 56 | M | 4314 | 885.27 | 210.46 | 4.2:1 | 605.03 | 400.15 | 1.5:1 | B12 deficiency |
| 210 | 38 | M | 4329 | 1090.11 | 174.84 | 6.2:1 | 276.13 | 640.13 | 0.4:1 | Anemia/DCLD |
| 211 | 39 | M | 4352 | 369.36 | 169.36 | 2.2:1 | 332.89 | 301.66 | 1.1:1 | To rule out Malabsorption |
| 212 | 19 | F | 4356 | 897.06 | 137.58 | 6.5:1 | 394.49 | 326.66 | 1.2:1 | Fever/ Loose stools/Vomitting/Tiredness |
| 213 | 53 | F | 4395 | 1102.12 | 182.92 | 6:01 | 304.09 | 302.81 | 1:01 | Malabsorption |
| 214 | 49 | M | 4410 | 843.76 | 192.77 | 4.4:1 | 271.99 | 213.05 | 1.2:1 | B12 deficiency/Pancytopenia |
| 215 | 49 | M | 4599 | 566.31 | 177.79 | 3.2:1 | 315.7 | 838.22 | 0.3:1 | Malabsorption(IBD) |
| 216 | 39 | F | 4656 | 966.45 | 169.52 | 5.7:1 | 426.82 | 407 | 1:01 | Malabsorption |
| 217 | 36 | M | 4668 | 980.05 | 175.78 | 5.6:1 | 330.09 | 297.98 | 1.1:1 | Megaloblastic anemia |
| 218 | 46 | F | 4698 | 970.52 | 189.52 | 5.1;1 | 518.15 | 394.49 | 1.3:1 | To rule out Malabsorption |
| 219 | 60 | F | 4716 | 960.5 | 193.29 | 4.9:1 | 216.63 | 210.72 | 1:01 | To rule out Malabsorption syndrome |
| 220 | 40 | M | 4760 | 1070.32 | 159.52 | 6.7:1 | 306.97 | 302.79 | 1:01 | To rule out Malabsorption syndrome |
| 221 | 63 | F | 4814 | 979.54 | 153.16 | 6.4:1 | 322.09 | 3088.2 | 0.1:1 | Chronic diarrhea |
| 222 | 12 | F | 4882 | 820.59 | 186.11 | 4.4:1 | 398.11 | 249.13 | 1.6:1 | Malabsorption |
| 223 | 44 | M | 4917 | 1000.01 | 188.31 | 5.3:1 | 259.42 | 233.32 | 1.1:1 | Chronic diarrhea for evaluation |
| 224 | 24 | M | 4933 | 1280.88 | 185.98 | 6.9:1 | 422.63 | 308.44 | 1.4:1 | B12 deficiency/Loose stools |
| 225 | 75 | M | 4967 | 922.65 | 159.37 | 5.8:1 | 403.83 | 401.1 | 1:01 | Weight loss/Anorexia |
| 226 | 33 | M | 4981 | 963.26 | 146.41 | 6.6:1 | 302.33 | 879.04 | 0.3:1 | Chronic small bowel diarrhea/B12 deficiency |
| 227 | 53 | M | 5026 | 1107.42 | 201.1 | 5.5:1 | 318.38 | 258.23 | 1.2:1 | Malabsorption |
| 228 | 51 | M | 5032 | 748.31 | 157.07 | 4.8:1 | 214.12 | 208.53 | 1:01 | Loose stools/B12deficiency |
| 229 | 48 | M | 5282 | 615.6 | 108.3 | 5.7:1 | 275.3 | 260.07 | 1.1:1 | B12deficiency |
| 230 | 65 | F | 5287 | 813.46 | 125.72 | 6.5:1 | 530.93 | 509.45 | 1:01 | Malabsorption |
| 231 | 62 | F | 5307 | 1232.74 | 251.89 | 4.9:1 | 321.99 | 317.97 | 1:01 | Malabsorption |
| 232 | 22 | F | 5336 | 1038.27 | 221.73 | 4.7:1 | 196.86 | 181.4 | 1.1:1 | Loss of appetite/B12deficiency/Dyspepsia |
| 233 | 30 | M | 5387 | 804.58 | 145.3 | 5.5:1 | 290.04 | 248.04 | 1.2:1 | Dyspepsia |
| 234 | 65 | F | 5564 | 940.32 | 179.11 | 5.2:1 | 412.4 | 231.23 | 1.8:1 | Malabsorption |
| 235 | 35 | M | 5566 | 1114.48 | 183.68 | 6.1:1 | 512.72 | 433.51 | 1.2:1 | vit.B12 deficiency |
| 236 | 43 | M | 5626 | 1094.02 | 207.63 | 5.3:1 | 281.8 | 270.14 | 1:01 | Malabsorption |
| 237 | 24 | M | 5647 | 932.92 | 200.06 | 4.7:1 | 235.39 | 212.46 | 1.1:1 | Malabsorption |
| 238 | 27 | M | 5665 | 1165.85 | 172.15 | 6.8:1 | 256.56 | 228.14 | 1.1:1 | Severe B12 deficiency |
| 239 | 31 | M | 5670 | 1033.24 | 189.82 | 5.4:1 | 454.5 | 265.26 | 1.7:1 | Anorexia/Weight loss |
| 240 | 51 | M | 5734 | 757.17 | 160.58 | 4.7:1 | 490.33 | 335.74 | 1.5:1 | B12 deficiency/Severe pancytopenia |

# MASTER CHART

| S.No | AGE | SEX | HISTO NO | NORMAL VILLI | NORMAL CRYPT | V:C | DISEASED VILLI | DISEASED CRYPT | V:C | CLINICAL FEATURES |
|---|---|---|---|---|---|---|---|---|---|---|
| 241 | 51 | F | 5804 | 1112.14 | 213.95 | 5.2:1 | 315.53 | 314.39 | 1:01 | Malabsorption |
| 242 | 30 | M | 5962 | 880.02 | 211.12 | 4.2:1 | 294.07 | 272.93 | 1.1:1 | Malabsorption |
| 243 | 65 | F | 5969 | 1122.56 | 214.85 | 5.2:1 | 308.67 | 308.18 | 1:01 | Malabsorption |
| 244 | 43 | M | 6003 | 1199.71 | 194.56 | 6.2:1 | 214.64 | 200.73 | 1.1:1 | Megaloblastic anemia/B12 deficiency |
| 245 | 26 | M | 6113 | 648.4 | 127.79 | 5.1:1 | 285.61 | 202.74 | 1.4:1 | To rule out Malabsorption |
| 246 | 58 | M | 6123 | 1137.4 | 232.01 | 4.9:1 | 287.79 | 238.45 | 1.2:1 | Malabsorption |
| 247 | 38 | M | 6131 | 1039.99 | 161.85 | 6.4:1 | 374.92 | 350.66 | 1.1:1 | Malabsorption |
| 248 | 44 | F | 6193 | 908.67 | 140.96 | 6.4:1 | 211.53 | 195.53 | 1.1:1 | Malabsorption |
| 249 | 54 | M | 6239 | 743.71 | 196.81 | 3.8:1 | 322.6 | 302.74 | 1.1:1 | Malabsorption |
| 250 | 45 | F | 6243 | 1048.55 | 216.29 | 4.8:1 | 296.61 | 244.43 | 1.2:1 | To rule outMalabsorption |
| 251 | 78 | M | 6280 | 1171.9 | 207.85 | 5.6:1 | 308.68 | 280.97 | 1.1:1 | Malabsorption syndrome |
| 252 | 41 | M | 6304 | 1224.94 | 266.26 | 4.6:1 | 465.6 | 420.95 | 1.1:1 | B12deficiency/Megaloblastic anemia |
| 253 | 39 | F | 6357 | 987.51 | 239.12 | 4.1:1 | 479.08 | 360.95 | 1.3:1 | To rule out Malabsorption |
| 254 | 51 | M | 6362 | 987.98 | 243.34 | 4.1:1 | 402.23 | 210.87 | 1.9:1 | Loose stools/B12 deficiency |
| 255 | 20 | M | 6377 | 900.98 | 198.14 | 4.5:1 | 518.31 | 512.44 | 1:01 | To rule out Malabsorption |
| 256 | 26 | F | 6534 | 1082.86 | 196.71 | 5.5:1 | 340.9 | 315.48 | 1.1:1 | Malabsorption |
| 257 | 65 | M | 6625 | 701.86 | 108.36 | 6.4:1 | 402.84 | 318.16 | 1.3:1 | To rule out Malabsorption |
| 258 | 48 | M | 6682 | 860.92 | 208.03 | 4.1:1 | 315.02 | 253.73 | 1.2:1 | B12 deficiency/Macrocytic anemia |
| 259 | 63 | F | 6704 | 1071.87 | 190.89 | 5.6:1 | 542.54 | 226.99 | 2.4:1 | Malabsorption |
| 260 | 47 | F | 6709 | 960.54 | 150.12 | 6.4:1 | 227.66 | 216.07 | 1.1:1 | Malabsorption |
| 261 | 42 | M | 6828 | 780.28 | 142.36 | 5.5:1 | 400.12 | 171.15 | 2.3:1 | Malabsorption |
| 262 | 40 | M | 6853 | 1052.52 | 154.81 | 6.8:1 | 434.22 | 325.22 | 1.3:1 | Megaloblastic anemia/Small bowel diarrhea |
| 263 | 67 | F | 63 | 926.97 | 146.07 | 6.3:1 | 287.12 | 244.18 | 1.2:1 | Malabsorption |
| 264 | 44 | M | 110 | 660.72 | 155.01 | 4.3:1 | 259.51 | 248.09 | 1:01 | Megaloblastic anemia |
| 265 | 66 | F | 154 | 801.02 | 158.05 | 5.1:1 | 290.08 | 265.91 | 1.1:1 | Malabsorption |
| 266 | 17 | M | 399 | 954.39 | 150.19 | 6.4:1 | 238.6 | 169.67 | 1.4:1 | Megaloblastic anemia |
| 267 | 30 | M | 488 | 902.55 | 158.19 | 5.7:1 | 507.55 | 279.94 | 1.8:1 | To rule out Malabsorption |
| 268 | 48 | F | 509 | 1021.89 | 146.37 | 6.9:1 | 377.14 | 231.74 | 1.6:1 | Iron deficiency anemia |
| 269 | 77 | M | 519 | 1166.62 | 266.2 | 4.4:1 | 298.28 | 295.15 | 1:01 | B12 deficiency/ Weight loss/Loss of apetite |
| 270 | 28 | M | 537 | 887.08 | 132.37 | 6.7:1 | 281.86 | 273.03 | 1:01 | To rule out Malabsorption |
| 271 | 33 | M | 586 | 974.45 | 173.07 | 5.6:1 | 232.3 | 215.52 | 1.1:1 | To rule out Malabsorption |
| 272 | 47 | M | 663 | 703 | 167.69 | 4.2:1 | 328.82 | 280.45 | 1.2:1 | B12 deficiency |
| 273 | 60 | F | 728 | 972.39 | 149.67 | 6.5:1 | 299.28 | 187.36 | 1.6:1 | Macrocytic anemia for evaluation/Fever |
| 274 | 70 | F | 790 | 893.15 | 149.04 | 5.9:1 | 245.29 | 163.4 | 1.5:1 | Hiatus hernia/Acute peptic disease |
| 275 | 41 | M | 816 | 1088.38 | 162.98 | 6.7:1 | 393.79 | 232.44 | 1.7:1 | Easy fatiguability |
| 276 | 40 | M | 850 | 1033.11 | 192.26 | 5.4:1 | 394.49 | 246.43 | 1.6:1 | To rule out Malabsorption |
| 277 | 49 | F | 888 | 1004.15 | 226.53 | 4.4:1 | 273.5 | 254.27 | 1.1:1 | To rule out Malabsorption |
| 278 | 59 | F | 1041 | 1157.76 | 207.6 | 5.6:1 | 348.14 | 270.84 | 1.3:1 | Chronic liver disease |
| 279 | 36 | M | 1099 | 924.84 | 144.4 | 6.4:1 | 250.86 | 233.54 | 1.1:1 | B12 deficiency |
| 280 | 43 | M | 1165 | 713.54 | 148.87 | 4.8:1 | 316.83 | 304.76 | 1:01 | TB |

# MASTER CHART

| S.No | AGE | SEX | HISTO NO | NORMAL VILLI | NORMAL CRYPT | V:C | DISEASED VILLI | DISEASED CRYPT | V:C | CLINICAL FEATURES |
|---|---|---|---|---|---|---|---|---|---|---|
| 281 | 65 | M | 1225 | 658.96 | 108.3 | 6.1:1 | 244.85 | 236.82 | 1:01 | Loss of apetite/Weight loss |
| 282 | 26 | F | 1286 | 838.77 | 127.82 | 6.6:1 | 347.51 | 273.56 | 1.3:1 | Loose stools |
| 283 | 50 | F | 1294 | 1129.26 | 185.41 | 6.1:1 | 342.73 | 289.7 | 1.2:1 | Megaloblastic anemia/Fever |
| 284 | 42 | M | 1368 | 1358.41 | 355.08 | 3.8:1 | 389.87 | 376.64 | 1:01 | Hemolytic anemia |
| 285 | 70 | M | 1408 | 990.09 | 196.09 | 5:01 | 330.01 | 195.87 | 1.7:1 | Dyspepsia |
| 286 | 46 | F | 1493 | 611.79 | 129.96 | 4.7:1 | 339.1 | 313.75 | 1.1:1 | To rule out Malabsorption |
| 287 | 39 | M | 1501 | 1022.97 | 156.49 | 6.5:1 | 424.82 | 413.47 | 1:01 | To rule out Malabsorption |
| 288 | 65 | M | 1632 | 1054.72 | 191.72 | 5.5:1 | 225.02 | 146.79 | 1.5:1 | B12 deficiency |
| 289 | 40 | M | 1851 | 716.34 | 150.28 | 4.8:1 | 441.29 | 415.44 | 1.1:1 | Malabsorption |
| 290 | 19 | F | 1873 | 990.32 | 153.7 | 6.4:1 | 244.85 | 228.34 | 1.1:1 | To rule out Malabsorption |
| 291 | 68 | M | 1877 | 1115.77 | 187.49 | 5.9:1 | 311.81 | 293.64 | 1.1:1 | To rule out Malabsorption |
| 292 | 22 | M | 2049 | 986.72 | 187.82 | 5.3:1 | 389.21 | 320.28 | 1.2:1 | Malabsorption |
| 293 | 44 | F | 2114 | 1018.68 | 162.98 | 6.3:1 | 350.75 | 302.33 | 1.2:1 | B12 deficiency/Anemia |
| 294 | 24 | F | 2174 | 957.44 | 211.72 | 4.5:1 | 335.93 | 305.72 | 1.1:1 | Malabsorption syndrome |
| 295 | 45 | F | 2278 | 1049.7 | 161.75 | 6.5:1 | 273.09 | 217.77 | 1.3:1 | Malabsorption |
| 296 | 66 | M | 2290 | 756.86 | 173 | 4.4:1 | 254 | 215.46 | 1.2:1 | Megaloblastic anemia |
| 297 | 43 | M | 2320 | 1210.17 | 196.14 | 6.2:1 | 391.45 | 388.45 | 1:01 | Anemia |
| 298 | 17 | M | 2338 | 1097.74 | 176.42 | 6.2:1 | 568.25 | 272.46 | 2.1:1 | Malabsorption |
| 299 | 41 | F | 2384 | 1005.72 | 191.08 | 5.3:1 | 261.9 | 259.41 | 1:01 | Diarrhea/ /Crohns |
| 300 | 52 | F | 2435 | 776.27 | 147.92 | 5.2:1 | 285.65 | 260.74 | 1.1:1 | Malabsorption syndrome |
| 301 | 55 | F | 2512 | 712.01 | 236.09 | 3:01 | 510.85 | 324.4 | 1.6:1 | To rule out Malabsorption |
| 302 | 20 | F | 2534 | 851.1 | 142.54 | 5.9:1 | 244.69 | 240.1 | 1:01 | Dyspepsia |
| 303 | 61 | F | 2536 | 711.67 | 170.69 | 4.2:1 | 339.48 | 321.04 | 1.1:1 | Anemia |
| 304 | 42 | M | 2580 | 882.11 | 159.67 | 5.5:1 | 354.51 | 253.26 | 1.4:1 | Malabsorption syndrome |
| 305 | 60 | F | 2582 | 1140.6 | 164.32 | 6.9:1 | 424.92 | 372.67 | 1.1:1 | Crohns disease |
| 306 | 51 | M | 2714 | 1117.14 | 175.23 | 6.4:1 | 388.83 | 300.15 | 1.3:1 | To rule out Malabsorption |
| 307 | 55 | M | 2738 | 516.15 | 112.69 | 4.6:1 | 315.47 | 311.74 | 1:01 | Malabsorption |
| 308 | 48 | M | 2810 | 674.14 | 160.18 | 4.2:1 | 239.17 | 173.05 | 1.4:1 | K/C/O Chronic pancreatitis |
| 309 | 68 | F | 2812 | 535.83 | 157.07 | 3.4:1 | 204.85 | 611.69 | 0.3:1 | |
| 310 | 43 | M | 2826 | 1029.52 | 186.32 | 5.5:1 | 431.49 | 314.37 | 1.4:1 | To rule out Malabsorption |
| 311 | 49 | M | 2845 | 1035.93 | 149.39 | 6.9:1 | 446 | 443.27 | 1:01 | Malabsorption |
| 312 | 26 | F | 2863 | 782.02 | 186.63 | 4.2:1 | 590.04 | 345.92 | 1.7:1 | To rule out Malabsorption |
| 313 | 57 | F | 2875 | 619.45 | 244.52 | 2.5:1 | 391.32 | 372.67 | 1.1:1 | Tropical sprue |
| 314 | 42 | F | 2907 | 871.63 | 174.63 | 4.9:1 | 404.49 | 400.57 | 1:01 | To rule out Malabsorption |
| 315 | 65 | F | 2921 | 761.99 | 153.16 | 4.9:1 | 275.3 | 250.47 | 1.1:1 | To rule out Malabsorption |
| 316 | 35 | F | 2947 | 1142.61 | 241.99 | 4.7:1 | 316.72 | 300.71 | 1.1:1 | To rule out Malabsorption |
| 317 | 59 | M | 3009 | 708.82 | 134.99 | 5.3:1 | 542.55 | 480.1 | 1.1:1 | Malabsorption |
| 318 | 61 | F | 3075 | 1035.95 | 165.2 | 6.3:1 | 430.66 | 331.67 | 1.3:1 | Malabsorption |
| 319 | 40 | F | 3098 | 879.03 | 155.03 | 5.7:1 | 400.05 | 374.25 | 1.1:1 | Malabsorption |
| 320 | 60 | F | 3188 | 1382.39 | 245.15 | 5.6:1 | 389.21 | 265.13 | 1.5:1 | GERD |
| 321 | 69 | F | 3220 | 787.64 | 129.83 | 6.1:1 | 262.55 | 257.41 | 1:01 | To rule out IBS |
| 322 | 50 | F | 3290 | 1010.09 | 220.08 | 4.6:1 | 287.67 | 198.96 | 1.4:1 | Anemia/ Loose stools |
| 323 | 76 | F | 3294 | 1117.11 | 243.19 | 4.6:1 | 488.27 | 454.51 | 1.1:1 | Malabsorption |

# MASTER CHART

| S.No | AGE | SEX | HISTO NO | NORMAL VILLI | NORMAL CRYPT | V:C | DISEASED VILLI | DISEASED CRYPT | V:C | CLINICAL FEATURES |
|---|---|---|---|---|---|---|---|---|---|---|
| 324 | 58 | F | 3321 | 1025.82 | 277.55 | 3.7:1 | 158.71 | 664.51 | 0.2:1 | B12 deficiency |
| 325 | 51 | F | 3431 | 1178.11 | 233.21 | 5.1:1 | 394.49 | 245.58 | 1.6:1 | Malabsorption |
| 326 | 54 | M | 3436 | 1097.33 | 172.89 | 6.3:1 | 333.74 | 327.37 | 1:01 | Malabsorption |
| 327 | 40 | F | 3448 | 990.06 | 199.01 | 4.9:1 | 245.56 | 197.86 | 1.2:1 | Anemia |
| 328 | 68 | M | 3481 | 1354.49 | 235.49 | 5.8:1 | 487.27 | 277.38 | 1.8:1 | To rule out Malabsorption |
| 329 | 17 | M | 3508 | 1060.33 | 173.14 | 6.1:1 | 537.71 | 355.79 | 1.5:1 | Malabsorption |
| 330 | 44 | M | 3514 | 938.69 | 137.46 | 6.8:1 | 331.67 | 325.32 | 1:01 | B12 deficiency/Chronic diarrhea |
| 331 | 46 | M | 3528 | 1066.61 | 182.95 | 5.8:1 | 395.9 | 341.65 | 1.2:1 | Anemia |
| 332 | 16 | F | 3540 | 880.84 | 173.7 | 5.1:1 | 321.79 | 310.03 | 1:01 | Malabsorption |
| 333 | 46 | F | 3579 | 876.49 | 197.45 | 4.4:1 | 509.73 | 500.24 | 1:01 | Malabsorption |
| 334 | 48 | M | 3607 | 1080.49 | 176.28 | 6.1:1 | 371.82 | 312.3 | 1.2:1 | To rule out Malabsorption |
| 335 | 50 | M | 3621 | 885.77 | 245.64 | 3.6:1 | 333.86 | 254.42 | 1.3:1 | Iron deficiency anemia |
| 336 | 46 | M | 3630 | 1183.67 | 193.48 | 6.1:1 | 318.15 | 306.98 | 1:01 | Malabsorption |
| 337 | 23 | F | 3716 | 1063.78 | 169.96 | 6.3:1 | 304.43 | 293.38 | 1:01 | Anemia for evaluation/B12 deficiency |
| 338 | 47 | F | 3746 | 705.01 | 182.02 | 3.9:1 | 441.77 | 280.65 | 1.6:1 | IBD |
| 339 | 29 | F | 3747 | 1039.2 | 188.4 | 5.5:1 | 398.11 | 332.84 | 1.2:1 | Malabsorption |
| 340 | 51 | M | 3756 | 869.52 | 162.69 | 5.3:1 | 368.21 | 348.98 | 1.1:1 | Tropical enteropathy/Portal duodenopathy |
| 341 | 55 | F | 3771 | 917.97 | 174.81 | 5.3:1 | 307.92 | 302.54 | 1:01 | Abdominal pain |
| 342 | 40 | F | 3773 | 879.08 | 198.11 | 4.4:1 | 397.72 | 386.54 | 1:01 | Chronic diarrhea |
| 343 | 26 | M | 3842 | 1165.88 | 201.59 | 5.8:1 | 384.8 | 269.24 | 1.4:1 | Anemia/Fever |
| 344 | 26 | M | 3854 | 1052.94 | 165.49 | 6.4:1 | 298.45 | 287.85 | 1:01 | Malabsorption |
| 345 | 77 | M | 3905 | 1015.23 | 185.57 | 5.4:1 | 429.46 | 400.13 | 1.1:1 | Anemia |
| 346 | 25 | F | 3933 | 307.63 | 96.53 | 3.2:1 | 261.79 | 255.46 | 1:01 | Malabsorption |
| 347 | 28 | M | 3977 | 809.48 | 175.8 | 4.6:1 | 372.86 | 290.59 | 1.3:1 | GERD/Chronic diarrhea |
| 348 | 47 | M | 4141 | 602.96 | 162.14 | 3.7:1 | 301.95 | 280.11 | 1.1:1 | B12 deficiency/Anemia/Fever |
| 349 | 17 | M | 4161 | 1001.51 | 170.69 | 5.8:1 | 244.69 | 231.31 | 1.1:1 | Macrocytic anemia |
| 350 | 49 | M | 4203 | 1013.22 | 200.55 | 5.5:1 | 472.78 | 250.07 | 1.9:1 | B12 deficiency |
| 351 | 39 | M | 4265 | 892.29 | 133.28 | 6.7:1 | 273.15 | 240.89 | 1.1:1 | Malabsorption |
| 352 | 79 | F | 4271 | 982.68 | 187.1 | 5.3:1 | 569.05 | 266.51 | 2.1:1 | Chronic diarrhea |
| 353 | 57 | M | 4422 | 874.16 | 180.28 | 4.8:1 | 289.87 | 252.09 | 1.1:1 | Anemia/Weight loss/Vomitting/Anorexia |
| 354 | 40 | M | 4497 | 1060.62 | 178.61 | 5.9:1 | 350.87 | 309.28 | 1.1:1 | Malabsorption |
| 355 | 30 | M | 4591 | 837.1 | 144.01 | 5.8:1 | 298.31 | 234.04 | 1.3:1 | Loose stools |
| 356 | 60 | F | 4766 | 824.44 | 143.22 | 5.8:1 | 421.32 | 233.42 | 1.8:1 | Dimorphic anemia |
| 357 | 53 | M | 4827 | 700.26 | 121.73 | 5.8:1 | 316.32 | 211.15 | 1.5:1 | Anemia |
| 358 | 55 | M | 4854 | 775.52 | 147.89 | 5.2:1 | 488.53 | 307.29 | 1.6:1 | B12 deficiency |
| 359 | 30 | M | 4866 | 1036.3 | 151.01 | 6.9:1 | 493.39 | 333.32 | 1.5:1 | Malabsorption |
| 360 | 56 | M | 4916 | 1093.3 | 183.28 | 5.9:1 | 238.12 | 237.06 | 1:01 | B12 deficiency/Dimorphic anemia |
| 361 | 48 | F | 4975 | 905.19 | 150.79 | 6:01 | 344.03 | 257.73 | 1.3:1 | Malabsorption |
| 362 | 36 | F | 4981 | 1126.3 | 247.81 | 4.5:1 | 264.63 | 249.85 | 1.1:1 | Malabsorption |
| 363 | 38 | F | 5014 | 1146.41 | 179.68 | 6.4:1 | 448.64 | 254.19 | 1.8:1 | Microcytic anemia |
| 364 | 43 | F | 5025 | 1141.04 | 257.54 | 4.4:1 | 470.56 | 199.69 | 2.4:1 | Malabsorption |

# MASTER CHART

| S.No | AGE | SEX | HISTO NO | NORMAL VILLI | NORMAL CRYPT | V:C | DISEASED VILLI | DISEASED CRYPT | V:C | CLINICAL FEATURES |
|---|---|---|---|---|---|---|---|---|---|---|
| 365 | 63 | F | 5027 | 546.2 | 122.79 | 4.4:1 | 326.88 | 314.36 | 1:01 | T0 rule out malabsorption |
| 366 | 39 | M | 5051 | 777.46 | 160.73 | 4.8:1 | 390.16 | 336.76 | 1.1:1 | Malabsorption |
| 367 | 45 | M | 5108 | 848.09 | 234.01 | 3.6:1 | 277.32 | 263.5 | 1.1:1 | Megaloblastic anemia |
| 368 | 36 | M | 5128 | 1126.54 | 233.32 | 4.8:1 | 261.71 | 239.48 | 1.1:1 | Anemia |
| 369 | 34 | F | 5226 | 1060.28 | 206.28 | 5.1:1 | 450.12 | 233.14 | 1.9:1 | Malabsorption |
| 370 | 34 | F | 5333 | 1004.8 | 173.65 | 5.8:1 | 494.9 | 183.44 | 2.7:1 | Dyspepsia |
| 371 | 69 | M | 5345 | 970.04 | 184.45 | 5.3:1 | 290.09 | 190.9 | 1.5:1 | Malabsorption |
| 372 | 23 | M | 5384 | 1097.25 | 222.09 | 4.9:1 | 521.21 | 242.47 | 2.1:1 | To rule out Malabsorption |
| 373 | 25 | M | 5520 | 1043.19 | 158.17 | 6.6:1 | 301.66 | 231.09 | 1.3:1 | Malabsorption |
| 374 | 52 | F | 5576 | 990.08 | 198.01 | 5.1:1 | 298.08 | 198.07 | 1.5:1 | Malabsorption |
| 375 | 53 | F | 5621 | 998.13 | 180.17 | 5.5:1 | 373.71 | 261.9 | 1.4:1 | To rule out Malabsorption |
| 376 | 58 | M | 5671 | 612.14 | 135.14 | 4.5:1 | 331.21 | 314.25 | 1.1:1 | Anemia/B12 deficiency |
| 377 | 55 | F | 5677 | 968.35 | 232.1 | 4.2:1 | 258.95 | 245.24 | 1.1:1 | To rule out Malabsorption |
| 378 | 38 | M | 5716 | 710.5 | 205.56 | 3.5:1 | 536.59 | 371.3 | 1.4:1 | To rule out Malabsorption |
| 379 | 68 | M | 5775 | 714.31 | 259.67 | 2.8:1 | 573.62 | 408.63 | 1.4:1 | Iron deficiency anemia/?Ppilloma oral cavity |
| 380 | 71 | M | 5777 | 757.39 | 156.91 | 4.8:1 | 393.4 | 389.97 | 1:01 | Malabsorption |
| 381 | 29 | M | 5779 | 729.2 | 254.19 | 2.9:1 | 509.03 | 286.7 | 1.8:1 | B12 deficiency |
| 382 | 70 | F | 5826 | 685 | 199.08 | 3.4:1 | 282.61 | 216.6 | 1.3:1 | To rule out Malabsorption |
| 383 | 49 | M | 5828 | 1168.65 | 195.48 | 5.9:1 | 271.99 | 270.12 | 1:01 | Fever/Jaundice |
| 384 | 28 | M | 5850 | 850.37 | 170.74 | 4.9:1 | 229.82 | 217 | 1.1:1 | Malabsorption syndrome |
| 385 | 53 | F | 5856 | 548.91 | 131.5 | 4.2:1 | 176.7 | 168.06 | 1.1:1 | B12 deficiency |
| 386 | 37 | M | 5933 | 663.75 | 132.97 | 4.9:1 | 257.44 | 256.72 | 1:01 | Loss of weight/Fatiguability |
| 387 | 44 | M | 6003 | 1158.99 | 178.52 | 6.5:1 | 265.35 | 197.08 | 1.3:1 | Loose stools |
| 388 | 55 | M | 6028 | 459.3 | 124.99 | 3.7:1 | 307.52 | 300.04 | 1:01 | Malabsorption |
| 389 | 44 | M | 6030 | 715.43 | 162.12 | 4.4:1 | 217.99 | 203.03 | 1.1:1 | Heartburn |
| 390 | 45 | M | 6233 | 867.96 | 184.54 | 4.7:1 | 253.83 | 242.88 | 1:01 | Megaloblastic anemia |
| 391 | 49 | M | 6251 | 858.65 | 196.45 | 4.4:1 | 273.86 | 182.2 | 1.5:1 | Malabsorption |
| 392 | 56 | M | 6310 | 1036.35 | 176.42 | 5.9:1 | 438.36 | 204.99 | 2.1:1 | Anemia for evaluation |
| 393 | 60 | M | 6344 | 572.87 | 161.1 | 3.6:1 | 280.64 | 265.13 | 1.1:1 | Anemia |
| 394 | 29 | M | 6353 | 1186.2 | 304.03 | 3.9:1 | 448.83 | 441.23 | 1:01 | Malabsorption |
| 395 | 49 | M | 6392 | 762.41 | 181.14 | 4.2:1 | 428.56 | 417.72 | 1:01 | Malabsorption |
| 396 | 64 | M | 6422 | 1008.48 | 181.49 | 5.6:1 | 210.66 | 208.28 | 1:01 | Malabsorption |
| 397 | 64 | M | 6447 | 1007.71 | 183.87 | 5.5:1 | 336.08 | 284.49 | 1.2:1 | To rule out Malabsorption |
| 398 | 39 | M | 4295 | 990.09 | 198.01 | 5:01 | 228.09 | 189.01 | 1.2:1 | Non ulcer/Dyspepsia |
| 399 | 39 | M | 4312 | 1000.1 | 210.01 | 4.8:1 | 220.01 | 198.01 | 1.1:1 | Malabsorption |
| 400 | 64 | M | 4381 | 990.08 | 289.02 | 3.4:1 | 250.09 | 198.01 | 1.3:1 | B12 deficiency |
| 401 | 54 | M | 71 | 1077.08 | 298.07 | 5.7:1 | 264.46 | 251.31 | 1.1:1 | To rule out Malabsorption |
| 402 | 45 | F | 201 | 1063.59 | 177.81 | 5.9:1 | 278.25 | 229.14 | 1.2:1 | Protein losing enteropathy/Loss of weight |
| 403 | 52 | M | 213 | 701.46 | 156.43 | 4.5:1 | 257.33 | 196.37 | 1.3:1 | Malabsorption |
| 404 | 39 | M | 242 | 737.95 | 181.49 | 4.1:1 | 499.68 | 390.67 | 1.3:1 | Malabsorption |
| 405 | 57 | M | 265 | 1029.92 | 168.82 | 6.1:1 | 408.95 | 361.91 | 1.1:1 | Malabsorption |
| 406 | 64 | M | 322 | 782.12 | 193.95 | 4:01 | 285.28 | 261.72 | 1.1:1 | Malabsorption |

# MASTER CHART

| S.No | AGE | SEX | HISTO NO | NORMAL VILLI | NORMAL CRYPT | V:C | DISEASED VILLI | DISEASED CRYPT | V:C | CLINICAL FEATURES |
|---|---|---|---|---|---|---|---|---|---|---|
| 407 | 50 | M | 326 | 875.51 | 141.52 | 6.2:1 | 440.55 | 364.02 | 1.2:1 | B12 deficiency |
| 408 | 67 | F | 515 | 811.64 | 162.82 | 4.9:1 | 488.77 | 318.22 | 1.5:1 | Anemia |
| 409 | 27 | F | 530 | 804.59 | 209.9 | 3.8:1 | 282.62 | 211.61 | 1.3:1 | Malabsorption |
| 410 | 42 | F | 552 | 1102.55 | 202.46 | 5.4:1 | 272.85 | 202.78 | 1.3:1 | B12 deficiency |
| 411 | 23 | F | 571 | 820.18 | 160.38 | 5.1:1 | 131.56 | 106.93 | 1.2:1 | Anemia for evaluation |
| 412 | 29 | M | 685 | 531.46 | 144.28 | 3.7:1 | 284.7 | 166.24 | 1.7:1 | Malabsorption |
| 413 | 42 | F | 726 | 521.43 | 172.48 | 3:01 | 219.79 | 201.23 | 1.1:1 | B12 deficiency/Anemia |
| 414 | 43 | F | 749 | 1015.4 | 236.88 | 4.3:1 | 385.14 | 364.96 | 1.1:1 | Severe Anemia/Spleenomegaly |
| 415 | 54 | M | 767 | 737.11 | 139.01 | 5.3:1 | 247.49 | 239.99 | 1:01 | Megaloblastic anemia |
| 416 | 60 | M | 795 | 826.99 | 237.27 | 3.5:1 | 286.83 | 272.32 | 1.1:1 | Anemia for evaluation |
| 417 | 49 | M | 893 | 900.65 | 160.67 | 5.6:1 | 234.24 | 223.96 | 1:01 | Weight loss/Anorexia |
| 418 | 40 | F | 921 | 890.05 | 189.09 | 4.7:1 | 220.09 | 198.01 | 1.1:1 | Malabsorption |
| 419 | 26 | F | 977 | 1030.41 | 181.49 | 5.7:1 | 276.67 | 218.99 | 1.3:1 | Malabsorption |
| 420 | 68 | M | 1028 | 1005.28 | 220.95 | 4.5:1 | 554.31 | 525.31 | 1.1:1 | Anemia |
| 421 | 57 | M | 1031 | 1023.45 | 188 | 5.4:1 | 245.75 | 227.18 | 1.1:1 | Anemia/Bicytopenia/Tropical sprue |
| 422 | 44 | M | 1058 | 1008.89 | 229.54 | 4.4:1 | 304.32 | 278.99 | 1.1:1 | Lymphangectasia |
| 423 | 37 | M | 1065 | 1216.41 | 213.47 | 5.7:1 | 295.89 | 253.97 | 1.2:1 | B12 deficiency/Loose stools/Retroviral disease |
| 424 | 56 | M | 1077 | 903.05 | 188.28 | 4.8:1 | 287.74 | 273.19 | 1.1:1 | Anemia |
| 425 | 40 | M | 1102 | 1140.29 | 183.71 | 6.2:1 | 306.35 | 293.72 | 1:01 | Malabsorption |
| 426 | 23 | F | 1118 | 648.38 | 167.15 | 3.9:1 | 312.54 | 310.83 | 1:01 | Anemia |
| 427 | 41 | M | 1153 | 670.82 | 141.24 | 4.7:1 | 242.25 | 228.14 | 1.1:1 | Megaloblastic anemia |
| 428 | 50 | M | 1213 | 1098.06 | 181.23 | 6:01 | 477.1 | 461.38 | 1:01 | Tropical sprue |
| 429 | 23 | M | 1215 | 749.88 | 217.65 | 3.4:1 | 271.61 | 184.07 | 1.5:1 | B12 deficiency |
| 430 | 56 | M | 1252 | 1174.97 | 196.23 | 5.9:1 | 295.06 | 218.21 | 1.4:1 | Chronic diarrhea |
| 431 | 31 | M | 1360 | 688.14 | 182.71 | 3.8:1 | 272.23 | 217.29 | 1.3:1 | K/C/O/Megaloblastic anemia |
| 432 | 49 | M | 1423 | 1133.22 | 181.23 | 6.3:1 | 296.53 | 251.25 | 1.2:1 | B12 deficiency |
| 433 | 40 | M | 1437 | 652.35 | 170.69 | 3.8:1 | 259.91 | 208.84 | 1.2:1 | Abdominal discomfort |
| 434 | 38 | F | 1454 | 1021.63 | 153.94 | 6.6:1 | 257.32 | 189.14 | 1.4:1 | B12 deficiency/Anemia |
| 435 | 44 | M | 1619 | 1065.51 | 182.7 | 5.8:1 | 138.78 | 193.46 | 0.7:1 | Dyspeptic symptoms |
| 436 | 59 | M | 1667 | 1067.26 | 188.83 | 5.7:1 | 234.04 | 210.8 | 1.1:1 | Weight loss/Loss of apetite |
| 437 | 45 | F | 1669 | 969.54 | 182.44 | 5.3:1 | 343.76 | 185.94 | 1.8:1 | Malabsorption |
| 438 | 66 | F | 1690 | 945.51 | 146.17 | 6.5:1 | 283.43 | 199.9 | 1.4:1 | Malabsorption |
| 439 | 55 | F | 1739 | 850.68 | 195.54 | 4.4:1 | 280.94 | 214.74 | 1.3:1 | B12 deficiency |
| 440 | 21 | F | 1741 | 1147.3 | 211.42 | 5.4:1 | 378.25 | 238.45 | 1.6:1 | Malabsorption |
| 441 | 35 | F | 1746 | 1043.7 | 207.37 | 5:01 | 236.91 | 222.05 | 1.1:1 | Chronic diarrhea |
| 442 | 77 | M | 1786 | 1098.59 | 243.39 | 4.5:1 | 260.76 | 189.97 | 1.4:1 | Malabsorption |
| 443 | 61 | F | 1793 | 749.48 | 131.18 | 5.7:1 | 319.71 | 223.36 | 1.4:1 | B12 deficiency |
| 444 | 24 | F | 1797 | 880.09 | 220.07 | 3.9:1 | 270.04 | 198.05 | 1.4:1 | Malabsorption |
| 445 | 32 | M | 1826 | 982.63 | 159.38 | 6.2:1 | 491.48 | 354.68 | 1.4:1 | Malabsorption |
| 446 | 66 | M | 1880 | 695.56 | 197.21 | 3.5:1 | 118.49 | 112.42 | 1.1:1 | Malabsorption |
| 447 | 68 | M | 2034 | 831.25 | 218.94 | 3.8:1 | 255.34 | 280.37 | 0.9:1 | Malabsorption |
| 448 | 56 | F | 2139 | 825.4 | 154.57 | 5.3:1 | 277.37 | 251.54 | 1.1:1 | Anemia |

# MASTER CHART

| S.No | AGE | SEX | HISTO NO | NORMAL VILLI | NORMAL CRYPT | V:C | DISEASED VILLI | DISEASED CRYPT | V:C | CLINICAL FEATURES |
|---|---|---|---|---|---|---|---|---|---|---|
| 449 | 52 | M | 2265 | 839.27 | 206.79 | 4.1:1 | 334.34 | 175.98 | 1.9:1 | Malabsorption |
| 450 | 71 | M | 2299 | 1029.48 | 196.48 | 5.2:1 | 513.51 | 293.14 | 1.8:1 | NSAID induced |
| 451 | 65 | M | 2624 | 855.92 | 225.1 | 3.8:1 | 334.98 | 329.8 | 1:01 | Chronic diarrhea |
| 452 | 51 | M | 2761 | 990.09 | 229.01 | 4.3:1 | 250.02 | 197.02 | 1.3:1 | Malabsorption |
| 453 | 56 | M | 2807 | 866.65 | 177.11 | 4.9:1 | 307.36 | 239 | 1.3:1 | Malabsorption |
| 454 | 54 | F | 2820 | 1453.78 | 315.29 | 4.6:1 | 386.64 | 337.1 | 1.1:1 | Malabsorption syndrome |
| 455 | 59 | M | 2867 | 909.85 | 213.17 | 4.3:1 | 462.73 | 435.59 | 1.1:1 | B12 deficiency/Altered bowel habits |
| 456 | 72 | F | 2944 | 745.92 | 166.13 | 4.5:1 | 283.09 | 233.04 | .12:1 | Malabsorption |
| 457 | 48 | M | 2979 | 815.7 | 218.53 | 3.7:1 | 324.27 | 287.94 | 1.1:1 | Malabsorption |
| 458 | 34 | M | 2983 | 909.18 | 233.32 | 3.9:1 | 479.71 | 397.56 | 1.2:1 | Malabsorption |
| 459 | 27 | M | 2999 | 1074.51 | 249.5 | 4.3:1 | 388.02 | 324.2 | 1.2:1 | Malabsorption |
| 460 | 41 | F | 3146 | 1592.1 | 256.66 | 6.2:1 | 285.41 | 248.24 | 1.1:1 | Malabsorption |
| 461 | 30 | M | 3292 | 1118.73 | 189.38 | 5.9:1 | 459.67 | 359.07 | 1:01 | Malabsorption |
| 462 | 43 | M | 3364 | 1027.13 | 209.5 | 4.9:1 | 475.17 | 472.43 | 1:01 | Dimorphic anemia |
| 463 | 48 | M | 3398 | 1062.17 | 293.64 | 3.6:1 | 432.15 | 342.01 | 1.3:1 | Malabsorption |
| 464 | 45 | F | 3413 | 1050.26 | 172.1 | 6.1:1 | 477.02 | 460.51 | 1:01 | Malabsorption |
| 465 | 34 | F | 3540 | 878.62 | 159.67 | 5.5:1 | 370.43 | 273.5 | 1.4:1 | Malabsorption |
| 466 | 44 | M | 3600 | 578.15 | 129.01 | 4.5:1 | 253.52 | 182.22 | 1.4:1 | Malabsorption |
| 467 | 75 | M | 3656 | 847.74 | 149.68 | 5.7:1 | 458.96 | 448.4 | 1:01 | Malabsorption |
| 468 | 65 | M | 3675 | 957.54 | 184.23 | 5.2:1 | 227.84 | 213.52 | 1.1:1 | Malabsorption |
| 469 | 76 | F | 3701 | 706.16 | 185.71 | 3.8:1 | 252.26 | 242.26 | 1:01 | AGE/H.pylori Gastritis |
| 470 | 35 | M | 3774 | 889.06 | 197.01 | 4.5:1 | 229.01 | 196.02 | 1.2:1 | B12 deficiency |
| 471 | 54 | F | 3818 | 1004.16 | 171.32 | 5.9:1 | 317.77 | 306.23 | 1:01 | Malabsorption |
| 472 | 37 | M | 4293 | 994.53 | 196.42 | 5.1:1 | 220.19 | 216.44 | 1:01 | Oral ulcer |
| 473 | 32 | M | 4406 | 804.58 | 182.95 | 4.4:1 | 303.39 | 204.33 | 1.5:1 | Malabsorption |
| 474 | 43 | M | 4469 | 887.5 | 240.96 | 3.7:1 | 251.82 | 226.68 | 1.1:1 | Malabsorption |
| 475 | 48 | F | 4486 | 1059.63 | 173 | 6.1:1 | 293.58 | 202.62 | 1.5:1 | K/C/O Retroviral disease/Loss of weight |
| 476 | 18 | F | 4567 | 844.69 | 263.29 | 3.2:1 | 383.18 | 330.35 | 1.2:1 | Malabsorption |
| 477 | 39 | M | 4572 | 813.89 | 193.48 | 4.2:1 | 329.54 | 250.34 | 1.3:1 | B12 deficiency |
| 478 | 50 | M | 4616 | 971.66 | 176.63 | 5.5:1 | 293.58 | 286.96 | 1:01 | Malabsorption |
| 479 | 52 | M | 4670 | 1018.19 | 217.58 | 4.7:1 | 513.35 | 348.35 | 1.5:1 | Malabsorption |
| 480 | 80 | M | 4715 | 813.67 | 189.34 | 4.3:1 | 211.04 | 173.37 | 1.2:1 | Megaloblastic anemia |
| 481 | 48 | M | 4775 | 1079.52 | 193.1 | 5.6:1 | 302.62 | 300.51 | 1:01 | Macrocytic anemia |
| 482 | 48 | F | 5107 | 791.49 | 230.53 | 3.4:1 | 179.6 | 565.21 | 0.3:1 | B12 deficiency |
| 483 | 53 | M | 5158 | 823.04 | 212.06 | 3.9:1 | 96.7 | 418.32 | 0.2:1 | Malabsorption |
| 484 | 83 | M | 5310 | 872.03 | 222.05 | 3.9:1 | 220.01 | 198.09 | 1.1:1 | Chronic diarrhea |
| 485 | 21 | F | 5402 | 938.84 | 201.99 | 4.6:1 | 281.92 | 250.86 | 1.1:1 | Chronic intermittent diarrhea |
| 486 | 25 | F | 5541 | 981.69 | 201.75 | 4.9:1 | 320.26 | 131.75 | 2.4:1 | Chronic diarrhea/Microscopic colitis |
| 487 | 10 | F | 5551 | 1109.94 | 219.5 | 5.1:1 | 349.2 | 246.96 | 1.4:1 | Recurrent abdominal pain |
| 488 | 60 | M | 5580 | 877.98 | 156.91 | 5.6:1 | 319.11 | 231.23 | 1.3:1 | Malabsorption |
| 489 | 34 | M | 5836 | 1000.48 | 180.38 | 5.5:1 | 381.32 | 230.53 | 1.6:1 | Malabsorption |

# MASTER CHART

| S.No | AGE | SEX | HISTO NO | NORMAL VILLI | NORMAL CRYPT | V:C | DISEASED VILLI | DISEASED CRYPT | V:C | CLINICAL FEATURES |
|---|---|---|---|---|---|---|---|---|---|---|
| 490 | 58 | F | 5966 | 1048.83 | 180.77 | 5.8:1 | 301.1 | 211.04 | 1.4:1 | B12 deficiency/Pancytopenia |
| 491 | 78 | M | 6038 | 677.1 | 129.71 | 5.2:1 | 396.15 | 144.01 | 2.7:1 | Malabsorption |
| 492 | 48 | F | 6091 | 1260.99 | 211.15 | 5.9:1 | 296.76 | 268.88 | 1.1:1 | Malabsorption |
| 493 | 42 | M | 6134 | 903.57 | 151.62 | 5.9:1 | 459.27 | 166.27 | 2.8:1 | Intermittent loose stools |
| 494 | 53 | F | 6212 | 871.24 | 165.14 | 5.3:1 | 562.14 | 325.04 | 1.7:1 | B12 deficiency |
| 495 | 55 | M | 6331 | 1641.43 | 253.26 | 6.5:1 | 281.92 | 270.32 | 1:01 | Increased stool frequency |
| 496 | 59 | M | 6362 | 916.04 | 142.54 | 6.4:1 | 247.22 | 193.4 | 1.3:1 | Malabsorption |
| 497 | 46 | M | 6375 | 838.95 | 165.05 | 5.1:1 | 324.94 | 221.21 | 1.5:1 | B12 deficiency/Pancytopenia |
| 498 | 66 | F | 6379 | 852.09 | 169.99 | 5:01 | 385.53 | 263.87 | 1.5:1 | Malabsorption |
| 499 | 56 | M | 6636 | 1427.16 | 213.32 | 6.7:1 | 482.44 | 446.61 | 1:01 | Malabsorption |
| 500 | 43 | M | 6678 | 971.48 | 165.1 | 5.9:1 | 375.69 | 248.23 | 1.5:1 | H.pylori |

## ABBREVIATIONS

| | | |
|---|---|---|
| PI-IBS | - | Post infectious-Irritable bowel syndrome |
| TGase | - | Transglutaminase |
| APCs | - | Antigen presenting cells |
| EMA | - | Endomysial autoantibody |
| ESPGHAN | - | European society for Pediatric , Gastroenterology, Hepatology and Nutrition |
| H&E | - | Hematoxylin and Eosin |
| PDF | - | portable document format |
| V:C | - | villous crypt ratio |
| MRD | - | Medical Records Department |