



**ORIGINAL RESEARCH PAPER**

**General Surgery**

**PREVALENCE AND RISK FACTORS ASSOCIATED WITH SIGMA VOLVULUS**

**KEY WORDS:** volvulus SIGMA, RISK FACTORS, ABDOMINAL PAIN, ACUTE ABDOMEN, CLAMP, postoperative

<b>Pablo Llerena Jara</b>	MD General Practitioner
<b>Victoria Trejo Martinez*</b>	MD General Practitioner *Corresponding Author
<b>Martha Moya Gamboa</b>	MD General Practitioner
<b>Johana Vasquez Villacis</b>	MD General Practitioner
<b>Liz Sanchez Obregon</b>	MD General Practitioner
<b>Irina Barragan Cisneros</b>	MD General Practitioner
<b>Viviana Sandoval Espinoza</b>	MD General Practitioner
<b>Manuel Yamunaqué Preciado</b>	MD General Practitioner
<b>Valeria Moya Olivo</b>	MD General Practitioner
<b>Karen Chavez Cadena</b>	MD General Practitioner
<b>Karolin Lalama Gomez</b>	MD General Practitioner

**ABSTRACT**  
 This study aims to determine the prevalence of the disease and identification of the most relevant risk factors, to propose a risk profile and appropriate clinical management. The research is descriptive, analytical, retrospective, was performed at a hospital in Latacunga Ecuador. medical records were reviewed with diagnosis of volvulus Sigma, 36 records were reviewed, of which the age range most presentation is between 41 to 64 years with 51.3% also was evident the existence of cases in younger ages although it does not correspond with the literature; males had higher prevalence with 64% of the total cases. In the institution which developed research evidenced complication rate with 71.8% of the total, considering that the most important are the presence of postoperative flanges with 10.3%. Demonstrating the importance of risk factors in the study group to take a closer clinical attitude. independent analysis of the variables, and the use of a wider population recommended.

**INTRODUCTION**  
 Sigma volvulus is a complication of megacolon, in which there is a twist of an intestinal loop around the mesentery, with partial or total jamming intestinal transit which lead to harmful complications to life.

The incidence varies according to geographical area, so that in Africa and South America is between 30-50%, occurring in Peru and Bolivia as the most common cause of intestinal obstruction. (Granados,R.,2014)

Copious intake of foods rich in cellulose and fermentable could be the precipitating factor for volvulus. The inhabitants of areas living in areas above 3,000 meters high have the colon length and diameter greater than the inhabitants of the plain. The high fiber diet inhibit the histological phenomenon called elastogenesis, which is the formation of elastic fibers as microfibrils or fibrillar component and amorphous component after inducing the gradual growth of the colon. (Saravia,J.,2014)

The abundant supply of products having cellulose is considered reagent volvulus, and high fiber content in the foods they eat, are limiting the continued growth of the colon.

The clinical picture of the Sigma volvulus can occur in different ways, which sudden abdominal pain associated with constipation, bloating, vomiting and difficulty removing flatus.

Diagnosis is clinical and radiological manner. With a thorough

physical examination and abdominal radiographs diagnosis is obtained. Thus the plain abdominal radiography we can come immediately to the diagnosis because you can see the characteristic sign "coffee bean" from Sigma volvulus.

The treatment is still in dispute because we have to take into account the state of the patient, location of the lesion and especially the experience of the surgical team.

**Definition**

Volvulus Sigma box is a mechanical obstruction caused by twisting of a segment of the colon full of air around the mesenteric axis, and producing luminal obstruction of blood perfusion alteration progressing strangulation, gangrene and perforation. 90% of cases occur in the sigmoid colon mainly mesenteric anatomy and factors associated with it. (Garcia, G.,2011) (Townsend, C.,2017)

The colon is divided into right and left by an imaginary line which passes over the transverse colon, volvulus located on the right side are produced by congenital malformations 15-30%; while the left side correspond to the sigma given by an abnormally movable handle associated diseases expand and lengthen a sigma 45-80%.

**Epidemiology**

Volvulus Sigma is considered a disease of poor presentation in developed countries, the United States occurs in 4% of blockages of the colon, however, in South America, Africa, Middle East, India and Russia, considered as a region of the belt of the volvulus, the frequency of occurrence is greater, with about 50% of cases.

Associated with the anatomical component, pathology is facilitated by the presence of several factors for its appearance, thus being advanced age, male sex, diet, medication use, intestinal disorders like constipation, and even the presence of infections such as trypanosomiasis American, which generate more prone to develop this disease. (Townsend, C.,2017)

In developed countries it affects elderly patients with incapacitating stroke and neuropsychiatric diseases such as increasing the surgical risk and therefore morbidity and mortality. Sigma volvulus is common in South America, Africa and some Asian countries, as consuming diets with high fiber. (Townsend, C.,2017)

The degree of twist in acute cases of Sigma volvulus may reach 180-540 °, being in 10-35% of cases. A twist of 360 ° occurs in 50% of cases. Torsion is contrary to the hands of the clock and the most common location of volvular sigma twist this around the mesenteric axis located at 15-25cm from the anus, being more accessible to the site by a sigmoidoscopy. (Saravia, J.,2014)

**Risk factor's**

physical exertion is considered as causing a sudden and sharp contraction of the abdominal wall (Ron, A.,2009)

coughing Sneezing

Crisis purgative intake of diarrhea

Precipitate in final stages of pregnancy or childbirth. (Ron, A., 2009)

Secondary to laparoscopic procedures, where the action of pneumoperitoneum and postsurgical patients with redundant position sigma lead to twisting.

**Pathogeny**

If there is an organic barrier it prevents the progression of the

content lies in hyperperistalsis fighting to try to cross the obstacle, responsible for colicky pain. After numerous unsuccessful attempts smooth muscle fiber fatigue, in the case of volvulus to having torque behaves like valve accumulation of gas and liquid, the gas is produced by fermentation and putrefaction of bacteria in the colon, which proliferate quickly predominance of gram negative and anaerobic with. (Londo, D.,2010)

Continuous distension of the intestinal wall causes a change in the parietal circulation can lead to ischemia, necrosis and perforation; circulatory engagement occurs by increasing intraluminal pressure and by thinning the wall compresses the vessels. (Londo, D.,2010)

Compressing the veins causes distension venous return down with stasis and retrograde engorgement. A towering the hydrostatic pressure in the capillary bed plasma extravasation in the intestinal wall (edema), the intestinal lumen and in the direction of the peritoneal cavity is produced, which together with the liquid in the intestinal lumen and vomiting that they give root cause obstruction dehydration and hypovolemic shock. (Tamames, S.,2000)

Because venous stasis may arise a problem that the breaking capillaries (with or without vein thrombosis), with wall hemorrhage into the intestinal lumen and into the peritoneal cavity which complicates hypovolemia. The wall edema and distension of the intestinal wall complicate blood circulation which causes intestinal necrosis leading from the mucosa to the serosa and drilling producing peritonitis that affect septic shock. (Enriquez, S.,2007)

No requirement is that there is perforation for septic shock, the reason is that the hypoxic intestinal wall no longer performs the action of protective barrier, so there step of bacterial toxins that target the peritoneal cavity. (Enriquez, S., 2007)

**Clinical forms**

Acute presentation: sudden onset, is a clinical low intestinal obstruction with colicky pain and abdominal distension, absence of flatus and stools, which are added nausea and vomiting. Evidence exploration and diminished rectal hydroaerial noise level reveals an empty ampoule. This is the presentation may divide the same time into two subtypes, depending on the degree of vascular compromise: with early vascular compromise, with late vascular compromise, described in the following table. (Londo, D.,2010) (Townsend, C.,2017)

	Early vascular compromise	Latevascular compromise
Frequency	25%	75%
Start	Fast	slow
Evolution	Rapid	Progressive
Clinic	Intense pain, early vomiting, signs of shock	Lower abdominal pain
Physical examination	Diffuse abdominal distention, on defense palpation and muscular contracture, empty rectal blister	Bayer sign, Von Wahl sign, Kivul sign, empty rectal blister

Chronic presentation features larvado boxes start to behave as partial bowel obstruction less intensity of abdominal pain. The paintings although usually resolve spontaneously, recurrent, and reflect incomplete volvulaciones (minor torsions 180) that fails to engage the mesenteric blood flow in

the affected area, however they can lead to acute obstruction completely volvulus some of recurrences. (Londo, D., 2010)

Recurrent presentation: cases which then recur in endoscopic or surgical treatment are included. (Londo, D., 2010)

**Clinical manifestations**

The clinical picture is the acute intestinal obstruction, typically formed by the triad of abdominal pain, bloating and constipation, also may be associated with other symptoms such as, nausea, lack of flatus, abdominal discomfort and inability to flatus low channel. Vomiting occurs late and if it is marked abdominal distention may occur respiratory and cardiac compromise. (Granados, R., 2014) (Garcia, G., 2011) (Townsend, C., 2017).

Physical examination reveals a diffuse bloating, can present a palpable mass. Abdominal distention level especially left iliac fossa may be a data suggestive physical examination. The presence of shock and temperature rise can be demonstrated against colonic perforation. Rectal examination shows an empty rectal ampulla. (Granados, R., 2014) (Garcia, G., 2011) (Townsend, C., 2017).

The duration of symptoms can be between 10 hours and 5 days determining the surgical procedure will require.

**Classification**

The Sigma volvulus has four degrees according to the rotation of the colon, presentation of symptoms and circulatory compromise.

Características Grados	Rotación del colon sigmoideas	Sintomatología	Complicaciones
GRADO I	Menor a 180°	No se acompaña	Se resuelve de forma natural
GRADO II	Mayor a 180°	Leve	Se resuelve naturalmente o con la realización de procedimientos endoscópicos
GRADO III	Mayor a 180°	Presente por oclusión total en asa cerrada	Con compromiso leve de la circulación manteniendo al asa afectada viable
GRADO IV	Mayor a 180°	Presente por oclusión total en asa cerrada	Con compromiso grave de la circulación que no puede ser resuelto.

**Laboratory exams**

Is mainly a CBC which could manifest leukocytosis, that is with or without deviation to the left of the formula, which when present suggests states throttle or peritonitis in the patient. Shows signs of hemoconcentration as well as hemoglobin, hematocrit and elevated plasma proteins. Electrolytes can be decreased, urea can be elevated by extrarenal origin, and usually glucose levels due to the stress of the patient. (Londo, D., 2010)

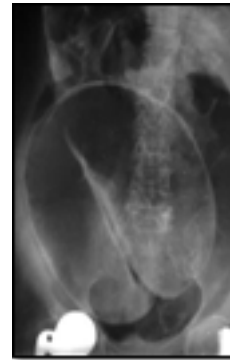
**radiological examination**

You should apply a simple abdominal radiography and barium enema.

Studies show great gaseous distension of the volvulada handle, being able to fill the entire abdominal cavity itself. With a simple abdominal can be diagnosed 60-70% of cases. Standing position highlights the intestinal air-fluid levels with a liquid / gas ratio increased to two and sometimes a marked elevation of the left hemidiaphragm and absence of gas in rectal blister is observed. (Londo, D., 2010)

Other signs that can be described are:

There are two segments of parallel handle, have the same distance and thus the same characteristics.



Sign of the coffee bean: It is observed the sigma rotated, filled with air and a line or central strip thickened, which is formed by the union of both walls turned colon. Disappear haustral of the sigma and intestinal contour is smooth and curvilinear.

"Sign Peak Ave" column barium getting to the bottom of the volvulus describes an image similar to a candle flame or as the name says a bird's beak. These drawings show the existence of the substance at the site of torque, in some cases while the test is performed, the blockage can be solved when a blockage of valve type and even no real volvulus. (Garcia, G., 2011) (Tacam, M., 2017.) (Townsend, C., 2017)

**Treatment**

Conservative management: is to relieve the blockage and prevent recurrent episodes. Should start managing the patient with relief from the clinical picture by placing a nasogastric tube, to reduce abdominal distension, applying urinary catheter to drain the urine or control hourly diuresis, also must be corrected electrolyte imbalance by administering hydration solutions, that maintain stable vital functions and use of antibiotic therapy to control the infectious process to be instituting .. initial treatment and the method of choice in patients with viable bowel is sigmoidoscopy. Decompression rigid sigmoidoscope is successful in 70- 90% of cases. When there bloody fluid, mucosa while observing blackish or has plates should be deleted necrosis procedure. (Botella, C., 2005) (Garcia, G., 2011) (Lopez, J. 2017)

Surgical Management: Indicated laparotomy in case of failure or decompression performed after persistent leukocytosis fever or clinical suggesting intestinal ischemia, perforation or peritonitis. (Botella, C., 2005) (Garcia, G., 2011) (Lopez, J. 2017)

In the presence of colonic necrosis resection of the compromised segment and colostomy Hartman type is performed. Mortality in emergency surgery necrotic colon is around 38%, compared to the range in which elective surgery is around 8%. (Castejón, M., 2015) (Lopez, J. 2017)

Resection anastomosis and primary bowel preparation is not controversial, studies such as Bagarani and colleagues reported a mortality of 0% with primary anastomosis viable bowel and 33% mortality in primary anastomosis with necrotic bowel. Taha instead reported a mortality of 60% in primary anastomosis in intestinal gangrene. The embodiment of a method of Hartman has a mortality of 9% and 13% mortality. (Guelfand, M. 2011).

The sigmoidopexia and fixing the sigmoid to the side wall of the abdomen is another treatment option is valid when there is adequate circulation and volvulus has been previously decompressed. (Castejón, M., 2015) (Lopez, J. 2017)

**complications**

Untreated complications are the high rate of mortality and complications related to surgical treatment are: wound dehiscence, bleeding haemoperitoneum for working port,

surgical site infection, wound seroma. Other complications associated with this disease are related to the recurrence of the sigmoid volvulus. The discharge occurs between the 4th and the 9th postoperative day, increasing the risk of complications. (Garcia, G., 2011)

**MATERIALS AND METHODS**

**Study Population**

It will be analyzed patients admitted with a diagnosis of volvulus Sigma in the service of General Surgery Latacunga. This research was conducted in Latacunga General Hospital of the Ministry of Public Health, which has the Department of General Surgery. The period analyzed is since 01 January 2016 until 30 June 2018.

**Inclusion criteria**

Patients were included with age greater than or equal to 20 years.

They include patients diagnosed radiologically Sigma volvulus.

**Exclusion criteria**

Excluding patients under 20 years.

Excluding patients whose medical records are not in the area of statistics.

Excluding patients who are outside the period established research.

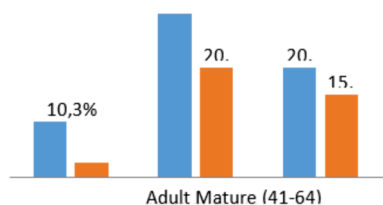
Excluded patients without radiodiagnostic

**Population size**

A total of 89 cases were reviewed by obstructive acute abdomen, yielding 57 diagnostic clinical histories Sigma volvulus, in the period from 2016 to 2018, of which 21 were excluded stories for being misplaced or incomplete information therein, presenting a total of 36 patients, no calculation of the sample was required to be a small universe.

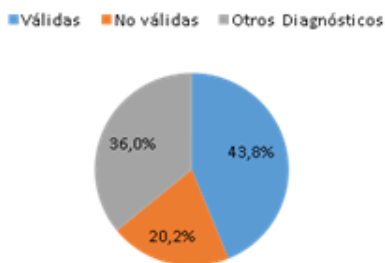
**RESULTS**

**Distribution by Age and Sex**



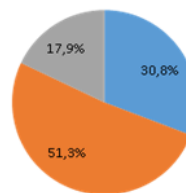
The number of cases presenting diagnostic Sigma volvulus by medical records in the study, correspond to 43.8% (n = 36), **This prevalence of the diagnosis in this study at this institution.**

**Prevalencia**



**Distribution of patients by years of research**

■ Período 2016 ■ Período 2017 ■ Período 2018



This study is conducted for about 3 years, being so the greater number of cases presented in 2017 with 51.3% of the total studied (n = 17), followed by 2016, with 30.8% (n = 12), and finally 2018 with 17.9% (n = 7). Given that over the past year only cases are taken for 6 months.

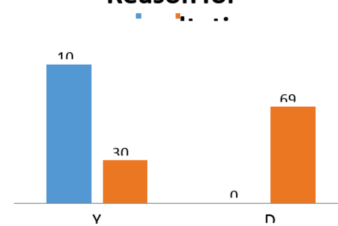
**Distribution of patients by age and sex**

Based on the WHO classification the distribution of patients by age group and sex is done, showing thus: Young Adult (20-40 years) a percentage of 10.3% in men (n = 4) and 2.6% in women (n = 1) of the total patients studied; mature adult (41-64 years) with a percentage of 30.8% in men (n = 12) and 20.5% in women (n = 8), which is the age group with the highest number of cases and elderly (over 65 years) 20.5% (n = 8) in men and 15.4% women (n = 6), consistent with the literature in relation to gender distribution, being more common in men but the number of cases in relation to the age group is discordant with literature.

**Distribution of patients by reason of consultation**

The main problems that led patients to go for health care are: abdominal pain with a percentage of 100% (n = 39), abdominal distention with 30.8% (n = 12) and those who had abdominal distention is 69.2% (n = 27)

**Reason for**



Is evidence that surgical treatment is greatest amount with a percentage of 51.3% (n = 20) and non-surgical treatment corresponding to use of nasogastric tubes, bladder and rectal addition to the clinical management (hydration, analgesia, antibiotic), occurs in 48.7% (n = 19) as the only handling the remaining patients.

Of the total patients in whom surgical treatment was performed, 70% (n = 14), he provided volvulus Sigma grade IV as surgical finding, while 30% (n = 6), presented volvulus Sigma Grade II. Could not show the remaining degrees as operative findings.

**DISCUSSION**

43.8% of the patients studied correspond to diagnosis of volvulus Sigma given parameters clinical, radiologic, and surgical research institution, based on medical records considered valid for the study according to the criteria for inclusion and exclusion thereof, showing the prevalence of this disease remains high in our environment, compared to other countries, such as the first world that have a lower prevalence with about 4% (Townsend, C., 2017); agreeing with the display value in countries of the Andean region.

The factors most important risk to consider as predisposing to present volvulus Sigma are: age, sex, ethnicity, place of residence, schooling and food, so it was evident a percentage of presentation of 51.3% in mature adults (41-64 years), which

do not correspond with the evidence presented by other authors state that the most common age of onset is between the sixth and eighth decade of life, showing that in this study corresponds to 36% this range age, although it is revealed that this condition is present at any age, draws attention to the presence of cases in young adults (20-40 years) with a percentage of 12.8% documented in this research.

11.1% of the Ecuadorian population has as work activity agriculture (INEC 2010), considering that it has a significant bearing on the occurrence of volvulus Sigma evidenced in this study that 46.2% of the patients presented as work activity the agriculture, associated with both schooling, ethnicity and power, influencing factors in the presentation of this pathology. Schooling no theoretical basis of association volvulus Sigma, however, in this study the absence of schooling is associated with this change and is 41% while the primary school is associated by 51.3%.

Feeding in the population in the Andean region it is mainly based on the consumption of vegetables, carbohydrates and fiber, with low proportion of proteins, given primarily for the ease of the inhabitant in the preparation thereof (Ochoa, F., 2008) ( Ron, A., 2009), associated with labor activity as mentioned above with agriculture; in this study detailed information feeding patients achieved 54% of which food to consume the main are in descending order of carbohydrates, followed by vegetable fibers and proteins.

The main sign associated with this condition corresponds to abdominal pain, occurring in all cases of this study, besides being associated with the presentation of abdominal distention as another sign and important symptom, with a percentage of 30.8% of the total cases. Could also show that in the most important clinical signs and symptoms will be the tenderness, bloating, air-fluid noises diminished or absent, absence of flatus and constipation in various proportions, but equally important.

The presence of complications associated with more days of hospital stay, is presented in May and number of complications between third and sixth day of hospitalization with 29.2%; the most frequent complication was postoperative flange with 10.3%, and the mortality rate associated with this disease is 7.7% of the total cases presented within the first day of hospitalization.

**CONCLUSIONS**

It was found that the prevalence of the volvulus Sigma in the time period studied is 43.8% in patients treated at the Hospital of Latacunga with diagnosis of obstructive acute abdomen, also was identified the main risk factors associated with the volvulus Sigma as sex in accordance with the literature; also one of the factors most important risk factor is age, because even though the mentioned literature increased frequency of cases between the sixth and eighth decade of life, he determined in this larger study prevalence between the fourth and sixth decade life, followed by the elderly (over 65 years).

**RECOMMENDATIONS**

Conduct investigations of variables these in larger towns and several villages, since the results may be influenced by our demographics and limitations of the study design, to reinforce the validity of the presence or absence of risk factors detailed above and its association with Sigma volvulus.

Investigate the correlation between the filing of complications and length of hospital stay in association with this disease, because patients of this study despite having a short hospital stay presented early complications.

**REFERENCES**

1. Agramonte, O. (2016). Leukocytosis with a left shift in acute appendicitis. Retrieved from [http://scielo.sld.cu/scielo.php?script=sci\\_](http://scielo.sld.cu/scielo.php?script=sci_)

artext&pid=S1025-02552016000200004

2. Amieva, C. (2014). Chagas disease in Latin America today: old and new problems, major challenges. *obtainedo* <http://www.apostadigital.com/revistav3/hemeroteca/camieva.pdf> f

3. Borda, L. (2017). Andean megacolon and sigmoid volvulus height. Presentation of 418 cases between 2008 - 2012 at the C.Monge hospital - Puno, Peru. Retrieved from [http://www.scielo.org.pe/scielo.php?script=sci\\_arttext&pid=S1022-51292017000400004](http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S1022-51292017000400004) f

4. Bottle, C. (2005). *obtainedo* <https://www.fisterra.com/material/tecnicas/enema/enemaLimpieza.pdf> f

5. Buzzi, M. (2005). *signsradiological.obtainedo* <http://www.redalyc.org/html/3825/382538435012/> f

6. Caceres, F. (2014). Sigma volvulus.

7. Cancino, R. (2012). Latin America: ethnic groups, nations and transformations. Retrieved from <https://journals.aau.dk/index.php/sd/article/view/896/72>

8. Casas, E. (2001). Volvulus Sigmoid Colon: years 1991-2001. Alberto Hurtado Hospital Abbey. Casas Diaz, Edmundo Clodoaldo. Retrieved from [http://sisbib.unmsm.edu.pe/bibvirtual/tesis/salud/Casas\\_D\\_E/marco\\_teo\\_rico.htm](http://sisbib.unmsm.edu.pe/bibvirtual/tesis/salud/Casas_D_E/marco_teo_rico.htm)

9. Castejón, M. (2015). Colostomias. Retrieved from <http://www.bvs.hn/RMH/pdf/1975/pdf/Vol43-2-1975-4.pdf>

10. Cortes, C. (2017). Intestinal obstruction by Bridas / Adhesions: Proportion and Evolution of Conservative Management. <http://www.archivosde medicina.com/medicina-de-obtenido-from-family-obstruccion-intestinal-by-bridas-adherencias-proporcioacuten-y-evolucion-acuten-of-the-handling-conservador.php?Aid=20054>

11. Enriquez, S. (2007). Analysis of intestinal ibstrucción in patients older than 50 years.

12. Retrieved from <https://hera.ugr.es/tesisugr/17243750.pdf>

13. Flores, N., & Ingar, C. (2005). Chiliditi syndrome complicated with transverse colon volvulus. *obtainedo* <http://sisbib.unmsm.edu.pe/bvrevistas/gastro/vol25n3/pdf/a08.pdf> f

14. Frisancho, O. (2008). Dolichomegacolon Andean and intestinal volvulus high. Retrieved from [http://www.scielo.org.pe/scielo.php?script=sci\\_artext&pid=S1022-51292008000300007](http://www.scielo.org.pe/scielo.php?script=sci_artext&pid=S1022-51292008000300007)

15. Garcia, G. (2011). *volvulus of the Sigmoid.obtainedo* <http://bdigital.unal.edu.co/7157/1/597738.2011.pdf>

16. Gonzalez, M. (2015). I manage colon volvulus in a primary hospital, conservative or surgical treatment? revision 5 years in the General Hospital Obispo Polanco Teruel. Retrieved from <https://dialnet.unirioja.es/descarga/articulo/5440245.pdf>

17. Granados, R. (2014). Intestinal obstruction syndrome. Retrieved from <https://revistas.ucr.ac.cr/index.php/clinica/article/viewFile/16428/15943>

18. Guelfand, M. (2011). primary anastomosis in necrotizing enterocolitis. Retrieved from [https://scielo.conicyt.cl/scielo.php?script=sci\\_arttext&pid=S0370-41062011000600006](https://scielo.conicyt.cl/scielo.php?script=sci_arttext&pid=S0370-41062011000600006)

19. INEC (2010). National Institute of Statistics and Census 2010 Population and Housing Census 2010

20. Jimenez, L. (2015). Abdominal pain in the emergency room. Retrieved from <http://www.medynet.com/usuarios/jraguilar/Manual%20de%20urgencias%20y%20Emergencias/dolorabd.pdf>

21. Jimenez, R. (2008). Cecal volvulus as a cause of intestinal obstruction. Retrieved from [http://scielo.isciii.es/scielo.php?script=sci\\_arttext&pid=S1130-01082008000600014](http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1130-01082008000600014)

22. Londo, D. (2010). Comparative study surgical management of sigmoid volvulus technique colonic resection with entero-anastomosis whole in one time vs ostectomy time and subsequent final correction in the Provincial General Teaching Hospital Riobamba. Retrieved from <http://dspace.unach.edu.ec/bitstream/51000/36/1/UNACH-EC-MEDI-2010-0003.pdf>

23. Manniello. (2017). The Putrefaction, Fermentation and Consequences. Retrieved from <https://metodomanniello.com/es/blog-post/la-putrefaccion>

24. Marquez, A. (2010). Volvulus of the right colon necrosis in young patient. Retrieved from [http://www.medigraphic.com/pdfs/imss/im-2010/im1\\_02\\_p.pdf](http://www.medigraphic.com/pdfs/imss/im-2010/im1_02_p.pdf)

25. Mayorga, W. (2014). Comparison of results between terminal end colostomy primary anastomosis and Hartmann type in sigmoid volvulus resolution, Provincial General Hospital in Latacunga 2007 - 2010. Retrieved from <http://dspace.epoch.edu.ec/bitstream/123456789/3438/1/94T00101x.pdf>

26. Mejia, G., & Arias, M. (2008). Pain of the sacroiliac joint. Anatomy, Diagnosis and Treatment. *obtainedo* [http://scielo.isciii.es/scielo.php?script=sci\\_arttext&pid=S1134-80462008000300006](http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1134-80462008000300006)

27. Mena, G., & Bellora, A. (2015). Sign swirl: Malrotation and midgut volvulus. Retrieved from [http://www.scielo.org.ar/scielo.php?script=sci\\_arttext&pid=S1852-99922015000200011](http://www.scielo.org.ar/scielo.php?script=sci_arttext&pid=S1852-99922015000200011)

28. Morales, H. (2014). Volvulus. *obtainedo* <http://medfinis.cl/img/manuales/volvulosgastrointestinales.pdf>

29. Pérez, F. (2010). Coloproctology. Gijón.

30. Red, G., & Garcia, J. (2017). An alternative therapy in recurrent colon volvulus. *Obtained* [https://aeed.com/document/os/publicos/revista/octubre2017/Enferm%20Endosc%20Di%20g%202017;4\(2\)36-39.pdf](https://aeed.com/document/os/publicos/revista/octubre2017/Enferm%20Endosc%20Di%20g%202017;4(2)36-39.pdf)

31. Ron, A. (2009). Socioeconomic factors prevalent in patients diagnosed with sigma volvulus in the surgery department of the Provincial General Hospital Latacunga 1995 - 2005. *obtainedo* <http://dspace.epoch.edu.ec/bitstream/123456789/190/1/94T00060.pdf>

32. Ruiz, M. (2015). Intestine Thick. *obtainedo* <https://es.scribd.com/document/289026705/intestino-grueso>

34. Saravia, J. (2015). Megacolon and sigmoid volvulus: Incidence and pathophysiology. Retrieved from [http://www.scielo.org.pe/scielo.php?script=sci\\_arttext&pid=S1022-51292015000100005](http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S1022-51292015000100005)

35. Schwartz, S. (2015). Principles of surgery. Spain

36. Tacam, M. (2017). Evolution of patients post primary anastomosis volvulus sigmoid. Retrieved from [http://biblioteca.usac.edu.gt/tesis/05/05\\_10525.pdf](http://biblioteca.usac.edu.gt/tesis/05/05_10525.pdf)

37. Tamames, S. (2000). Surgery: digestive system, circulatory system, respiratory apparatus. Madrid.

38. Townsend, C. (2017). Sabiston: General and digestive tract surgery. Spain

39. <http://bdigital.unal.edu.co/7157/1/597738.2011.pdf>