

## **ACUTE APPENDICITIS IN PREGNANCY, OUR EXPERIENCE AND REVIEW OF LITERATURE**

### **ABSTRACT**

The Most common non-obstetric surgical emergency in pregnant women is Acute Appendicitis, However, as there is shifting of anatomical position of the appendix by the enlargement of the gravid uterus, the diagnosis becomes difficult. Higher risk of Feto-Maternal Morbidity as well as Mortality is noted in cases of appendicular perforation, therefore rapid and accurate diagnosis and management is essential. The purpose of this study is to investigate the clinical presentation, management of Acute Appendicitis in Pregnancy.

### **KEYWORDS**

Appendix, appendicitis, pregnancy, acute abdomen.

### **BACKGROUND**

Clinical and radiological diagnosis of appendicitis become more difficult in third trimester. In the past, open appendectomy use to be prefer choice of intervention while in recent years laparoscopic is an alternative option with accepted safety. In this paper we aim to share our experience of patients of appendicitis in pregnancy along with review of literature.

### **METHODS**

A total of 25 pregnant women who underwent appendectomy with the initial diagnosis of acute appendicitis in Dept. of General Surgery of Acharya Vinoba Bhave Rural Hospital which is affiliated to Jawaharlal Nehru Medical College Sawangi (Meghe) Wardha in between July 2018 to June 2020 were analyzed.

Data about patients' age, gestational age, chief complaints, findings of physical examination, total and differential leukocyte count, biochemical parameters, urine analysis, ultrasonography of abdomen and pelvis, type of surgical intervention, post-operative complications, and hospital stay were studied. Maximum patients received single prophylactic doses of Cefotaxim 1 g. And for 4 patients, 7 days antibiotic therapy was given. Tocolytic agent was used as and when required.

Scopus, PubMed and Cochrane libraries were searched for scientific articles with the terms "appendicitis" and "pregnancy". Thorough analysis was done and data was used in this review.

### **RESULTS**

Median age of the patients was 22.9, At admission the cases were there as in First Trimester– 4, Second Trimester-6, Third Trimester-5. Median gestational age was 18.4 weeks. Out of these 25 patients, 12 were primi-gravida, 8 were 2<sup>nd</sup> Gravida and 5 were 3<sup>rd</sup> Gravida. Out of these 2 patients had history of abortion twice.

On admission, mostly the patient complained of pain in abdomen, out of which 76% had Pain in the right lower quadrant, 20% had Pain in the right upper quadrant, 4 % had non specific pain in abdomen the other non specific symptoms were nausea (64%), vomiting (60%), anorexia (56%), Low grade fever, Dysuria (12%).

On physical examination: tenderness in right lower abdomen, n=19, rebound tenderness in lower right quadrant 48%, abdominal guarding 40%, Rectal tenderness 40% Median WBC count was 12.39 per cubic mm. (range is 9000 to 17500 per cubic mm.) C- reactive Protein were raised in 80 percent of the patients. Biochemical parameters were with normal limits in 20 percent of the patients. Hemoglobin was 8.2 percent in 4 patients and 1 patient had hyperglycaemia. On abdominal ultrasound findings, the positive findings suggestive of appendicitis were in 24 patients. MRI was done in one patient where USG was inconclusive and there was strong clinical suspicion for appendicitis. 22 patients had open appendectomy under spinal anaesthesia and 3 patients underwent laparoscopic appendectomy under general anaesthesia. All open cases were done using Lanz incision. In 2 cases of Open surgery, intra-operative findings were suggestive of localized perforative peritonitis. Radiological and Biochemical co-relation was present in both of these cases of perforative peritonitis. Post-operative period was uneventful for all the patients and 3 patients were given tocolytic agents in post-operative period. Histopathological findings were consistent with acute appendicitis in all the operated cases. None of the patients had developed any surgical site infection. No foeto-maternal mortality was detected. 23 patients were discharged within 6 days. 2 patients were discharged on 10<sup>th</sup> day.

## DISCUSSION

The Most common surgical cause of acute abdomen in pregnancy is appendicitis. It is also the most frequent non-obstetric indication for emergency surgery in pregnancy.<sup>(1,2),(3 4),(5)</sup> Incidence rate ranges from 0.05% to 0.07%: similar to non-gravid population with slightly higher in second trimester.<sup>(5, 6)</sup>

As there is change in physiological and anatomical parameters during pregnancy, the diagnosis of appendicitis is delayed with increased materno-fetal risk.<sup>(7)</sup>

Overall incidence of acute appendicitis is similar to that seen in normal population<sup>(1,8)</sup> but as per the Registry study done in Sweden, 778 patients who underwent appendectomy in pregnancy were compared with non pregnant women on age matched control basis. It was found that women in pregnancy are less likely to develop appendicitis<sup>(1,8)</sup> It is most frequent during the second decade of life.<sup>(7,9)</sup>

1 in every 800 pregnancies is suspected to have appendicitis in developed countries, out of which 1/1500 are confirmed cases. It is most commonly seen in the second trimester.<sup>(8,10)</sup> According to Kim et al it is most commonly seen in 1<sup>st</sup> trimester while Joe et al indicated that it is most common in third trimester. Lee et al suggested that there is not much difference in between trimesters.<sup>(7,9)</sup> In our study the maximum no of patients were seen in first trimester. As per the study done by flexor SM et al, study shows that in 908 pregnant females showed increased fetal risk to acute appendicitis relative to those healthy ones. The list included Low Birth Weight(LBW), small for gestational age (SGA), and Preterm Labour. SGA and LBW were associated with increased fetal mortality<sup>(7,11)</sup> Fetal mortality is 1.5percent with uncomplicated appendicitis while it increases to 37 percent with perforative appendicitis.<sup>(7,12)</sup>

In our experience, we had 2 cases of perforative appendicitis with no fetal mortality. Post-Operative period was uneventful. Early diagnosis and Early surgical intervention might decrease the mortality rate<sup>(7)</sup> In our study, Classically in the cases of appendicitis, abdominal pain is the first symptoms which begins in periumbilical region and radiating to right lower quadrant to where the process of inflammation extends.<sup>(5,13,14)</sup> There may be associated anorexia and vomiting following pain. Fever and leukocytosis may develop subsequently.<sup>(5,13)</sup> But during pregnancy, the conventional signs and symptoms of appendicitis may not be evident as the location of appendicitis migrates a few centimeters cranially with increasing volume of uterus and pain in the third trimester might be located in the the right upper quadrant or in the right flank.<sup>(5,15,16)</sup> Since there is no direct contact of the inflamed appendix with the peritoneum, decompression or abdominal guarding has less sensitivity due to decreased tenderness.<sup>(5,17)</sup> Chances of Diffuse peritonitis are increased as the gravid uterus may prevent contact between the inflamed appendix and omentum.<sup>(5,17)</sup> Although guarding and rebound tenderness is seen in 70% of the patients, this may not be the diagnostic finding in the pregnancy due to relaxation of abdominal muscles,<sup>(7)</sup> Nausea, Vomiting and Loss of Appetite can be physiological in pregnancy hence they may not be diagnostic of acute

appendicitis hence abdominal tenderness is the most reliable diagnostic sign in appendicitis in pregnancy.<sup>(7,9)</sup> In our study, the most common complaint was right lower quadrant pain with tenderness in right lower abdomen on examination which is consistent with the literature. In normal pregnancy, the normal W.B.C count is about 12000, which may increase as the pregnancy progress. Key matter indicated that when W.B.C count goes higher than 16000/mm<sup>3</sup> there should be high index of suspicion of appendicular perforation. In our cases, median W.B.C count was 12.39 per cubic mm. In 2 cases of perforative appendicitis it was higher than 16000/mm<sup>3</sup>. There is increase in C-reactive protein in appendicitis although it's a non-specific sign of inflammation. Classical signs of abdominal pain from peri-umbilical region migrating to right lower quadrant associated with tenderness, nausea and vomiting are strongly suggestive towards clinical diagnosis of acute appendicitis.<sup>(5,18)</sup> Whenever there is atypical presentation of acute appendicitis, imaging studies in the form of USG is recommended owing to its easy applicability and reproducibility.

Non-compressible blind ending tubular structure is the chief finding in U.S.G..<sup>(5,19,20)</sup> Inability to compress the uterus, obesity and high BMI, intestinal gas and operator dependency are the disadvantages of U.S.G and the sensitivity ranges from 67 to 100 percent and specificity of 83-96 percent as compared with the sensitivity of 86 % and specificity of 96% in general population.<sup>(5,21)</sup>

MRI is the best investigation to rule out the acute appendicitis in pregnant females where clinical findings and U.S.G. is inconclusive. It can be used safely, non-invasive, safe in pregnancy with higher sensitivity (91%) and specificity (98%).<sup>(5,22)</sup>

CT is not advisable as radiation exposure carries risk for the fetus and can be used in selected cases.<sup>(7,23)</sup> In our study, MRI was used only in one case which yielded accurate result consistent with intra-operative findings. When the patients of acute appendicitis are treated with conservative management, the recurrence rate is 30%.<sup>(7,11)</sup> Conservative approach to acute appendicitis in pregnancy has been seen to increase maternal mortality and fetal loss.<sup>(7,24)</sup>

In our study, after confirmation of acute appendicitis we treated all the patients surgically. Conventional open appendectomy through Lanz incision for 22 patients. Laparoscopic appendectomy was done in 3 patients. Recent Data suggests that laparoscopic appendectomy has many advantages over conventional appendectomy in decreasing wound site infection and there is no increase in risk of preterm labor, miscarriage and maternal complications.<sup>(7,9,25)</sup> In our study, we performed lap appendectomy in 3 patients and observed post-operative period uneventful.

### **Differential diagnosis:**

when we are suspecting an acute appendicitis, we have to keep in mind various pathologies taken place in non-pregnant state and pregnant state as a differential diagnosis. In addition, the causes related to pregnancy leading to abdominal pain, fever, leukocytosis, nausea/vomiting, and changes in bowel function are to be considered. (26) When the patient present with pain in right lower quadrant or right upper quadrant or right flank with positive pregnancy test, the possibility of an ectopic pregnancy must be excluded. (26) Nausea and/or vomiting, malaise with or without bowel irregularity/indigestion are commonly occurring in both appendicitis and early phase of pregnancy. In acute appendicitis nausea and vomiting mostly aggravated after the onset of pain, while the nausea and vomiting of early phase of pregnancy are never associated with pain. (26) Many time, round ligament can cause light pain in right lower quadrant in early pregnancy, but it is non progressive in nature and not associated with other symptoms. (26) Pyelonephritis take place more commonly in pregnant female compare to non-pregnant female. Pregnant female complaining of abdominal pain on the right side associated with fever, leukocytosis and leukocyturia may be treated as pyelonephritis, where the effective diagnosis of an acute appendicitis may be delayed. (26) In the second half of pregnancy, pre-eclampsia and HELLP syndrome can be ruled out from acute appendicitis due to their association with hypertension mainly and others are nausea, vomiting, epigastric/upper right quadrant pain. Fever and leukocytosis are atypical association with them. (26) Premature detachment of the placenta and uterine rupture are associated with median or lateral lower abdominal

pain. Unlike appendicitis, both diagnoses are often associated with vaginal bleeding, changes in fetal heart rate and significant increase of the uterine tonus (stiffness). (26) In postpartum patients, ovarian vein thrombophlebitis (OVT) should be ruled out which usually gives Symptoms within one week of birth, and symptoms may include fever and abdominal pain and tenderness localized to the right, if the right ovarian vein is affected. Nausea and other gastrointestinal symptoms may occur but are generally mild, which may be useful in distinguishing between OVT on the right side and appendicitis. (26)

## CONCLUSIONS

Acute appendicitis is one of the most commonest causes of acute abdomen in pregnant women. The severity of inflammation gives the fetomaternal outcome. Early diagnosis and management should be done to avoid complications. The only option for effective cure in any gestational period is Surgical management. Due to difficult diagnosis due to gravid uterus, imaging studies are recommended in cases where clinical findings and ultrasonography are inconclusive, MRI is the investigation of choice.

## REFERENCES

- [1] Mazze RI, Kallen BJO, Gynecology. Appendectomy during pregnancy: a Swedish registry study of 778 cases. 1991;77(6):835-40.
- [2] Mourad J, Elliott JP, Erickson L, Lisboa LJAjoo, gynecology. Appendicitis in pregnancy: new information that contradicts long-held clinical beliefs. 2000;182(5):1027-9.
- [3] S. Al-Qudah MA, A. Sroujeh, A. Issa, M %J Journal of Obstetrics, Gynaecology. Appendectomy in pregnancy: the experience of a university hospital. 1999;19(4):362-4.
- [4] Andersen B, Nielsen TJAoegS. Appendicitis in pregnancy, diagnosis, management and complications. 1999;78(9):758-62.
- [5] Franca Neto AHd, Amorim MMRd, Nóbrega BMSVJRdAMB. Acute appendicitis in pregnancy: literature review. 2015;61(2):170-7.
- [6] Birnbaum BA, Wilson SRJR. Appendicitis at the millennium. 2000;215(2):337-48.
- [7] Burcu B, Ekinci O, Atak T, Orhun K, Eren TT, Alimoglu OJNcol. Acute appendicitis in pregnancy: Case series and review. 2016;3(1):60.
- [8] Weston P, Moroz PJTO, Gynaecologist. Appendicitis in pregnancy: how to manage and whether to deliver. 2015;17(2):105-10.
- [9] Jung SJ, Do Kyung Lee JHK, Kong PS, Kim KH, Bae SWJJotKSoC. Appendicitis during pregnancy: the clinical experience of a secondary hospital. 2012;28(3):152.
- [10] Andersson RE, Lambe MJlJoe. Incidence of appendicitis during pregnancy. 2001;30(6):1281-5.
- [11] Flexer S, Tabib N, Peter MJTs. Suspected appendicitis in pregnancy. 2014;12(2):82-6.
- [12] Thompson MM, Kudla AU, Chisholm CBJWJoEM. Appendicitis during pregnancy with a normal MRI. 2014;15(6):652.
- [13] Chung C, Ng C, Lai KJHKMJ. Delays by patients, emergency physicians, and surgeons in the management of acute appendicitis: retrospective study. 2000;6(3):254-9.
- [14] Lee SL, Walsh AJ, Ho HSJAos. Computed tomography and ultrasonography do not improve and may delay the diagnosis and treatment of acute appendicitis. 2001;136(5):556-62.
- [15] Pates JA, Avendiano TC, Zaretsky MV, McIntire DD, Twickler DMJO, Gynecology. The appendix in pregnancy: confirming historical observations with a contemporary modality. 2009;114(4):805-8.
- [16] Oto A, Srinivasan PN, Ernst RD, Koroglu M, Cesani F, Nishino T, et al. Revisiting MRI for appendix location during pregnancy. 2006;186(3):883-7.
- [17] Sivanesaratnam VJBP, Obstetrics RC, Gynaecology. The acute abdomen and the obstetrician. 2000;14(1):89-102.
- [18] Guttman R, Goldman RD, Koren GJcfp. Appendicitis during pregnancy. 2004;50(3):355-7.

- [19] Lim HK, Bae SH, Seo GSJAajor. Diagnosis of acute appendicitis in pregnant women: value of sonography. 1992;159(3):539-42.
- [20] Barloon T, Brown B, Abu-Yousef M, Warnock N, Berbaum KJAI. Sonography of acute appendicitis in pregnancy. 1995;20(2):149-51.
- [21] Williams R, Shaw JJEMJ. Ultrasound scanning in the diagnosis of acute appendicitis in pregnancy. 2007;24(5):359-60.
- [22] Long SS, Long C, Lai H, Macura KJJAoR. Imaging strategies for right lower quadrant pain in pregnancy. 2011;196(1):4-12.
- [23] Yagci MA, Sezer A, Hatipoglu AR, Coskun I, Hoscoskun ZJDTD. Gebelikte akut apandisit/Acute appendicitis in pregnancy. 2010;37(2):134.
- [24] Cheng H-T, Wang Y-C, Lo H-C, Su L-T, Soh K-S, Tzeng C-W, et al. Laparoscopic appendectomy versus open appendectomy in pregnancy: a population-based analysis of maternal outcome. 2015;29(6):1394-9.
- [25] Chung JC, Cho GS, Shin EJ, Kim HC, Song OPJCoS. Clinical outcomes compared between laparoscopic and open appendectomy in pregnant women. 2013;56(5):341.
- [26] Barth WH Jr, Goldberg JE. Acute appendicitis in pregnancy. Uptodate. [cited 2014 feb 28].

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