

Nursing Assessment of Surgical and Obstetric Clinical Outcomes of Open Compared to Laparoscopic Appendectomy in Pregnant women.

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Abstract: During the last years, laparoscopic appendectomy has been widely done in pregnant women in spite of the absolute or even relative contraindication of such surgeries during pregnancy. Few studies compared the outcomes of open versus laparoscopic appendectomy. **Aim:** This study aimed to investigate the postoperative surgical and obstetric clinical outcomes of open compared to laparoscopic appendectomy in pregnant women.

Methods: Non-experimental descriptive design was applied in conducting this research. **Tools:** two tools were used. Tool 1: Patient's interviewing questionnaire, post-operative clinical outcomes sheet. **Results:** The mean age of studied patient was 27.08 ± 5.4 vs. 28.8 ± 8.3 among LA vs. OA groups respectively. Number of CS among LA vs. OA was 17 vs. 21 respectively, with no statistically significant differences among the two groups in all bio-demographic data. There was highly statistically significant difference between the two studied groups concerning postoperative hyperthermia, wound infection, hospital stay, time till first flatus ($p < 0.001$). Furthermore, there was a statistically significant difference among both groups concerning with abortion and delivery through cesarean section. **Conclusion:** post-operative surgical outcomes revealed that, patients of laparoscopic appendectomy (LA) group showed faster return of first flatus, shorter hospital stay, lesser wound infection and postoperative hyperthermia than patients of open appendectomy (OA) group. Maternal post-operative outcomes indicating that, patients of the OA group had more abortion, preterm labor, placenta abruption and cesarean section delivery than LA patients. Fetal and neonatal post-operative outcomes showing that, fetal death and prematurity, neonatal admission to NICU and neonatal death among LA group were little compared to the OA group. **Recommendation:** Nurses should pay more attention to the OA pregnant patients for early detection of bedpost operative complications. Fetuses and neonates of the OA mothers should be carefully monitored during and immediately after delivery.

Key words: surgical, obstetric, open and laparoscopic appendectomy.

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Operational Definitions:

Surgical outcomes: Postoperative hyperthermia, wound infection, re-exploration and length of hospital stay.

Obstetric outcomes: abortion, preterm labor, placental abruption & the way of delivery.

Open appendectomy: It is the old-style method and the ordinary treatment for appendicitis. The surgeon creates a cut in the lower right abdomen, pulls the appendix through the incision, ties it off at its base, and eliminates it.

Laparoscopic appendectomy: It is a slightly invasive surgical technique includes creating several surgical opens in the abdomen and inserting a laparoscope to eliminate the appendix.

I. Introduction

Acute appendicitis is the ultimate public key sign of non-obstetric surgical emergencies in contemporary medicine. The most public non-obstetric cause for abdominal pain is acute appendicitis which has an incidence of 1 in 1500 pregnancy which is similar to the incidence in the non-pregnant population. It has been described that maternal morbidity in acute appendicitis without perforation is 17% compared with 52% with perforation while fetal mortality in non-complicated appendicitis is 7% compared with 24% in cases with complicated appendicitis. (1)

Abdominal pain through pregnancy caused by a wide variety of obstetric and non-obstetric pathologies that make the diagnosis of acute appendicitis in pregnancy is a quiet challenging problem. Anatomic variations of the appendix due to distended uterus Physiological leukocytosis at pregnancy, and non-specific abdominal

awkwardness symptoms of pregnancy as nausea, vomiting, anorexia and abdominal pain all are indicators of pregnancy and acute appendicitis which may delay the emergent diagnosis and consequently leading to maternal and fetal large morbidity and mortality rate. (2)

Once acute appendicitis is supposed, an aggressive approach is suggested. Delaying surgery more than 24 hours after onset of symptoms increase risk of complicated appendicitis, subsequent aggressive maternal sickness and pregnancy loss. In contrast, the maternal death rate may be much reduced with the aid of rapid diagnosis, proper management, proper antibiotics and close evaluation of the pregnant woman. (3)

Although open appendectomy was the standard intervention for appendicitis, the surgical procedure has altered from open to laparoscopic appendectomy in pregnant and the overall population in the previous few years due to efficacy, safety and low risk of complication. LA has many benefits as healthier visualization, fewer incidence of wound infections, abdominal pain and abdominal compartment syndrome, shorter hospital stay and quick return to daily activities, permitted for a good outcome and keeping ongoing pregnancy as compared to open appendectomy. (4)

Pregnancy laparoscopic appendectomy, especially on the first and second trimester, is recommended, as a safer procedure, with scarcer post-operative obstacles as likened to open appendectomy, which usually linked with higher post-surgical fever and greater frequency of premature contractions. (5)

Significance of the Study:

There are restricted statistics on the outcomes of LA compared with OA during pregnancy. The selected of the ideal surgical mediation for appendectomy during pregnancy whether OA or LA, remaining controversy. Consequently, the current research tried to examine the clinical obstetric and surgical outcomes to assess the protection and efficacy of LA compared with OA in pregnant women. (6)

Research Questions:

What are the surgical post-operative outcomes of open compared to laparoscopic appendectomy in pregnant patient?

What are the obstetric (maternal- fetal and neonatal) post-operative outcomes of open compared to laparoscopic appendectomy in pregnant patient?

II. Material And Methods

Study Design: Non-experimental descriptive design was used to conduct the current study.

Study Location: Data were collected from General surgery Department at Menoufia University Hospital, Menoufia, Egypt.

Study Duration: From November 2014 to December 2018.

Sample size: 100 pregnant females with acute appendicitis.

Sample size calculation: Based on post-operative clinical outcomes reported in Chung *et al.*, (2013) (7) sample size was 50.56 ± 1.53 patients for the laparoscopic group and 50.36 ± 2.11 as a control group; the sample size was calculated to be 100 pregnant patients (50 for each group), considering CI=95% and power=90% (10% dropout).

Subjects & selection method: Patients were purposively selected from the aforementioned setting and recruited in the study according to the following **inclusion criteria**

Patients with acute appendicitis

During current pregnancy

Singleton pregnancy

Willing to participate in the research.

Recruited patients were distributed into two different groups: Laparoscopic appendectomy group and open appendectomy group according to their condition and needed intervention.

Procedure methodology

Stage I: A wide reviewing of electronic data associated with the study area was carried out. A demo of the literature to accumulate pertinent knowledge to study was also used in developing data collection instruments.

Stage II: The fieldwork was listed of following-up the patients after operation and then during and after their deliveries.

Stage III: After approval to participate in the study, the researchers explained study aim and obtained an oral consent and then used instrument I (interviewing questionnaire sheet) to record basic data then instrument II to record post-operative outcomes. The researchers sit schedule for follow-up times, identified methods of contacting patients till delivery.

Stage IV: At delivery, the researchers attempted to join the method to record data by instrument III (Clinical maternal and neonatal results sheet). For some patients (9 cases), the researchers collected required data from the obstetrician and the pediatrician whom attended the delivery method.

Datagathering instruments:

Three instruments were utilized through the course of this study all were established by the researchers and tested for validity and reliability.

Tool I: Patient's interviewing questionnaire: To evaluate patient's personal characteristics, it involved:

Part one: Patient's bio-demographic data: eight questions asking about Sociodemographic characteristics of studied patients as age, BMI, marriage duration, occupation, residence, and income.

Part two: Obstetric data: four questions asking around patient's gestational age at operation, gravida, parity and previous cesarean section

Tool II: Patient's post-operative clinical outcomes sheet: It included two parts

Part one: Patient's surgical outcomes: Seven questions about fever, wound infection, thromboembolism, hospital stay (days), re-exploration, time till first flatus and complications.

Part two: Patient's Obstetric clinical outcomes sheet: It included two sections

Section one: maternal clinical outcomes: four questions about abortion, preterm labor, placenta abruption type of delivery and maternal death.

Section two: fetal and neonatal clinical outcomes: Birth weight, APGAR score at 1st min and 5th min, fetal death, prematurity and admittance NICU.

Validity of data collection tools: All data collection tools were assessed for content and construct validity by 4 professors in the surgical and nursing fields. They were questioned similarly to judge the objects for perfection and precision. Proposals were pooled into the instruments.

Reliability of the tools: Test retest method was used for analyzing the internal consistency of the instruments.

By giving the same instrument to the same participant below parallel conditions on double or extra opportunity.

Scores from repetitive analysis were compared. The scores were satisfactory with scores of 0.76, 0.88 for Tool I and Tool II respectively.

Pilot study:

All steps of the study were carried out on (10% of the whole sample) to test the applicability of the tools and to evaluate the period required for data gathering. The results of the pilot assisted in refining the interview questionnaire.

Administrative design

Official steps were taken to take approval for study conduction. An authorized agreement was taken first from the faculty of nursing authority. The protocol for the research was accepted by the ethical and hearing committees of the faculty of nursing. Then permission from the university hospital authorities was taken after explanation of the aim and the importance of the study was granted.

Ethical concern

After descriptions former to registration in the research, a knowledgeable written permission was taken from all patients before sharing in the research. Separately patient was learnt that partaking was voluntary and she could withdraw from the research when she decided to and each one has assumed the opportunity to freely refuse participation. They were capable to request any question about the research details. Patients were confident that their information was confidential and only used for the research process also the result would be described as a group data with no personal participant's information endured.

Statistical analysis

The currently possessed data were tabularized then analyzed by the statistical set for the public science (SPSS) software version 20 on IBM compatible computer. The data were quantitatively articulated as the mean ± standard deviation. The used tests of significance involved: Chi-square test (χ^2): was used to study the association among qualitative variables. Student t-test: utilized to compare between two groups having quantitative variables.

III. Result

Table 1: Socio-demographic data of studied patients

Variables	Laparoscopic appendectomy	Open appendectomy	Test	P value
Age, year (mean±SD)	27.08±5.48	28.81±8.35	0.13*	>0.05
Duration of marriage			5.5**	>0.05
1-5 years	21	19		
6-10 years	16	23		
More than 10 years	13	8		
Occupation			9.2**	>0.05
Employee	41	37		

House wife	9	13		
Residence			3.2**	>0.05
Urban	12	18		
Rural	38	32		
Income			8.9*	>0.05
Enough	27	30		
Not-enough	23	20		
BMI (mean±SD)	22.6±2.7	22.9±2.5	0.2**	>0.05
Gestational age at operation by weeks (mean±SD)	22.42±8.25	25.67±6.57	1.4***	>0.05
1 st trimester (n)	24	32		
2 nd trimester (n)	15	12		
3 rd trimester (n)	11	15		
Gravida (mean±SD)	2.08±1.16	2.64±1.61	0.23***	>0.05
Parity (mean±SD)	0.92±1	1.47±1.48	0.19**	>0.05
Previous cesarean section (n)	17	21	1.8***	>0.05

*Student t test, **Mann Whitney test, *** Chi square test

Table 2 presents the postoperative surgical outcomes of studied patients. There was an extremely statistically significant difference between two groups about the occurrence of postoperative hyperthermia, wound infection, hospital stay, time till first flatus (p<0.001).

Table 2: Post-operative surgical outcomes of studied patients

Variables	Laparoscopic appendectomy	Open appendectomy	Chi-square test	P value
Postoperative hyperthermia (n)	14	26	13.5	<0.001
Wound infection	8	17	9.9	<0.001
Thromboembolism	0	0	-	-
Re-exploration	0	0	-	-
Hospital stay (days)	3.25±2.45	4.28±3.31	9.29*	<0.001
Time till first flatus /hrs. (mean±SD)	2.3±0.3	4±1.6	12.6	<0.001
Complication's occurrence	0	0	-	-

*Student t test

Table 3 illustrates the maternal outcomes of studied patients. There was a statistically significant difference between both groups regarding abortion and delivery through cesarean section.

Table 3: Clinical maternal outcomes of studied patients.

Variables	Laparoscopic appendectomy	Open appendectomy	Chi-square test	P value
Abortion	4	11	4.73	<0.001
Preterm labor	5	6	0.09	>0.05
Placenta abruption	3	4	0.47	>0.05
Type of delivery				
• Cesarean section	38	28	1.68	<0.001
• Vaginal delivery	12	26		
Maternal death	0	0	-	-

Table 4 clears fetal outcomes in two groups. There was a statistically significant difference between both groups only in occurrence of fetal death (p<0.001).

Table 4: Clinical fetal and neonatal outcomes of studied patients

Variables	Laparoscopic appendectomy	Open appendectomy	Chi-square test	P value
Fetal death	4	15	8.56	<0.001
Prematurity	5	6	0.09	>0.05
Admission to NICU	6	7	3.25	>0.05
Neonatal death	1	2	0.08	>0.05
Birth weight (mean±SD)	3030±744	2944±664	0.7*	>0.05
APGAR score			1.9*	>0.05
1 st minute	8.11±1.6	8.42±1.08		
2 nd minute	9.1±0.9	9.0±1.0		

*Student t test

IV. Discussion

Acute appendicitis is emergent situation usually treated with surgery but the management through pregnancy is not fully recognized, particularly concerning the choice between open and laparoscopic appendectomy. The choice to continue to surgery in a pregnant patient should be based upon clinical history, examination and imaging results. The present study aimed to study the clinical outcomes of OA versus LA among group of pregnant women. (8)

The present study proved that, there was no statistically significant difference among both groups regarding any of the sociodemographic variables. This outcome assures the homogeneity of groups which help in establishing the cause-effect relationship. This was consistent with Karaman et al., 2016 who shown that there were no statistical significant differences in demographic characteristics age, BMI, gravidity, gestational age at operation, and history of cesarean sections of the studied population. (9)

In relation to the postoperative surgical outcomes of studied patients, LA group had lesser hospital stay and faster time until first flatus occur with highly statistically significant difference. In the same line, a study of Laparoscopic Appendectomy in Pregnancy with Acute Appendicitis published by Maimaiti et al., 2017, reported that, the LA group had little hospital stay and dumpier time to first flatus as compared to the OA group. (10)

As for wound infection; the current study outcomes exposed a statistically significant difference between groups concerning this point. The occurrence was high in OA group than LA. Supporting this result was Yu et al., 2017 who studied "Is laparoscopic appendectomy feasible for complicated appendicitis" and found wound infection higher significantly among OA group. (11)

Despite numerous studies confirming the protection and efficiency of LA during pregnancy; Chunget al., 2013 (7) performed a retrospective study enrolling 61 patients whom undergone appendectomy (with 22 laparoscopic and 39 open surgery) and found no differences in terms of surgery as duration and incidence of postoperative complications or obstetric and fetal outcomes as incidence of preterm labor, delivery manner, gestation age at delivery, weight at birth, and APGAR scores.

In relation to maternal outcomes of studied patients, OA group demonstrated more abortion and cesarean sector deliveries with a significant difference between both groups. Cheng et al., 2015 (12) in a study named (Laparoscopic appendectomy against open appendectomy in pregnancy) was in the same line with the current result. They found that the incidence of preterm labor (<37 completed weeks) was significantly very high in the OA group (8%) compared to the LA group (2%).

Our result is denied with a previous study done by Pearl et al., 2011 (13) about "Guidelines for diagnosis, treatment, and the use of laparoscopy for surgical problems in pregnancy". The aforementioned study described that, the overall rate of interrupted pregnancies subsequent LA in pregnancy was 7.7%, compared to 11.3% following OA with no difference in rates of preterm delivery between the LA and the OA group. Rendering to the researcher point of view; the contradiction in results may be rationalized by the idea that inflammatory reaction, medications, and even anesthesia may prompt abortion.

Fetal death was with a lower incidence in the Lo as compared to OA with a statistically significant difference. Resembling this result, a research was done by Alkatary and Bahgat 2017 (Laparoscopic versus open appendectomy during pregnancy) showing that, laparoscopic appendectomy in pregnancy effects in an exactly twofold significantly higher risk of fetal demise compared with open appendectomy. (14)

Oppositely; a recent data from Winter et al., 2017's study "laparoscopic or open appendectomy for suspected appendicitis in pregnancy and evaluation of fetal outcome in Australia". The study revealed that laparoscopic appendectomy (LA) in pregnancy was linked with higher rates of embryonic loss when compared to open appendectomy (OA). The contradicted result is seen to be due to studied sample differences. (15)

V. Conclusion

The study findings succeeded in answering both research questions. Based on the results of the current study, it was concluded that:

- Surgical post-operative outcomes revealed that, patients of laparoscopic appendectomy (LA) group showing faster first flatus return, shorter hospital stay, lesser wound infection and postoperative hyperthermia than patients of open appendectomy (OA) group.
- Maternal post-operative outcomes indicating that, patients of OA group had more abortion, preterm labor, placenta abruption and cesarean section delivery than LA patients.
- Fetal and neonatal post-operative outcomes showing that, Fetal death and prematurity, neonatal admission to NICU and neonatal death among LA group were little compared to OA group.

VI. Recommendations

Based on the current findings, the following are recommended

1. Nurses should pay more attention to OA pregnant patients for early detection of bedpost operative complications.
2. Fetuses and neonates of OA mothers should be carefully monitored during and immediately after delivery.
3. Pregnant women underwent OA should be followed-up for the occurrence of preterm labor and placental abruption.
4. Replication of the study using a larger sample to ensure findings adequacy

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